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AFFECTS OF TELEVISION AS A NATURAL EDUCATOR: CAN TELEVISION BE A TOOL AS AN INFORMAL EDUCATOR? : A TRNC SAMPLE

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ABSTRACT
The major objective of this study is to discuss the effects of television on children and adolescents. Our children are spending many hours in front of the television. This study examined the viewing habits and personal opinions of Turkish Cypriot children. The participants were 250 children and adolescents whose ages varied between 4 – 17. This study revealed that children and adolescents are spending most of their time in front of the TV. Besides most of them admire a character and want to act like their famous character. It is one of the most important finding of some certain studies about the role of television on socialisation and shaping values. In this study, viewing habits and personal opinions of children and adolescents are revealed. From that point of view, some suggestions are put forward in order to benefit more from TV. Also a comparison about viewing habits, effects of watching TV is made between other cultures and Turkish Republic of Northern Cyprus

I. INTRODUCTION

A new era has started with the invention of television. The word "Television" consists of two words, "Tele" that means at *distance* and "Visio" which means *to see*. Composite of these two words forms the word "television", which means to see an image at a distance (Temel Britannica, 135) Television is the source of most broadly shared images and messages in history (Brynat&Zillman, 1994). In 1926 the very first television image was broadcast by a Scotch engineer, John Logie Baird.

It was a very important invention from the beginning, an invention that brings the world, entertainment, news and some other programs into every home. In 1981, a study reported an average, that a young person has watched more than 15,000 hours of television, but spent only 10,800 in school (Mitchell&Kirkham, 1981)). Another similar study has been done by The Istanbul Chamber of Commerce in Turkey. This study has showed that 441 out of 504 adults (who were older than 18) watch television, at least two hours everyday (ICC, 2001). In such a time period it is inescapable that children watch television with their parents. It is the mainstream of the common symbolic environment into which our children are born and in which we all live out our lives (1). We allow our schedules to be altered by televisions. If we had to sum up the spiritual zeitgeist of the late twentieth century, it might be said that ours is an age not of churchgoers, not of atheists, not of Buddhists or Muslims, but of TV watchers (Arthur, 1996). Arthur argues that, it has been estimated that in the course of an average lifetime we may spend as much as eight years watching television. Since its invention many studies have been done about viewing television and its effects on people especially on young children. Many disadvantages and advantages of watching television has been examined since its invention. Many researchers in various subjcets are still conducting comprehensive studies about viewing television and its effects in a broad perspective.

In spite of this situation, we, as educators, should guide the parents and children in order to benefit from television. Therefore, orientating television channels should be educators' and other authorities' profession.

Research Question

Everything which concerns education should be analyzed very thoroughly. As mentioned earlier, television has a great influence on people, especially on children. For this reason, there are certain questions that we should research for possible answers. These certain questions are; "How many hours per day do they watch television?" what do people do when they watch television, "what do people, especially children watch on television?", "Do they think that television is a natural educator?" In this research the exact question we would like to find the answer to is "Is it possible to use television as a teaching tool, outside the classrooms?"

Literature Review

Lawrence Cremin, the distinguished historian of US education, defined education as the deliberate, systematic and sustained effort to transmit evoked or acquired knowledge, attitudes, skills or sensibilities as well as any outcomes of that effort. This definition clearly explains the education concept which is not restricted within the term schooling.

There are three patterns of education which are; formal, informal and non-formal education. According to Merriam, formal education refers to all educational institutions including all levels of schools both private and public, as well as specialized programs offering technical and professional training. She explains informal

education as an unplanned incidental learning that occurs in the process of people's daily lives. Merriam explains non-formal education as any organized educational activity outside the established formal system that is intended to serve identifiable learning clienteles and learning objectives (Merriam&Brockett, 1996).

People often confuse the education concept with schooling and they discuss this concept only within the scope of schooling. These terms of education might help us to examine the education concept. As Merriam indicated earlier, informal education is based on incidental learning, occurring in people's daily lives. Television and radio channels, the Internet, various games are all included in the scope of informal education. There is no real evidence that all the television sets and viewing hours make a difference in how much children learn, but certainly much informal learning does take place (Lesser, 1975). Recent research studies have showed that the television is an essential need for humankind especially children. From this view point we need to critically examine its effects on children in order to develop a more balanced approach (Schlozman, 2002).

"It came as little surprise to me when a Kaiser Family Foundation study found that children between the ages of 8 and 18 spend more time with the television than with almost all other media combined, including books, computer games, magazines and video games", says Williams (Williams, 2003). In fact people watch television in their everyday lives. They have fun, acquire knowledge, and learn what is happening all around the world. Experts are still investigating the effects of viewing television; they guide the authorities, parents and educators as well according to the results. In this section some relevant research studies and results will be explained.

It is easy for children to ignore sights and sounds that surround them. To some extent they have to learn to do this, or how else could they concentrate? But the medium which is the most ignored is also the one supposed to be most stimulating: *television* (Cullingord, 1995). At this point the question we need to answer is what do children watch? Cullingford says that children mostly watch programs which make fewest demands on them. Such programs are usually action films that are aimed at adults. Cullingford also points to that the amount of time spent on watching television. Most, if not all, spend about three hours everyday. In this case, we should investigate the negative effects of viewing television.

A study report which was prepared by the American Academy of Pediatrics has showed that watching television has possible negative health effects; such as violent or aggressive behaviour, substance use, sexual activity, obesity, poor body image and decreased school performance (AAP, 2001). A similar study on the same subject has been done among high schools in the United States of America. The study analyzed data from the 1999 National Youth Risk Behaviour Survey, a representative sample (N = 15,349) of USA high school students. 11% of 15,349 students were overweight, 31% were sedentary and 43% of them watched television more than two hours everyday (Lowry, Wechsler, Galuska, Fulton&Kann, 2002). Another study was done by other certain researchers. They randomly selected 2760 children whose ages vary between 14 and 16 from ten urban areas. For all the young people surveyed, these behaviours correlated with frequency of viewing television. This study has reported that, as the frequency of viewing television of young people increases, an increase in such behaviours as having sexual intercourse, drinking, smoking cigarettes and marijuana, cutting glass, cheating, stealing and driving a car without permission has been observed (Schlozman, 2002). Scholzman also claims that a body of data suggests that children who witness either fictional or real violence on television sometimes develop symptoms of post traumatic stress disorder.

In many countries, especially in the USA many similar studies have been done by certain researchers and institutions. All findings are summarizing the negative effects of television as; obesity, poor communication, aggressive behaviour and decreased school performance.

We usually have an inclination to say that viewing television has disadvantages more than advantages; but actually it would be much more constructive and enlightening to examine with good programs. Cullingford put emphasis on using television as an educational tool. This idea of using television as an educational tool requires information about how children and adolescents learn. Attempting to use television to teach children and adolescents is based on so little real evidence that it is almost purely an act of faith (Lesser, 1975). All we need is to obtain necessary information about children's learning and the effects of television. In the 21st century both positive and negative effects of watching television is known thoroughly. And we are able to see its definite and lasting effects on children. Children are more likely to learn through television, than going to school or reading a book. Going to school is compulsory whereas watching television is not. Reading a book might be dull or obscure whereas, viewing television is easier and amusing in a visual manner. For whatever reasons, children seek opportunities to watch television, providing us, in turn with opportunities–as yet unused–to put their spontaneous pleasure to use (Lesser, 1975).

The effects of television on children's behaviours are not all negative. Educational programs such as "Sesame Street" give children the opportunity to learn letters of the alphabet, words, numbers, and social skills. Such programs also show people solving problems and resolving differences through cooperation and discussion rather than through aggression and hostility. Television's conventions operate strongly to expedite a viewer's understanding. Clair and Schwetz have investigated the effects of a show named "Between the lions" on children. The show's message aimed at children between the ages of 4 to 7. They found that the program helped children with certain details of the reading process (Clair&Schwets, 2003). They also claimed that such shows help youngsters on the road to literacy.

American Pediatrics stress on the effects of messages conveyed through television. In 1967 Bandura, a psychologist, helped kids of similar ages who were afraid of dogs, to overcome their fears by showing them a short film. The film featured a kid resembling them who was not afraid of dogs and was playing with dogs in a happy mood. Thus he has succeeded in helping children to overcome their fears (Senemoğlu, 2000). One of the most important points about viewing television is that, young children have a tendency to imitate the televised characters as indicated in the Bandura's experiments named ***Modelling***. Giggling, washing, scratching, kicking, hopping, rubbing and various actions evoke considerable imitation. According to Bandura; individuals are more likely to learn modelled actions that are valued rather than those acts that are not rewarded (Smith, Nathanson&Wilson, 2002). To prove this idea, in the early 1960s Bandura and other researchers conducted a classic set of experiments that demonstrated the power of observational learning. In one experiment, a preschool child worked on a drawing while a television set showed an adult behaving aggressively toward a large inflated Bobo doll. The adult pummelled the doll with a mallet, kicked it, flung it in the air, sat on it, and beat it in the face. The child was then left in another room filled with interesting toys, including a Bobo doll. The experimenters observed the child through one-way glass. Compared with children who witnessed a non-violent adult model and those not exposed to any model, children who witnessed the aggressive display were much more likely to show aggressive behaviours toward the Bobo Doll, and they often imitated the model's exact behaviours and hostile words. (Senemoğlu, 2000) Albert Bandura's Social Learning Theory has maintained an important place in the study of aggression and criminal behaviour. In order to control aggression, he believed family members and the mass media should provide positive role models for their children and the general public (Bandura, 1976). As Bandura indicated the importance of mass media in informal education, we, as educators and parents should also focus on the effects of commercial television programs.

Because of the modelling theory and its effects, it requires quite attention to investigate the commercial television programs and their contents. In general, the messages these programs convey, lead people to think in a narrow perspective. On commercial television's family situation comedies father is bumbling and helpless, but lovable-doubly so if he happens to be a professor. On game shows women are greedy, grasping and hysterical with gratitude when receiving a refrigerator dishwasher for nothing. On soap operas, only bad people have sexual impulses; good peoples' sex is apologetic and engaged in solely for purposes of reproduction. Good children are respectful and reverent, dogs are heroic and loyal, dolphins are clever and sharks are vicious (Lesser, 1975). In this view, it is not possible for children to grow up as intellectuals. Stereotype characters only cause rote learning but nothing.

During the prime-time hours, many situation comedies and advertisements are broadcast. Furthermore similar approaches are still used in various television programs. In Turkey, on commercial televisions, such as family situation comedies and advertisements, mothers and girls are quiet and shy and all responsibility of house works belongs to them! Fathers and boys are always strong and pretend to be powerful; they never help their wives or mothers and expect to be served. In other words, discrimination in sex roles is still imposed to young children as a part of informal education. As stated earlier, informal learning does take place mostly during viewing television. For these reasons, the messages conveyed in these programs must be analyzed with further attention. In addition to this, necessary alterations should be made in the scheduling of the programs.

Importance of the study

Since its invention, television has become one of the most influential tools in humankind's life and behaviour. As especially children are influenced by what they see on television, a study concerning the positive and more importantly the negative effects television has on the informal education of children is of utmost importance.

Furthermore, as this study is not only about the effects of watching television on informal education, but also about how everybody in the society must act to improve these effects, it requires further and close attention.

Aim of the study

The aim of this study is to observe the role of television as an informal education tool and knowing its effects, make the necessary changes in programming of television channels. In addition to these, this study aims to help academicians guide their students while helping the rest of the society guide their young ones, (and making television a positive tool for informal education), thus helping to raise a healthier and more educated generation in the context of social behaviour.

Limitations

This study is limited due to;

- The academic year of 2004-2005 fall semester
- 250 students from 4 different age groups, and 4 schools
- The insufficient number of TV channels and lack of quality, Turkish Cypriots prefer to watch Turkish television channels. Consequently the subject studied in this research includes eight international TV channels which are still being transmitted on Turkish TV channels in Turkey.

II. METHODOLOGY

Sample

The subjects were 250 students, 119 boys and 131 girls, enrolled in different classes and age groups. There are 20 people in the ages of 4 – 6, 60 people in the ages of 7- 11, 91 people in the ages of 12-14 and 79 people in the ages of 15 – 17.

Instruments

Two types of questionnaires are used for this research. One of them is for the children who are between 7-17 years old and the other form was prepared for parents of the children whose ages are between 4-6 years old. The questions that are included into the questionnaire are prepared according to the certain scientific research studies. It includes two parts that are; personal information and questions about television viewing.

A pilot survey on 22 children in the ages of 4 – 17 was performed. Afterwards, a questionnaire was arranged in the context of answers to the questionnaire. In the following procedure the questionnaire was proofread by two experts. After that the questionnaire was rearranged and proofread by experts again. In the last version of the questionnaire there are two parts. The first part includes the first 7 questions which are the age, gender, education of mother and father, number of television in the home, in the child's bedroom, if any. The second part includes 10 questions and those 10 questions consist in each of the following categories:

(a) viewing television habits
(b) effects of viewing television
(c) Personal opinions about watching television.

All questions in the questionnaire require either various or yes/no responses

Procedure

The subjects, between the ages 7 and 17 were given the questionnaire in their classrooms. A few oral instructions were given to emphasize that the honest perception was required and the items were to be answered without consultation or comparison with peers. The subjects, who were younger than 7 years old, answered the questions in the questionnaire with the help of his or her parents and the researchers or the questionnaire was completed by the child's parents.

III. RESULTS

Demographic Data

The first five items of the questionnaire asked for "Personal Data", including the variable age, gender, education level of their mothers and fathers and whether they television(s) at their home and bedroom.

An analysis of the characteristics of the target population for the study indicated that 52.4 % (131) female and 47.6 % (119) male responded the questionnaire.

Similarly, 8 % of participants are between the ages of 4 – 7. 24 % of the subjects are between the ages of 7 – 11 and 36.4 % of the participants are between the ages of 12 – 14. 31.6 % of the participants are between the ages of 15 – 17.

About 10.4 % (26) of the participants stated that their mothers' education level is primary school, 13.6 % (34) of the participants stated that secondary school level, 41.6 % (104) responded as high school level, 28 % (70) of the participants responded as graduate level and 6.4 % (16) of the participants responded as postgraduate level by comparing their mothers' education level.

In addition to this, About 9.6 % (24) of the participants stated that their fathers' education level at primary school, 9.2 % (23) of the participants stated that secondary school level, 36.8 % (92) responded as high school level, 36 % (90) of the participants responded as graduate level and 8.4 % (21) of the participants responded as postgraduate level by comparing their fathers' education level.

Another analysis of the peculiarity of the target population for the study showed that 23.2 % (58) of the participants have only one television, 54.8 % (137) of the participants have two televisions, 16.8 % (42) of the participants have three television and 5.2 % of the participants have more than three televisions at their homes.

Similarly, 24.4 % (61) of participants stated that they have a television in their bedrooms whereas 75.6 % (189) of the participants stated that they do not have a television in their bedrooms.

Frequencies of Survey Items

Table 1. How many hours per day do you watch television?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<2 hours	50	20.0	20.0	20.0
	2-4 hours	120	48.0	48.0	68.0
	4-6 hours	62	24.8	24.8	92.8
	More than 6 hours	18	7.2	7.2	100.0
	Total	250	100.0	100.0	

In Table 1, 20 % of the subjects indicated that they watch television less than two hours per day. About 48 % of the subjects responded that they watch television between 2-4 hours per day, 24.8 % of the subjects stated that they watch television between 4-6 hours per day and 7.2 % of the subjects stated that they watch television more than 6 hours.

Table 2. At what time of the day do you prefer watching television?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7 am - 12 pm	17	6.8	6.8	6.8
	12 pm - 5 pm	42	16.8	16.8	23.6
	5 - 9 pm	131	52.4	52.4	76.0
	9 pm - 12 am	52	20.8	20.8	96.8
	After midnight	8	3.2	3.2	100.0
	Total	250	100.0	100.0	

In Table 2, 6.8 % of the participants responded that their preferences about watching TV time are between 7 am – 12 pm. Similarly 16.8 % of the subjects prefer watching television between 12 pm – 5 pm. About 52.4 % of the participants prefer watching television between 5 pm – 9 pm. About 20.8 % of the subjects prefer watching TV between 9 pm – 12 am.

In addition to this, subjects are asked to answer the kind of television programs that they prefer to watch. They have selected at most three kinds of programs and results are shown in Table 3.

Table 3. What kind of television programs do you prefer to watch?

		Frequency		Frequency
Valid	Fight Films	73	Horror Films	113
	Comedy Films	141	Reality Shows/Discussion Platforms	10
	Action Films	103		
	Suspenser Films	0	Documentary Programs	39
	Cartoons	61	Series of Film	30
	Competition Programs	35	Educational Programs	10
	Reality Shows	21	Other	2
	News	37		
	Magazine Programs	6		
	Advertisements			

Table 4. When you see a character smoking on television, do you feel any urge to smoke or do you envy the character who is smoking?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	14	5.6	5.6	5.6
	no	236	94.4	94.4	100.0
	Total	250	100.0	100.0	

As it is obvious from Table 4, 5.6 % of the subjects chose the option yes for "When you see a character smoking on television, do you feel any urge to smoke or do you envy the character who is smoking?", whereas 94.4 % of the subjects responded the question as " No"

Table 5. What do you do while watching television? (You may choose more than one options)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I definitely eat snacks	137	54.8	54.8	54.8
	I chat with people around me.	26	10.4	10.4	65.2
	I prefer to remain silent	72	28.8	28.8	94.0
	I read newspapers, books or magazines	8	3.2	3.2	97.2
	Other	7	2.8	2.8	100.0
	Total	250	100.0	100.0	

As shown in Table 5 most respondents 54.8 % (137) have chosen the option which is "I definitely eat snacks" About 28.8 % (72) of the participants prefer to remain silent. "Chatting with people" option was chosen by 10.4 % (26) of the participants, 3.2 % (8) of the respondents read newspapers and 2.8 % (7) of the participants choose "other" option in the questionnaire.

As a follow-up question, participants are asked to prefer to watch a TV program that is enjoyable or going out to have fun. Results are listed in Table6.

Table 6. Would you prefer to watch a television program that you enjoy over going out to have fun?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	49	19.6	19.6	19.6
	sometimes	146	58.4	58.4	78.0
	no	55	22.0	22.0	100.0
	Total	250	100.0	100.0	

In Table 6, it is shown that 19.6 % of the subjects prefer to watch a TV program that they enjoy. Most of the respondents 58.4 % (146) have chosen the option "sometimes". 22.0 % (55) of participants prefer to go out to have fun.

In the next question, subjects were asked to indicate, if there is a famous character that they envy on any TV channel. Further details are listed in Table 7.

Table 7. Is there a famous character that you envy on any television channel?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	163	65.2	65.2	65.2
	no	87	34.8	34.8	100.0
	Total	250	100.0	100.0	

5.2 % (163) of the subjects indicated that they envy a famous character while 34.8 % (87) of the subjects do not envy a famous character.

As a follow up question, respondents who chose option "Yes" were asked to indicate the type of their famous character that they envy and results are shown in Table 8.

Table 8. which of the followings is the type of the character?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Film/TV Series Star	67	26.8	41.4	41.4
	Sportsman	32	12.8	19.8	61.1
	Showman	4	1.6	2.5	63.6
	Cartoon Character	20	8.0	12.3	75.9
	Model	12	4.8	7.4	83.3
	Singer/Actor/Actress	25	10.0	15.4	98.8
	News Caster	2	.8	1.2	100.0
	Total	162	64.8	100.0	
Missing	System	88	35.2		
Total		250	100.0		

41.4 % (67) of the participants responded that, the character they envy is a film/ TV series star. Similarly 19.8 % (32) of the participants responded that the character they envy is a sportsman. About 2.5 % (4) of the participants indicated that they envy a showman. 12.3 % (20) of participants envy a cartoon character, 7.4 % (12) of the participants envy a model, 15.4 % (25) envy a singer/actor/actress and 0.8 % (3) of the participants envy a news caster.

In the next question, participants were asked to state if they dream any events, characters or people after watching them on television. Results are shown in table 9.

Table 9. Are there any events, characters or people that you dream about after watching them on the television?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	99	39.6	39.6	39.6
	no	151	60.4	60.4	100.0
	Total	250	100.0	100.0	

As shown by (in) table 9. 39.6 % (99) of the subjects responded that they dream any event/ character/ or people after watching them on the TV. 60.4 % (151) of the subjects responded negatively by choosing "No" option.

Table 10. Do you believe that television is an informative invention in any way ?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	92	36.8	36.8	36.8
	sometimes	98	39.2	39.2	76.0
	no	60	24.0	24.0	100.0
	Total	250	100.0	100.0	

In question 16, subjects are asked to indicate their personal opinions about watching TV. Results are listed in table 10.

36.8 % (92) of the subjects believe that TV is an informative invention in any way. 39.2 % (98) of the subjects believe that TV, sometimes is an informative invention in any way whereas, 24 % (60) of the subjects did not believe that TV is an informative invention in any way.

Last question is "Do you support the idea that there is no life without television?" was also in the category of personal opinions about watching TV, which Results are shown by table 11

Table 11. Do you support the idea "there is no life without television"?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	126	50.4	50.4	50.4
	sometimes	73	29.2	29.2	79.6
	no	51	20.4	20.4	100.0
	Total	250	100.0	100.0	

Slightly more than half of the respondents 50.4 % (126) indicated that they supported the idea that "there is no life without television". 29.2 % (73) of the subjects sometimes support the idea that "there is no life without television". 20.4 % (51) of the subjects indicated that they did not support the idea "there is no life without television".

t-test and ANOVA Results

In the analysis of the data, when comparing means, no evidence is found to say that there is a statistical difference between the specific groups except a gender difference about the kind of programs. A t-test analysis revealed a significant difference between males and females about the preference of TV programs ($p < 0.05$).

Most of the male participants in the ages of 7-17 prefer to watch fight, action or horror films whereas; most of the female participants in the ages of 7-17 prefer to watch comedy, horror films and TV-series.

Another result of the study showed that female participants in the ages of 7 – 17 envy a famous character. In the follow-up analysis it is found that 33 % (43) of the females' famous character they envy is a film/TV series star. Similarly, 13 % of the female participants' famous character they envy is a model. In the same way, 21% of males' famous characters they envy are film/TV series star and sportsman.

Same question was also asked to the participants who are in the ages of 4 – 6. A surprising result was found. That is all participants envy a character on the TV. 25 % of the children indicated that, their famous character they envy is a TV/film star, 30 % of the children responded that, their famous character they envy is a sportsman 20 % of children responded that, their famous character they envy is a model or a singer/actor/actress and 5 % of the children indicated that his/her character he/she envies is a carton character.

IV. DISCUSSIONS

This study was designed to explore the viewing habits and personal opinions about TV of the children and adolescents between the ages of 4 – 17. We can draw a number of conclusions regarding the likelihood that viewers will learn anything (violence, love, etc…) from depictions on TV channels.

In answer to research question, it is found that over 80 % of people watch TV 2-6 hours per day. In addition to this participants indicated that they ate definitely snacks when they watch TV. It is a big problem for the whole world people to deal with health problems such as obesity. Television watching is directly linked with obesity. It is not only "obesity" but also hypertension and poor body concept are the major problem that people deal with such sicknesses. In a research that is done by Prof. Dr. Manfred Spitzer, an academician at the Ulm University in Germany, it is found that about 20.000 people die per year because of watching too much TV in their everyday lives. (Hürriyet Gazetesi[1], 2005). Prof. Spitzer also found that such people are under the risk of obesity, hypertension and diabetics. In this study it is found that a child in the ages of 4 – 17 watches television averagely 4 hours per day. A research was done in July 2005, by the Cyprus Turkish Association of Diabetics. This research explored that more than 33 % of Cypriot children are obese and pre-obese that overlaps with those studies. So our children are under the risk of obesity and diabetics. And yet in spite of this situation, we should guide both our children and their parents about the serious effects of watching TV. (Kıbrıs Gazetesi[2], 2005)

A big portion of the sample indicated that their preference(s) about watching TV time is/are between 5 pm – 12 am. Another finding of this study put forward that children prefer to watch fight, action, comedy and horror films. After an attentive examine of rating percentages of aforesaid TV channels, it is found that high rated programs are consistent with the survey results. That program selections differ according to the gender. The study showed that male participants prefer to watch programs that involve violence. According to this result, many of the male participants in the ages of 12 – 17 stated that the character they envy is a mafia man who acts in a TV series named "Kurtlar Vadisi". This TV series was always in the first rank of the rating list on every Thursday. Its content includes too much fight and violence. Young males would like to act as the man who stars in this TV series. This actor and his gangs are spreading terror and not punished for any violence. And the adolescents especially boys would like to imitate like this strong, unbridled and popular man. Further more this TV series is broadcast between 8 – 10 pm that is the most preferred watching time.

Similarly, another finding revealed that, female participants prefer to watch TV series that involve love, passion, treason and intrigue. But female participants did not indicate any specific character. Another result showed that most of the children prefer to watch a fantastic TV series named as "Sihirli Annem". The theme of that program is about daily lives of several families and fairies. They are flying and practicing some kind of magic. These scenes are the most exciting scenes of the TV series. And besides this TV series is one of the most rated programs on TV.

Such programs can cause children build high hopes or experiment disappointments in their real lives. And this can make children unhappy. We, as adults should not let children and adolescents to get confused and submit themselves to the external imaginary. It is not surprising that about 40 percent of the participants dream any event, characters or people after watching them on TV. This finding shows that people are hypnotized by TV. May be it is brainwashing or destroying their fresh minds. Also it is not surprising that more than half of the subjects cannot imagine a world without television. So it is easy to draw a conclusion that; our children are colonized by TV.

[1] Hürriyet Gazetesi: A newspaper that is published in Turkey
[2] Kıbrıs Gazetesi: A newspaper that is published in Turkish Republic of Northern Cyprus

An expected result is also consistent with the study, which is a very low percent of the sample would like to watch educational programs. This is why; educational programs are not broadcast in the prime time or those programs are not broadcast! We all know some certain regulations about the broadcasting laws and principles. Every TV channel has to broadcast some kind of educational programs for a certain amount of time. But most of the international TV channels violate this rule. And this is the second issue that should be considered in order to guide some authorities.

If our children like watching TV and don't think a life without a television and think it is informative in anyway then, it can be used as a teaching tool outside the classrooms. In fact we have to assemble our power to make this hypnotizing machine more useful than it is. If we let *Social Cognitive Theory* to frame this study, it can be said that TV can serve as a teaching tool in many ways. "If violence in television causes people to be more aggressive, then shouldn't the good-hearted qualities in TV cause its audience to be kinder to others? Then what do we need? We need to serve good role models by using TV in an appropriate way. We should be qualified to speak about rating system and work with competent authorities such as producers, directors and channel owners.

Overall, this study found that watching television is a very popular activity that all people participate. Within prime time, most of the TV channels are broadcasting some similar programs which are violating the broadcasting laws and principles. And they mostly contain many features that may encourage a luxury life both in TV-series and films that make children and adolescents imitate their behaviours. So this factor may affect a person's life in a bad way. However, it should be reminded that these findings should be interpreted with the limitations that are mentioned before.

Further research studies should be encouraged for the following subject;

What are the reflections of watching TV on children and adolescents in their daily lives?
In what ways of socializing do watching television influences?
What is the relationship between health issues and watching television?

As a result, television has a great potential to be informal educator to educate our children in a positive way, and it should be of the upmost importance for the teachers and other authorities.

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AN EXAMINATION OF THE RELATIONSHIP BETWEEN THE INTEGRATION OF TECHNOLOGY INTO SOCIAL STUDIES AND CONSRUCTIVIST PEDAGOGIES

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ABSTRACT
Educational technologies, specifically computer and the Internet technologies, have apparently become powerful tools in the classroom as they change the way we teach and learn today. That is why pedagogies of school reform are now highly influenced by and built around the "constructivist" theories of learning, assuming the use of technology in education for active and meaningful knowledge construction. Due to these trends it appears inevitable that social studies educators do need know how to use technology effectively in their educational settings. Therefore, after a brief look at the concepts of technology and educational technology including a rationale for the use of technology in education, the current literature specifically on the integration of technology in the social studies with a reference to constructivism is examined. As a result, based on this study it seems that the infusion of technology into educational environments—specifically in the social studies—alinged with constructivist pedagogy bears the potential to inspire new ways of teaching and learning.

Key Words: Technology Integration, Constructivism, and Social Studies Education

"Integrated social studies teaching and learning include effective use of technology that can add important dimensions to student learning."
(NCSS, 1994, p. 165)

INTRODUCTION

Today we cannot deny we live in a technological world, and technology is rapidly changing our world and the way we live. Now it is almost impossible to ignore the pervasiveness of information technology within education as technology has become a valuable resource to educators. In this age of information and computers, simply clicking a button can now access tremendous resources once unavailable. Because of the increase of technology in schools, more is expected from teachers. Especially new teachers are expected to enter the educational field with knowledge not only in their content areas, but of technology as well.

In the 21st century, the new vision of education is to make learning accessible to *all*, but it is hard to reach this goal through the use of traditional methods. Besides, technology in education has the potential for improving teaching and learning. Hence, technology innovations are increasing the demand for reforms in teaching and learning approaches. That is why pedagogies of school reform are now highly influenced by and built around "constructivist" theories of learning that assume the use of technology in education (Windschitl, 2002). Therefore, educational technologies, specifically computer and the Internet technologies, have inevitably become powerful in the classroom as they change the way we teach and learn.

Although there are some concerns with technology, as a social studies educator I think that the integration of technology into social studies can be a very effective way to improve our teaching if done properly. I believe that social studies teachers who effectively integrate technology in their classrooms provide students with great opportunities to express themselves in a meaningful way as technology has become a desirable and supportive *tool* for authentic and meaningful learning (Jonassen et al, 2003). Today kids love learning by doing, discovering, and interacting. Technology makes learning more interesting, enjoyable and interactive for them. Whether we like it or not, our kids are going to use technology. Thus, the question becomes not to use technology but how to use technology effectively and meaningfully.

Educational technologies that can be applied into teaching of social studies are almost countless. However, my purpose in this paper is not to describe how every single technological tool can be used in the social studies; rather, my purpose is to examine the reciprocal relationship between the social studies, constructivism, and integration of technology; and then present some effective examples of how actually technology might work well in the social studies with respect to constructivist principles of teaching and learning. However, although the main focus of this paper is on the integration of technology into social studies education and constructivist pedagogies, for an effective grasp of the discussion in order to set the stage, I first look briefly at the concepts of *technology* and *educational technology* and then shortly examine the field of educational technology, including a rationale for the use of technology in education. Secondly, I review the current literature on the integration of

technology in the social studies with a reference to constructivism, including a concise examination of the *social studies* as a discipline and *constructivism* as a theory of learning, followed by a rationale on the *integration of technology* into the social studies classroom along with an argument regarding the limitations of and/or concerns with technology. Finally, I draw conclusions and point out some implications for further research.

TECHNOLOGY

In order to clearly understand the concept of educational technology, one must have a firm grasp of what technology means. In general, most people think of technology in terms of its artifacts such as computers and software, tools, appliances, automobiles, machines, etc., implying that technology is everything and everything is technology. But, technology is more than just these tangible and visible products. Basically, technology is the process and tool by which humans modify nature to meet their needs and wants and to make life easier and better. Herschbach (1995) defines technology as "organized knowledge for practical purposes" (p. 31). Technology, however, as a distinctive phenomenon refers to the use of knowledge, materials, tools, techniques, systems, and sources of power to make life easier and better and to work more productively and efficiently.

However, although technology is always considered as good and desirable for most people, there also are some serious critiques of technology. For example, similar to Neil Postman (1993) and Johnsen & Taylor (2002), McDermott (1962) defines technology as follows: "technology, in its concrete, empirical meaning, refers fundamentally to systems of rationalized control over large groups of [people] events and machines by small groups of technically skilled [people] operating through organizational hierarchy (as cited in Johnsen & Taylor, 2002, p.13-14). In sum, like McDermott, Neil Postman (1993) and Johnsen & Taylor (2002) are more concerned with the human effects of technology than its origination, believing that technological development is motivated by the desire to control—drawing attention to what technology takes away from us.

EDUCATIONAL TECHNOLOGY

What does technology have to do with education? Where does the concept of educational technology come from? In fact, technology in the classroom has been around for a quite long time in the form of blackboards, chalks, pencils, slates and more recently overheads, movies, computers and even newer technologies (Roblyer & Edwards, 2000). However, although the use of technology in education is not new, educational technology as a field is rather new. Educational technology is a term widely used in the field of education as well as in other areas, but it is often used with different meanings. For many educators, any mention of educational technology immediately brings to mind the use of some device or set of equipment, particularly computers (Roblyer & Edwards, 2000).

Educational technology as a field has evolved and been systematized over the past few decades (AECT, 2004; Kearsley, 1998; Roblyer & Edwards, 2000; Salomon & Almog, 1998; Wiley, 2002). Due to new understandings of the processes of human learning and of the nature of knowledge underlying teaching methods, the field has experienced many changes and challenges to the theory and practice of educational technology (AECT, 2004; Salomon, 1998; Salomon & Almog, 1998; Reiser, 2001; Wiley, 2002; Wilson, 1997). Correspondingly, conceptions of educational technology have been evolving as long as the field has, and they continue to evolve (AECT, 2004; Roblyer & Edwards, 2000; Salomon & Almog, 1998; Wiley, 2002).

The professional association with the most extensive history in the field of educational technology is the *Association for Educational Communications and Technology* (AECT). AECT has defined technology several times for the past few decades. The last definition of technology as follows:

> Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (AECT, 2004, p. 3).

Believing that the times have created a new context for thinking about the meanings of educational technology, AECT (2004) provides us with a conceptual framework through its most recent definition of educational technology, which basically refers to the use of technological *processes* specifically for teaching and learning. In today's conception, the last definition of educational technology first uses the term "*study*" claiming a broader field; then, focuses "*facilitating learning*" as the purpose of the field; next, makes an explicit commitment to an "*ethical*" practice; and finally is viewed as a construct that is larger than instructional technology, as education is more general than instruction.

Besides, educational technology as a general term also brings some confusion or misuse of the concept. For instance, the term educational technology is often used interchangeably with the term "instructional technology,"

which refers to the concept, theory, and field that focus on facilitating learning through technology under conditions that are "purposive and controlled" (AECT, 1977, p. 3). Therefore, educational technology is a broader concept as the framework, while the term "instructional technology" is a subset of educational technology, just as instruction is a subset of education (AECT, 1977 & AECT, 2004).

Similarly, educational technology is often confused with "technology in education," even though "technology in education" is *not* the same as educational technology. *Technology in education* is the application of technology to any of those processes involved in operating the institutions which house the educational enterprise (AECT, 1977). In other words, technology in education involves the application of technology to support education within institutions, such as food, health, and finance. Other terms such as instructional development, educational or instructional media, and instructional systems design also refer to particular parts of the field, which are sometimes used to refer to the field as a whole (AECT, 2004).

Therefore, although educational technology is an "evolving" field, one thing is correct for sure in the field over time is its central emphasis on the "process" as "the historical function of educational technology is a process rather than a product" (Roblyer & Edwards, 2000). Hence, useful definitions of educational technology must focus on the *process* of applying tools for educational purposes. Educational technology thus becomes a particular approach to achieving educational ends.

RATIONALE FOR THE USE OF TECHNOLOGY IN EDUCATION

Why do we use technology in education? Why do educators integrate technology into their teaching? What does technology have to offer in regards of teaching and learning? Although this is one of the hot topics currently discussed in the field, there evidently are incentives to use technology in educational settings. During the 20th century, education has embraced technology, believing that educational technology can facilitate unique learning environments or contribute unique features to make traditional learning more powerful and effective (Fulton, 1998; Jonassen, 2000; Jonassen, 2000a; Jonassen et al., 2003; Roblyer & Edwards, 2000; Thornburg, 1999). Technology has promised smarter, better educated, and more fulfilled learners (Jonassen, 2000). Many educators, parents, and students believe that the reasons for using technology seem so obvious that everyone should recognize them based on two major beliefs: (1) "technology is everywhere and therefore should be in education" and (2) "research has shown how and where computer-based methods are effective" (Roblyer & Edwards, 2000, p. 12).

Moreover, according to Jonassen (2000a), technology has always been zealously promoted as a modern solution to the problems of education—lack of productivity, inefficiency, and lack of focus. Likewise, one of the most important elements of a rationale for using technology in education is *motivation* (Roblyer & Edwards, 2000). Therefore, educational technologies, especially but not limited to computers, have become as powerful in classrooms as they are in the world outside the classroom. They changed the way people think about problems and solutions. Jonassen (2000) calls them "mindtools," which refers to "computer applications that have been adapted or developed to function as intellectual partners with the learner in order to engage and facilitate critical thinking and higher-order learning" (p. 9). For him, computers as mindtools promote meaningful learning—which has five elements: active, constructive, intentional, authentic, and cooperative— and meaningful learning occurs when students are making meaning (Jonassen et al., 2003). In sum, research shows that application of technology improves student performance, student motivation, teacher satisfaction, and other important educational results in technology-rich classrooms (Fulton, 1998; Jonassen, 2000a; Thornburg, 1999).

Consequently, the field of educational technology has grown and changed greatly over the past century, affected by various influences including historical forces, paradigm shifts in educational psychology, emerging technologies, and evolving approaches to inquiry (AECT, 2004; Kearsley, 1998; Reiser, 2001; Roblyer & Edwards, 2000; Salomon, 1998; Salomon & Almog, 1998; Wiley, 2002; Wilson, 1997). In the 1980s and 1990s, computer technology dominated the field (Roblyer & Edwards, 2000), while in educational psychology, theories of constructivism and situated cognition offered new ways of thinking about instruction (Jonassen, 2000; Jonassen, 2000a; Roblyer & Edwards, 2000; Salomon, 1998; Salomon & Almog, 1998). Toward the turn of the century, the World Wide Web made significant inroads in telecommunication, enabling both asynchronous and synchronous communication and information sharing on a global scale (Jonassen, 2000a; Jonassen et al., 2003; Merryfield, 2003; Roblyer & Edwards, 2000). It seems that academia is becoming highly dependent on the use of Internet for administrative purposes as well as for teaching and research.

Above all, in spite of the strong critiques regarding effectiveness of educational technology (Becker 98; Becker & Ravitz, 2001; Cuban, 2001; Kearsley, 1998; Kirkpatrick, & Cuban, 1998), as a new field educational technology has come to serve as a dual function. On one hand, it provides the tools needed for the realization of

learning as construction and as a social process of meaning appropriation; on the other hand, it offers novel opportunities that suggest novel learning activities and ways of teaching, which in turn require novel psychological insights (Jonassen, 2000; Jonassen, 2000a; Jonassen et al., 2003; Salomon, 1998; Salomon & Almog, 1998). As a result, while there is much research to be done to provide a better understanding of why and how technology benefits the educational process—both teaching and learning, a body of evidence to date (Fulton, 1998; Jonassen, 2000a; Roblyer & Edwards, 2000; Thornburg, 1999) suggests that new educational technologies provide powerful vehicles for educational improvement.

SOCIAL STUDIES

Social Studies have been regarded as a major school subject and is taught in K-12 schools across the United States, as well as around the world (NCSS, 1994). However, because social studies is multidisciplinary and interdisciplinary, it is often difficult to define it. Definition of social studies has therefore tended to change as knowledge of subject matter increased and developed and as more was learned about how children construct meaningful knowledge (Sunal & Haas, 2002). However, most educators agree that the social studies in essence is the study of humankind from a multitude of perspectives, and at the core of the field is citizenship education (Dynneson, Gross, & Berson, 2003). The National Council for the Social Studies (NCSS), the leading national social studies organization, has adopted the following formal definition for the social studies:

> Social studies is the integrated study of the social sciences and humanities to promote civic competence. Within the school program, social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. The primary purpose of social studies is to help young people develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world (NCSS, 1994, p. 3).

NCSS, thus, not only emphasizes the field precisely as "promoting knowledge of and involvement in civic affairs," but also defines it as *multidisciplinary* and *interdisciplinary* in nature (p.3).

Additionally, the national social studies standards include ten themes that serve as organizing strands for the social studies curriculum in order to foster student achievement at every school level (NCSS, 1994):

1. Culture,
2. Time, Continuity, and Change,
3. People, Places, and Environments,
4. Individual Development and Identity,
5. Individuals, Groups, and Institutions,
6. Power, Authority, and Governance,
7. Production, Distribution, and Consumption,
8. Science, Technology, and Society,
9. Global Connections,
10. Civic Ideals and Practices.

Each theme incorporates one or more of the disciplines contributing to social studies content, such as history, geography, government, economics, and sociology. In addition, NCSS has outlined five principles of powerful social studies teaching and learning. These five principles tell us that social studies teaching and learning are powerful when they are *meaningful*, *integrative*, *value-based*, *challenging*, and *active* (NCSS, 1994).

In addition, the NCSS sees the knowledge as constructed by learners as they attempt to fit new information, experiences, feelings, and relationships into their existing or emerging intellectual, aesthetic, and emotional constructs (NCSS, 1994). Besides, the skills that should be promoted in an excellent social studies program include the following (NCSS, 1994):

- acquiring information and manipulating data;
- developing and presenting policies, arguments, and stories;
- constructing new knowledge;
- and participating in groups.

As will be discussed later in this paper, the social studies as a field itself, ten themes of the social studies national standards—specifically the eighth theme: Science, Technology and Society, the knowledge construction in the social studies classroom, and the social studies skills clearly promote a constructivist theory of learning as well as integration of technology into the social studies.

CONSTRUCTIVISM

There has been a visible paradigm shift from the behavioral to constructivist theories in answering the question of what learning theories schools use today. Constructivism entered mainstream educational thought and research in the 1970s through the work of disciples of Piaget and Vygotsky (Damarin, 2004; Roblyer & Edwards, 2000; Windschitl, 2002). Constructivism is a learning theory based on the notion that people are "active" knowledge seekers powered by innate curiosity (Sunal & Hass, 2000). Thus, constructivism challenges the traditional goals of education and proposes re-structured and innovative teaching approaches. Unlike the traditional and/or behaviorist theories of learning, constructivism fundamentally promotes the idea that the learner constructs his or her own knowledge (Boyer & Semrau, 1995; Damarin, 2004; Doolittle & Hicks, 2003; Fosnot, 1996; Jadallah, 2000; Jonassen et al., 2003; Rice & Wilson, 1999; Roblyer & Edwards, 2000; Sunal & Hass, 2002; Windschitl, 2002). Whereas traditional and/or behaviorist pedagogies claim that learning is transmitted knowledge and teaching should be teacher-centered, systematic and structured, constructivist pedagogies claim that learning is constructed knowledge and teaching should be student-centered and meaningful so that learners can construct their own knowledge (Boyer & Semrau, 1995; Damarin, 2004; Doolittle & Hicks, 2003; Fosnot, 1996; Jadallah, 2000; Jonassen et al., 2003; Rice & Wilson, 1999; Roblyer & Edwards, Sunal & Hass, 2002; 2000; Windschitl, 2002). In other words, the idea that knowledge is not transmitted from teacher to student but actively constructed by each student or group of students is central to constructivism, which is perhaps the most current psychology of learning.

The Individual versus the Social

Multiple literatures within the domain of constructivism support various conceptions of learning and instruction as philosophers have suggested more than a dozen different *constructivisms* (Boyer & Semrau, 1995; Damarin, 2004; Fosnot, 1996; Windschitl, 2002). However, according to the debate in the literature between those who place more emphasis on the individual cognitive structuring process and those who emphasize the sociocultural effects on learning, constructivism can be divided into two main categories: (1) cognitive constructivism and (2) social constructivism (Fosnot, 1996 & Windschitl, 2002).

According to Piaget (1971), *cognitive constructivism* is a system of explanations of how learners as individuals adapt and refine knowledge (as cited in Windschitl, 2002). Piaget thus advocates that knowledge is constructed in the mind of the individual. Moreover, Brown, Collins, & Duguid (1989) believe that meaningful learning is rooted and indexed by personal experience and learners maintain ideas that seem intuitively reasonable to them (as cited in Windschitl, 2002). That has been interpreted to mean that the teacher creates a learning environment and of hands-on exploration and discovery that allows students to make connections between any new subject matter and their prior knowledge (Jadallah, 2000).

Unlike Piaget, Vygotsky's *social constructivism* (1978) suggests that knowledge is not solely constructed within the mind of the individual; rather, interactions within a social context involve learners in sharing, constructing, and reconstructing their ideas and beliefs (as cited in Jadallah, 2000). Therefore, social interactions provide the necessary language skills and understanding of cultural norms that facilitate learning (Damarin, 2004 & Jadallah, 2000) through the use of tools available. Students participate in activities relevant to the discipline using tools commonly available as they carry out their works. Hence, tools are seen as powerful mediators of learning, which can include language itself, computers, diagrams, maps, and math symbols—anything that can facilitate the co-construction of knowledge among learners (Windschitl, 2002). Thus, social interactions with the teacher and other students become a significant part of the learning process. Vygotsky also introduced the concept of the *zone of proximal development*, which means that developing mental functions must be fostered and assessed through collaborative activities in which learners participate in constructive tasks or problem solving with the assistance of more knowledgeable others (Fosnot, 1996 & Windschitl, 2002).

RATIONALE FOR TECHNOLOGY INTEGRATION INTO SOCIAL STUDIES

As the study of humankind from a multitude of perspectives with a citizenship education at its core (Dynneson, Gross, & Berson, 2003), social studies education has been affected by the impact of technology perhaps more than any other subject mater (Roblyer & Edwards, 2000). However, researchers report that social studies educators are somewhat less likely to integrate technology into the curriculum than instructors in other disciplines (Berson, 1996; Doolittle & Hicks, 2003; Rice & Wilson, 1999; White, 1998; Whitworth & Berson, 2003), such as mathematics and science education (Damarin, 2004). Likewise, Martorella (1997) characterized the field of social studies as "sleeping giant" because of the gap between current and potential uses of educational technologies in the field.

Traditional classrooms tend to involve students in a passive learning and direct instruction through lectures, textbooks, and other largely expository learning materials, resulting with lack of motivation and disengagement

in students (Fairey, Lee & Bennett, 2000; Jonassen et al, 2003; Roblyer & Edwards, 2000; Sunal & Hass, 2002; Rice & Wilson, 1999; White, 1998). According to the literature, however, technology has the potential that technological tools can foster students' abilities; revolutionize the way they work, think, and learn; give them access to information; promote critical thinking and problem solving, and meaning in learning (Berson, 1996; Boyer & Semrau, 1995; Doolittle & Hicks, 2003; Fairey, Lee & Bennett, 2000; Jonassen et al, 2003; Rice & Wilson, 1999; Roblyer & Edwards, 2000; Rose & Ferlund, 1997; Sunal & Hass, 2002; White, 1996; White, 1998; Whitworth & Berson, 2003). In other words, according to the literature above, technology as a personal supportive "tool" for communication and exploration can be meaningfully used to expand the student control over their own learning by increasing the quality and extent of their experiences with information.

Moreover, the NCSS (1994) has adopted the "Thematic Standard 8: Science, Technology, and Society" which calls for educators to encourage students to consider the impact of technology critically and thoughtfully. Thus, students who consider the impact of past and current technologies may be better able to maximize the positive capabilities of technology.

Furthermore, current educational technologies can help students achieve the expectations of powerful social studies teaching and learning, of the social studies skills, of a meaningful knowledge construction in the social studies (Rose & Fernlund, 1997) that are addressed in the publication of *Expectations of excellence: Curriculum standards for the social studies, NCSS, 1994*. Consequently, White (1998) and Rose & Fernlund (1997) similarly suggest that it is essential to improve the integration of educational technology in schools in order to prepare children for the future. Likewise, White (1998) proposes that it is vital that integration of technology be viewed as a major component of student-centered approaches to social studies education at K-12 levels.

LIMITATIONS OF AND CONCERNS WITH EDUCATIONAL TECHNOLOGY

I recognize that there are some limitations of and concerns with technology and its educational use in the classroom. For example, despite the power and popularity of technology, many educators have expressed the opinion that although technology should be viewed as important, it should not be allowed to dominate all classroom instruction (Dynneson, Gross, and Berson, 2003). Also, modern technology is rapidly changing and technological tools often are outdated at the time of purchase. Thus, it becomes a real challenge for schools to keep up with technology and not to fall behind in this rapidly changing technological race. Additionally, Dynneson, Gross, and Berson (2003) recognize that educational technologies are limited by several important factors, including the curriculum, physical plant (or the physical limitations of the school buildings), and psychological concerns. They also remind that in considering technology use within the school environment, loud audio sounds and student noise are important factors to think about as they cause distractions (Dynneson, Gross, and Berson, 2003).

In spite of a strong support for the use of technology in education, research has evoked considerable controversy over the use of educational technologies. As an example, in California, an investigation by the San Jose Mercury News found that on the 1994 California Learning Assessment System (CLAS), schools that spent heavily on technology did no better on test scores than schools that did not (as cited in Dynneson, Gross, and Berson, 2003). Besides, technology has also been viewed with suspicion by some researchers. For instance, while Larry Cuban—an educational researcher—identifies a technological cycle in which new technologies are (too) heavily promoted for school use, Neil Postman—the technology critic—remains completely skeptical on the use of technology. Dynneson, Gross, & Berson (2003) in response assert that "suspicion often is based on budgetary restraints, teacher resistance, and a paralyzing educational bureaucracy" (p. 148).

On the one hand, while educational technology is presented as the remedy for the modern problems of today's education; on the other hand, there are some serious critiques of the use of technology in education (Cuban, 2001; Kearsley, 1998; Kirkpatrick, & Cuban, 1998). Basically, these educational researchers claim that effectiveness is not achieved through the use of technology in educational settings and there is no correlation between computer use and test scores. For them, educational technologies, specifically computers, play no significant role in teachers' instructional practices. Kearsley (1998) emphasizes that the enormous amount of attention and resources devoted to the use of technology in the education distracts us from the really important problems and issues that needed to be addressed, and then he urges us to start to thinking about a different perspective and approach to technology in education. Likewise, Cuban (2001) points out that computers have been oversold by policy makers and promoters, and underused by those in education. Therefore, for him, computers in the school are not worth the investment. He then asks, "How can technology build stronger communities and citizens and how monies can achieve larger social and civic goals?" Unlike Cuban (2001), Oppenheimer (1997) argues that "the solution is not to ban computers from classroom altogether. But it may be to ban federal spending on what is fast becoming an overheated campaign. After all, the private sector with its

constant supply of used computers and the computer industry's vigorous competition for new customers seems well equipped to handle the situation" (as cited in Dynneson, Gross, and Berson, 2003, p.173). Overall, it seems that, for the opponents, the major problem with the use of technology is to find out how and why educational technology fails; and then to work on how we can actually use technology to achieve greater goals.

Consequently, although there are some limitations of and concerns about technology, I do not think the real problem is technology itself. Sandholtz, Ringstaff, and Dwyer (1997) state that "even more difficult to overcome are barriers that are in the minds of teachers—deeply held beliefs about teacher and student roles, about the nature of learning and instruction, and even about technology itself" (as cited in Dynneson, Gross, and Berson, 2003, p.151). I feel the problem is ourselves, our mindset, and our traditional values that challenged by technology. This is what Joel B. Stellwagen calls as "intellectual resistance." Besides, I do not think that new generations are concerned with technology as much as we do. For them, technology is everywhere and it is naturally part of their current lifestyle. Indeed, that is why the literature and/or research regarding the effectiveness of technology prove that children (or new generations) are effectively engaged and motivated by technology in their learning. However, I do not mean we have to use technology blindly; rather, we as facilitators and co-constructors of learning need to be selective, of course. In sum, recognizing the limitations of technology, we have to know what technology can do and cannot.

IN PRACTICE: SOCIAL STUDIES, EDUCATIONAL TECHNOLOGY, AND CONSTRUCTIVISM

The advancement in computer and information technologies over the past two decades has dramatically changed the way we teach and learn (Diem, 2000). Yet, due to the nature of subject matter with its historic dates and geographic names, social studies instruction traditionally has been "fact driven" (Rice & Wilson, 1999; Roblyer & Edwards, 2000; Sunal & Hass, 2002). Also, in this information age, the National Council for the Social Studies Education has embraced a "vision of powerful social studies teaching and leaning" that calls for meaningful, integrative, value-based, challenging, and active learning (NCSS, 1994, p.162). However, that cannot be accomplished by using traditional instructional models, but it can be accomplished through the integration of technology with a constructivist model of learning (Berson, 1996; Boyer & Semrau, 1995; Diem, 2000; Doolittle & Hicks, 2003; Martorella, 1997; Mason et al., 2000; Rice & Wilson, 1999; Roblyer & Edwards, 2000; Rose & Fernlund, 1997; Sunal & Hass, 2002; White, 1998; Whitworth & Berson, 2003). Indeed, technology seems ideally suited to constructivist, student-centered approaches to learning (Boyer & Semrau, 1995; Damarin, 2004; Doolittle & Hicks, 2003; Jonassen et al., 2003; Mason et al., 2000; Rice & Wilson, 1999; Roblyer & Edwards, 2000; Sunal & Hass, 2002; White, 1998). Therefore, the literature suggests that constructivism can be used as a foundation for application of technology in the social studies in order to achieve the goals of social studies education.

Recent developments have created new opportunities for powerful social studies teaching assisted by technology. For example, today computers are much more powerful and versatile than they were a decade ago. Therefore, through the integration of technology by using right combination of hardware and software, teachers can develop lessons that enhance student skills in information retrieval, the presentation of data, the comparison and evaluation of different perspectives, and critical reflection and decision making (Berson, 1996; Boyer & Semrau, 1995; Diem, 2000; Doolittle & Hicks, 2003; Martorella, 1997; Mason et al., 2000; Rice & Wilson, 1999; Roblyer & Edwards, 2000; Rose & Fernlund, 1997; Sunal & Hass, 2002; White, 1998; Whitworth & Berson, 2003). Thus, according to this literature, a key assumption of integrating technology, when used effectively within K-12 social studies classrooms, technology can improve social studies teaching and student performance. Friewald (1997), fortunately, notes that social studies teachers generally hold positive perceptions toward using interactive technologies in their classrooms. Also, teachers who use technology in their classrooms often find it easier to motivate their students, to persuade them to have a better attitude toward social studies, and to make social studies content relevant to their students (Berson, 1996; Doolittle & Hicks, 2003; Mason et al, 2000; Rice & Wilson, 1999; White, 1998).

Doolittle & Hicks (2003) believe that integrating technology for improvement of social studies learning should begin with "implementing an aligned constructivist philosophy, theory, and pedagogy in pursuit of the development of critically minded global citizens" (p. 97). Hence, in response to this felt need for infusing constructivist pedagogies into social studies classrooms, Doolittle & Hicks (2003) propose six principles of constructivism that might guide teachers in the construction of knowledge. Therefore, the construction of knowledge:

1. (and the making of meaning) are individually and socially active process.
2. involves social mediation within cultural context.
3. is fostered by authentic and real-world environments.

4. takes place within the framework of the learner's prior knowledge and experience.
5. is integrated more deeply by engaging in multiple perspectives and representations of content, skills, and social realms.
6. is fostered by students becoming self-regulated, self-mediated, and self-aware.

In addition to these constructivist principles, Doolittle & Hicks (2003) also see another need to create an effective, viable, and robust framework for the integration of technology into a powerful teaching and learning of social studies. Yet they also believe that in order to achieve the goals of the social studies as defined by the NCSS (1994), technology is not the key *itself*, rather "how technology can be used as a developmental tool to encourage responsible citizenship" (p. 87). Therefore, implementing technology as a developmental *tool* within a constructivist framework in the social studies, Doolittle & Hicks (2003) suggest the following six pedagogical strategies; thus, teachers should:

1. (and students should be) prepared to implement technology as a tool for inquiry.
2. use technology to create authenticity, which facilitates the process of student inquiry and action.
3. use technology to foster local and global interaction such that students attain multiple perspectives on people, issues and events.
4. facilitate student knowledge construction by using technology to build on students' prior knowledge and interest.
5. enhance the viability of students knowledge by using technology to provide timely and meaningful feedback.
6. cultivate students' academic independence by using technology to foster autonomous, creative, and intellectual thinking.

Similarly, although many educators have taken for granted the assumption that technology can play a pivotal role in making content relevant to the objectives of instruction, Fairey, Lee, & Bennett (2000) also think that there is an absence of a clear rationale for why teachers should integrate instructional technology. For that reason, Fairey, Lee, & Bennett (2000) recommend a conceptual model for integration based on the five principles of powerful social studies teaching and learning in the social studies: technology and theme #1-meaningful teaching and learning; technology and theme #2-integrative teaching and learning; technology and theme #3-value-based teaching and learning; technology and theme #4-challenging teaching and learning; and technology and theme #5-active teaching and learning.

There is a wide range of tools that can be used to integrate technology into the social studies classroom. Also, tools commonly available in the field can be seen as powerful mediators of learning (Windschitl, 2002) as students participate in activities through the use of these tools. Similarly, good technology-based products provide opportunities for students to play active roles in authentic activities (Rose & Fernlund, 1997). Those technology tools that aid in constructivist learning in the social studies classroom include but limited to drill and practice, tutorials, educational games, webquests, simulations, virtual field trips, CD-ROMs, videodiscs, multimedia and/or hypermedia, telecommunications (e-mail and the Internet), database management, word processing and writing, and graphing (Berson, 1996; Rice & Wilson, 1999). Yet, I do not describe each possible tool or method that can be used in the integration of technology, as it is beyond this paper. However, I present some examples that integrate technology effectively and meaningfully into the social studies classroom.

Here is an example in which Teague & Teague (1995), in community planning project with seventh-grade students, used a computer simulation program—*SimCity*, which allows users to manipulate a variety of factors in the development of a community by assuming various roles to determine whether the city flourishes or is destroyed (Frye & Frager, 1996; Rice & Wilson, 1999). The idea that for the project was the creation of a master plan in their township, which tied directly into the citizenship and geography components of the social studies curriculum. Students worked actively in groups of four or five to build their own community in order to achieve low crime rates and pollution levels with reasonable expenditures and public approval through the use of what-if scenarios that reinforce collaborative learning, decision making, and higher-order thinking skills. As a result of the *SimCity* project, Teague & Teague (1995) felt that students were learning effectively in this technology-rich classroom. They observed that "students became aware of their responsibility to become informed citizens and to participate in local decision making" (p. 87), which is one of the primary purposes of the social studies as addressed by the NCSS (1994). In addition, according to Teague & Teague (1995), students learned how to work cooperatively in teams and use the computer in the planning process. Thus, this project supports not only one of the principles of powerful social studies learning and of the skills promoted by the NCSS (1994), but also a key characteristic of constructivist classroom practices (Boyer & Semrau, 1995; Diem, 2000; Doolittle & Hicks, 2003; Jadallah, 2000; Mason et al., 2000; Rice & Wilson, 1999).

As can be seen in the case of Teague & Teague (1995), many social studies software/CD-ROM programs, such as SimCity, can reinforce the use of constructivist principles as they allow students to engage in activities, such as simulations and problem solving, that encourage them to construct their own knowledge and conduct their own research (Boyer & Semrau, 1995; Frye & Frager, 1996; Rice & Wilson, 1999; Whitworth & Berson, 2003).

Another example, in which Wilson, Rice, Bagley, & Rice (2000) present a lesson—the virtual field trip guide to Mount Vernon, uses computers and the Internet as tools for learning social studies content in the high school. In this lesson students took a virtual trip to Mount Vernon at the conclusion of a unit of study on the American Revolution & George Washington. Students met in the computer lab and were divided into groups of three and assigned a computer. Each group had at least one student who had some familiarity with using the Web. Students then *traveled* to the Mount Vernon website (www.mountvernon.org) to begin their research after each student has been given a Virtual Field Trip Guide, which provided basic directions and key questions that they must answer in their own words by using information that they will find at the site. Also, the teacher monitored the student progress during the virtual trip. At the end of the day, the teacher collected the guides, which were now filled with students' notes and answers. On the next day, back in the classroom, students discussed what they had learned about George Washington, followed by such extension activities as creating a poster, a collage, or the other appropriate work relating to the life of George Washington.

Virtual or online field trips are only one of the numerous ways that the Internet can offer us to integrate technology into the social studies classroom. As in the example of Wilson, Rice, Bagley, & Rice (2000), an Internet field trip encourages students' interest in learning social studies while facilitating their critical and higher order thinking skills, and letting teachers as facilitators monitor students' performance and progress. Furthermore, as Rice and Wilson (1999) puts it, virtual field trips on the Internet "provide students with first-hand learning experiences and allow for the interactivity and student control delineated in a student-centered constructivist model" (p.31). Thus, virtual or online field trips for students can become an authentic experience, which is one principle of meaningful learning.

An additional example that integrates technology effectively comes from Lipscomb (2003): the use of WebQuests by eighth-grade students studying the Civil War at a middle school, demonstrating how social studies teachers can harness the power of Internet and integrate it into their instruction. After an orientation and initial discussion on the key elements of a webquest, resources available, and strategies for making effective use of time in the computer lab, students were given a meaningful task: to assume the role of a person living during the Civil War era, such as a Confederate Soldier, Union Soldier, Southern Woman, Northern Woman, or Female Abolitionist.
Students were divided into teams based upon these scenarios, which meant they worked with people who share their same scenario to collaborate information; however, each student was required to write an individual journal in the form of a booklet for potential publication. After students explored their on-line resources, they took the information and completed six journal entries: two written before the Civil War, two during, and two immediately following the conflict. According to Lipscomb (2003), students were extremely engaged in the material during the process, and the journals showed a tremendous amount of creativity, in both appearance and content. Overall, as Lipscomb (2003) states, the students enjoyed undertaking the project, and they came away with a stronger understanding of the people who lived during the Civil War. This is very meaningful especially when students often finds the social studies and/or American history boring and overwhelmed with a large amount of data (battles, generals, dates, speeches, etc).

Webquests have become an increasingly popular form of Internet use in classrooms (Whitworth & Berson, 2003). Bernie Dodge (1995) describes the WebQuest as "an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet" (as cited in Lipscomb, 2003). As can be seen in the example above, in addition to being an Internet-supported and inquiry-driven instructional tool, webquests have a great potential for cooperative/collaborative learning (Whitworth & Berson, 2003), by supporting the principles of meaningful learning in the social studies classroom.

Overall, when we look at those examples that integrate technology effectively into the social studies classroom, they seem to fit into both the principles of constructivism and pedagogical strategies for technology integration in the social studies classroom as proposed by Doolittle & Hicks (2003). These examples, as constructivist theories stress, reinforce active learning through exploration rather than by simply giving a correct answer. Student learning in these examples occur in meaningful contexts as they relate the new information they have learned to their own experiences (Rice & Wilson, 1999) which means that constructed knowledge is embedded in one's own authentic personal experience (Boyer & Semrau, 1995). Besides, in a constructivist learning

environment, the teacher's role changes from the traditional giver of knowledge to a facilitator or coach who provides authentic activities (Boyer & Semrau, 1995; Jonassen, et al., 2003). Thus, in a constructivist classroom, learning becomes a social and collaborative activity, promotes such attributes as student empowerment, the teacher as facilitator, social inquiry, active learning, and an authentic learning (Boyer & Semrau, 1995; Damarin, 2004; Doolittle & Hicks, 2003; Fosnot, 1996; Jadallah, 2000; Jonassen et al., 2003; Rice & Wilson, 1999; Roblyer & Edwards, 2000; Sunal & Hass, 2002; Windschitl, 2002). On the other hand, as emphasized by many educators, technology can offer constructivist values with authentic learning experiences by engaging students in critical thinking, decision making, and problem solving (Berson, 1996; Boyer & Semrau, 1995; Diem, 2000; Jonassen et al., 2003; Rice & Wilson, 1999; Rose & Ferlund, 1997; White, 1998; Whitworth & Berson, 2003). As a result, the point is that technology is a tool to think and learn *with* not *from* it (Jonassen et al., 2003). Therefore, technology can foster meaningful learning, which is active, constructive, intentional, authentic, and cooperative (Jonassen, et al., 2003). Above all, Boyer & Semrau (1995) posit that constructivism and technology are ideal partners; and that through the marriage of the two, social studies students can construct knowledge that is derived from personal context and embedded in authentic experience.

CONCLUSION

Throughout this paper, it was not the purpose to show every possible use of technology in the social studies education and *not* to propose that the integration of technology becomes panacea to all the educational problems we have. Yet, it was intended to point out that there are indeed some exemplary works showing that technology can be successfully integrated into social studies classrooms in the construction of meaningful learning, which supports the constructivist principles of teaching and learning.

As a result of the call for the use of technology in education for the last few decades, the National Council for the Social Studies (NCSS) has explicitly advocated technology integration into the social studies classroom to transform the teaching and learning. The use of technology within the social studies thus becomes a key element for the NCSS's "vision of powerful social studies teaching and learning" (1994, p. 162). This vision assumes that "when used effectively within the K-12 social studies classroom technology can improve social studies teaching and student performance" (Doolittle & Hicks, 2003, p. 72). However, successful integration requires an effective connection between how students learn and how teachers employ technology to help and enhance student learning, which also calls for application of constructivist pedagogies in the social studies classroom (Roblyer & Edwards, 2000). Unlike those who are afraid of integrating technology into their classroom, technology cannot replace teachers rather teachers become more important than ever but as a *facilitator* of learning not a *transmitter* of knowledge.

Moreover, the literature evidently supports that integration of technology into the social studies classroom has the potential to facilitate development of students' critical thinking, decision-making and problem solving skills (Berson, 1996; Boyer & Semrau, 1995; Diem, 2000; Doolittle & Hicks, 2003; Martorella, 1997; Mason et al., 2000; Rice & Wilson, 1999; Roblyer & Edwards, 2000; Rose & Fernlund, 1997; Sunal & Hass, 2002; White, 1998; Whitworth & Berson, 2003). This literature also indicates that the use of technology significantly supports the constructivist values in the social studies classroom, providing students with a great opportunity to meaningfully construct their own knowledge through collaboration, motivation, engagement, and a "sense of ownership" (Jonassen et al., 2003). Thus, recognizing the importance of educational technology as a tool for achieving authentic learning, social studies educators must "harness the power of technology" (Lipscomb, 2003) for the sake of meaningful learning in the social studies classroom. Yet, it still remains a fact that for the benefit of meaningful knowledge construction, integration of technology into social studies specifically needs to be grounded into a constructivist theory of learning.

On the other hand, the literature evidently points out that research is also lacking on the effects of technology in social studies classrooms. To date, there is no empirical research enough to judge the effectiveness of technology either on the part of student or instructional performance in the social studies (Whitworth & Berson, 2003). Therefore, further research is needed in the area of how the use of technology impacts the social studies instruction and thus student achievement. Although research indicates that integration of technology has a positive influence on knowledge construction in social studies classrooms (Diem, 2000; Whitworth & Berson, 2003), there also is an immediate need for both quantitative and qualitative research to assess the integration of particular types of technology into social studies classrooms (Berson, 1996; Diem, 2000; Mason et al., 2000; Whitworth & Berson, 2003).

Consequently, with the help of technology and employment of constructivist pedagogy in the classroom, social studies teachers have already started to make a difference. It seems that the "sleeping giant" (Martorella, 1997) is awakening for the benefit of students and for the sake of meaningful learning. It thus appears that powerful

teaching and learning that integrates technology alinged with constructivist pedagogy has the potential to move social studies education beyond meaningless facts, inadequate connections, superficial coverage of content, and passive knowledge construction (Fairey, Lee, & Bennett, 2000).

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BIOLOGY TEACHERS' ATTITUDES AND COMMUNICATION BEHAVIOR IN TURKEY: FROM THE VIEW POINT OF THEIR STUDENTS

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ABSTRACT
The purpose of this study was to determine students' perceptions about their biology teachers' attitudes and communication behaviors in classroom environment in Turkey. A Likert type questionnaire was constructed consisting of 33 statements divided to three sub-sections. The Cronbach's alpha reliability for the instrument was 0.9076. Results showed that attitudes, behaviors, communication and examination styles of the biology teachers in are ranged between normal and acceptable limits. Results also provide a discussion frame of communication related problems in order to improve the subject knowledge and teacher training programs.
Key Words: Biology teachers, communication behavior, attitudes, student perceptions

INTRODUCTION

While definitions of the attitude and behavior change according to research area and test subject; generally it is received a person's negative or positive manner (mode) to a certain object or situation or event. Petty and Cacioppo (1986) describe attitude and behavior comprehensively as "individuals' general evaluations about himself/herself, others, other objects, events and problems". Based on a lot of behavior, affective and cognitive foundations, these general evaluations affect developments, alterations and formations.

Most of us can remember one or more classroom episodes when teachers' acts determined some lasting negative effects on pupil. Unfortunately, on a scientific level, many writings are encapsulated in recalling these intense emotional experiences only. Yet their message is clear, underlining that the pedagogical relationship is the heart of effective teaching (Kearney et al., 1991).

Constituting positive attitude is important for pre-service teachers. Thus required qualifications should be determined through measuring acquired attitudes and behaviors during teacher education. Changing time and social structure require teachers' having much more skills in order to perform their jobs effective. A lot of research activity in teacher education expose classroom management as the most important skill teacher must have.

International research efforts involving the conceptualization, assessment, and investigation of perceptions of aspects of the classroom environment have firmly established classroom environment as a thriving study (Fraser and Walberg, 1991; Fraser, 1998). For example, recent classroom environment research has focused on constructivist classroom environments (Taylor et al., 1997), computer-assisted instruction classrooms (Fraser, 1994), and teacher interpersonal behavior in the classroom (Henderson et al., 2000).

Interaction with other people is a major part of the school day for most teachers. In the classroom, interaction with the students is an essential part of the learning process (Fisher and Cresswell, 1999).

Classroom interactions between teachers and students occur rapidly in a classroom. It is indicated that teachers in secondary schools may have interactions with 150 different students in a single day. However, teachers are usually not aware or are not able to describe or remember what happens in these interactions with their students. For example, interviewing teachers, it is confirmed that teachers usually were not aware how many questions they asked students and what kind of feedback they provided (Good and Brophy, cited in She and Fisher, 2002). Classroom management is one of the important variables of the learning and teaching process. Beside discipline problems, teaching process involves variables such as planning learning activities, passing between activities, organizing physical order of the classroom, preparing learning materials, using time, keeping general order (Latz, 1992; Wilks, 1996).
Learning environments have been studied with a view to identifying those characteristics of the environment that are associated with enhanced student achievement. Past learning environment studies have shown that interpersonal behaviour is one of the characteristics related to student learning outcomes (Brekelmans et al, 1993, p. 60). A strong relationship between student attitude and the students' perception of the teacher's interpersonal behaviour was also found. Whereas classroom environment normally refers to relationship between teachers and their students or among students; school environment pertains to a teacher's relationships

with other teachers, senior staff and the school principal (Cresswell and Fisher, 1999; Fisher et al., 1993 Lee et al., 2003).

This paper assesses student perceptions of their biology teachers' communication behaviors in the classroom environment. Data were gathered from a sample of Turkish students in science classrooms. In keeping with previous researches, associations between students' perceptions of their biology teachers' communication behaviors in the classroom environment and their attitudes toward their science class were investigated.

THEORETICAL FRAMEWORK

She and Fisher (2002) report that three common approaches to studying teachers and their classrooms are systematic observation, descriptive case studies, and using student and teacher perceptions. Systematic observation and case studies have been used frequently in the past; however, now perceptual measures are often used particularly when investigating a large sample of classes.

She and Fisher (2002), report a number of studies, e.g., Rosenshine, 1971; Walberg and Haertel, 1980; Stodolsky, 1984, in which the advantages of using student perceptions as indicators of the classroom environment have been elucidated. Examples of past findings include; students are directly involved in classroom activities and observe more of the teacher's typical behavior than does an observer; students are more familiar with their teacher's idiosyncrasies, which might be interpreted differently by an observer; using trained observers over a period of time is more expensive and time consuming than the administration and scoring of questionnaires; and the presence of observers could alter what generally occurs in the classroom (She and Fisher, 2002).

In the past three decades, much attention has been given to the development and use of instruments to assess the qualities of the classroom-learning environment from the perspective of the student (Fraser and Walberg, 1991, Fraser, 1998; She and Fisher, 2000). The association between learning environment variables and student outcomes has provided a particular focus for the use of learning environment instruments (She and Fisher, 2000).

In the past two decades studies about science student's outcomes focused primarily on educational objectives in the cognitive domain, but in more recent times attention has been paid to outcomes in the affective domain.

She and Fisher (2002) report also a number of research, e.g. Shulman and Tamir, 1972; Mathews, 1974; Hough and Piper, 1982; Gardner and Gauld, 1990, put forward that affective outcomes of the education are at least as important as cognitive outcomes and acknowledgement of the importance of affective outcomes is reflected in their increasing emphasis in curricula.

Associations between student cognitive and affective outcomes and the learning environment have been found when classroom environment perceptions have been used as predictor variables. For example Fraser (1994) provided a broad overview of these results, which indicate that classroom environment perceptions can influence students' outcomes.

Wubbels et al., (1991), report that the communication style of physic teacher is the most important variable in explaining differences in the students' appreciation of the lessons and the subject being taught at the class level. Because of the importance of students' affective outcomes in education and because past studies frequently have reported statistically significant associations between students' perceptions of their learning environment and their affective learning outcomes (Fraser, 1998), it was decided to examine associations between students' perceptions of their teachers' behaviors with students' attitude to their class (She and Fisher, 2002).

Although past studies have examined associations between students outcomes and student perceptions of the learning environment in science class (Fraser, 1994), the present study is distinctive in that, first, it assessed student perceptions of two distinct aspects of learning environments (namely, interpersonal teacher behavior and the classroom environment), and second, it examined student outcomes in two distinct areas—student attitudes towards biology lessons and examination system of the teacher.

This study centered on students (ages from 16 to 18) in different grades of high school biology classes and aimed to investigate associations between students' perceptions of their learning environment and students' attitudinal outcomes.

METHOD

The survey instrument was constructed by the authors. The expert opinion of two educational evaluators and four biology teachers were used to validate the instrument. The Cronbach's alpha reliability for our instrument was 0,9076 (Number of cases=2463 and Number of items=33). The instrument was a five-point Likert Attitude Scale designed to determine "How do biology students' perceptions of their biology teacher, biology lessons, biology examination system?" has three chapters and total 33 items scale. There are 24 questions about biology teacher in the first chapter, and 6 questions about the examination system of their biology teachers in the second chapter, and 3 questions about their biology lessons in the third chapter. The responses to the statements ranged from strongly disagree to strongly agree. The survey instrument was given in appendix.

The survey instrument was administered to the student sample in Turkish. The sample was composed of students from 12 government high schools and 1 private high school (which encompass grades 9,10 and 11), which offer biology courses in Erzurum, Turkey. A total of 821 students in 25 biology classes were involved, representing nearly all of the students taking biology in Erzurum.

The Turkish education system has long been characterized as extremely examination oriented. The aim of education is not seen as expanding the learner's mind and developing the learner's intellectual potential, but rather as achieving high marks, passing examinations, gaining a university place, and obtaining a professional position with the highest possible salary. As in all parts of the Turkey, similarly in Erzurum, biology students are assessed on their performance in examinations during their course. Examinations may generally be written but rarely tests. The students' examination responses are assesses by their own biology teacher. In addition to three examinations, teachers have responsibility to assess students' verbal performance during the semester with more than a mark. Arithmetic average of the examinations and verbal performance marks determines whether the student pass the lesson or not.

Erzurum is a city that takes part in the east part of Turkey. In this part of the Turkey and Erzurum, a person's annual national income is under 1500 American Dollars. Generally people's especially parents' education levels are low. Most of the students have a rural origin.

RESULTS

The results are reported in Table 1.

Table 1: The survey of student perceptions of Biology Teacher's attitudes and communication behavior in Turkey (Valid percent of answers).

	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	About your teacher:					
1.	Has a great Biology knowledge.	8.2	6.5	10.5	23.5	51.3
2.	Teaches clearly and comprehensible.	7.7	7.4	11.3	24.9	48.8
3.	Encourages students to join the lesson.	10.0	7.7	14.1	26.3	41.9
4.	Lets us to criticize him/her.	16.2	11.7	19.9	19.1	33.1
5.	Knows how to attract our attention to the lesson.	12.1	9.5	13.8	25.3	39.3
6.	Encourages us to research and study lesson.	10.6	10.7	16.8	30.9	30.9
7.	Keeps his/her words about the lesson.	6.3	7.3	12.2	26.0	48.1
8.	Loves teaching us.	6.0	5.3	11.2	20.3	57.1
9.	Tries to inform us the latest improvements about the lesson.	7.2	8.1	16.4	32.5	35.7
10.	Wants us to be active during the lesson.	3.9	3.4	7.2	21.8	63.7
11.	Encourages us about exams.	22.4	13.5	20.4	21.2	22.5
12.	I don't like his/her teaching methods.	41.6	16.4	13.2	11.9	17.0
13.	Warns the student acting negative during the lesson.	5.0	3.4	6.4	21.4	63.8
14.	Never warns the student.	64.3	12.5	11.1	5.4	6.7
15.	Wants us to keep silence during the lesson.	3.3	3.1	5.8	23.3	64.5
16.	Controls what and how we learned.	12.7	8.7	16.6	26.3	35.7
17.	Doesn't mind if one did homework late.	47.8	17.4	18.1	5.0	11.7
18.	Doesn't rebuke students in order not to hurt their feelings.	30.1	11.2	14.8	15.1	28.8
19.	Doesn't make preparation for lessons.	60.1	10.3	10.8	6.5	12.3
20.	Makes an effort for explaining causes of his decisions and rules.	9.1	6.2	20.2	24.7	39.9

21.	Doesn't accept apologize of the student who is late.	44.9	16.3	13.8	7.6	17.4
22.	To him/her it is better students' to be emotionally good than the classroom control.	18.7	10.9	32.0	17.1	21.4
23.	Students know that if they've an important problem they can stop the lesson.	19.9	9.6	19.7	20.0	30.8
24.	Approves whenever students want to stop the lesson.	35.6	13.6	14.7	16.0	20.0
	About your examination system:					
25.	His/her exam questions are a part of the education.	7.7	5.3	10.0	19.4	57.6
26.	His/her exam questions have been prepared carefully.	7.8	7.3	13.8	25.5	45.6
27.	Scores of the exam can be guessed before the announcement.	23.3	10.8	17.7	25.7	22.6
28.	Exam questions have been prepared carefully.	25.7	14.4	20.8	22.1	17.0
29.	His/her exams are good means in order to evaluate our knowledge level.	10.0	10.3	16.5	24.9	38.3
30.	I approve his/her examination style.	28.7	12.3	12.9	18.4	27.7
	About your biology lesson:					
31.	This lesson holds important knowledge that I may have need in the future.	10.6	7.5	17.5	21.5	42.8
32.	I took the lesson important and studied enough.	7.7	7.8	15.3	31.5	37.8
33.	I enjoyed the contents of this lesson.	14.1	8.5	14.0	24.7	38.7

According to 74.8 % of the respondents, they think that their biology teachers have great biology knowledge. Nearly 73.7 of the respondents think that their teacher teaches clearly and comprehensible. 74.1% of the students informed that teachers keep their words about the lesson. 77.4% of the respondents felt that teachers love to teach biology. 85.5% of the respondents felt that teacher want them to be active during the lesson. 85.2% percent of the students indicated that teachers prefer to warn the students acting negative during the lesson. 87.8% percent of the students felt that teachers want them to keep silence during the lesson. 70.4 percent of the respondents felt that their teacher makes preparation for lessons. 68.2 % of the students felt that their teacher encourages them to deal with the lesson. 64.6 % of the students thinks that their teachers know how to attract students' attention. According to the survey, 61.8 % of the respondents felt that teacher encourages them to research and study about biology. In the area of honesty, In the area of improvements in biology, 68.2% of the students indicated that biology teachers try to inform them about the latest improvements in biology. But only sixty-two percent of the students felt that teachers control what and how they learned. 65.2 percent of the respondents pointed that teacher minds if one of the students did his/her homework late. 64.6% of the students thinks that teacher makes an effort for explaining reasons of his decisions and rules. 61.2 percent of the respondents indicated that their teacher accepts apologize of the student who is late.

About the examination system of the teachers; seventy-seven percent of the respondents stated that examination questions are a part of their education. 71.1% of the students thinks that their exam questions have been prepared carefully. 63.2 percent of the respondents think that their exams are good means in order to evaluate their knowledge level.

In the area of the lesson; 64.3% of the students thinks that their biology lesson holds important knowledge that they may have need in the future. Nearly seventy percent of the respondents stated that they took the lesson important and studied enough. In addition 62.7% of the students stated that they enjoyed the contents of biology lesson.

DISCUSSION

The purpose of this study was to determine students' perceptions of their biology teachers' attitudes and communication behaviors in classroom environment in Turkey.

This study doesn't aim to criticize teachers for making mistakes, but rather provide a discussion frame of communication related problems in order to improve the subject knowledge and teacher training programs.

In this study included not only student perceptions of their biology teachers' attitudes and communication behaviors but also student perceptions about examination system and biology lesson from the viewpoint of students.

This study adds to the growing body of research in to learning environments in the junction of Asia and Europe, as well as to being the first study of learning environments research specifically in Turkey.

Besides this study is first to determine Turkish high school students' perceptions of their biology teachers' attitudes and communication behaviors in classroom environment, our research is going to lead further studies for teachers and researchers.

Students' responses indicate that attitudes, behaviors, communication and examination styles of the biology teachers in Turkey are generally between normal and acceptable limits.

When students' answers about their biology teachers' attitudes and communication behaviors reviewed it has seen that more than 85% of the respondents state that teacher wants them to be active and to keep silence during the lesson. This indicates nearly all of the teachers have a student-control ideology and inviting students to involve in learning activities.

In addition, 70-85 percent of the students agreed that their teacher; has a great biology knowledge, teaches clearly and comprehensible, keeps his/her word about the lesson, loves teaching them, wants them to be active during the lesson, warns them if necessary, wants them to keep silence during the lesson, makes preparation for the lesson. These indicate that most of teachers are: well informed about biology, use appropriate teaching methods of biology, honest to keep their words, enthusiastic to teach biology and loves their student, invite students to get involved in activities such as peer discussion, observing demonstrations, make preparation before lessons.

It is reported, by the 50-70 percent of the students, about teacher; encourages them to contribute lesson and research and study biology, knows how to attract their attention to the lesson, tries to inform them about the latest improvements of biology, observes what and how they learned, minds if one did homework late, accepts the apologize of one who is late. They also think that they like their teacher's teaching methods and they can break the lesson if they have an important problem. We can deduce from this paragraph that teachers: want their student to know that they can easily succeed in biology if they study enough, know the appropriate ways of how to attract students attention to the lesson without using negative ways such as fear and sarcasm, are interested in latest biological improvements and make effort to inform their students, get feedback and control how and what students learned, have some rules and want students to obey their lesson rule such as doing homework on time, accepting apologizes of one who is late indicates teachers are not always prescriptive and behaves respectfully to their students. Students approve their teachers' teaching methods and think that they have an understanding and friendly teacher so they could stop the lesson if they have valid problems.

But less than 50% of the students feel that teacher; encourages them about the exams, doesn't rebukes students in order not to hurt their feelings, doesn't approve whenever students want to stop the lesson. These indicate that some of the teachers: may use exams as a threat means, rebukes students in order to keep the general order of lesson, do not think that it s better students to be emotionally good than classroom control. These indicate that some of the teachers: don't encourage their students towards exams enough or may use exams as a threat, use sarcasm and humiliation and doesn't mind if he or she could hurt student's feelings.

When student perceptions about biology examination system reviewed it s seen more than 70 percent of the students think that exam questions are a part of their education besides having been prepared carefully. And student perception about the examination system is generally approval.

When student answers about the biology lesson reviewed it has seen that more than 64 percent of the respondents think that biology lesson holds important knowledge that they may have need in the future, and nearly seventy percent of the students state that they took the lesson important and studied enough and more than 63% of the respondents state that they enjoy the contents of biology lesson.

Now, we may think of what are the causes of different percents of the answer given to each statement? Answer of this question for each statement is multidimensional and different research subjects. Here, we would like to mention some of the possible reasons of deviation differences.

Unfortunately, studying the characteristic of effective teachers will not give us all the elements necessary to understand teacher misbehavior. As an analogy, it is not enough to study the characteristics of non-abused children when dealing with the abused ones (Sava, 2002). It is also difficult to distinguish if a teacher's attitude towards punishment reflects cultural norms or if it is a personal attribute.

The communication that occurs within schools is crucial in shaping the social reality that teachers' experience. In addition, perceptions about their schools heavily influences their attitudes and, in turn, their behaviors.

Because school excellence is directly related to what teachers think and do, effective communication is that the heart of creating and maintaining the effective school (Rafferty, 2003).

As expected, teachers' work conditions, assessed by their level of job satisfaction, affect teacher-student interaction. Hence higher level of job satisfaction leads to a better teacher morale, an aspect that is positively perceived by students. Also, the school climate indirectly affects the student teacher interaction due to teachers' level of burnout (Sava, 2002).

On the other hand we should consider that teachers, stay longer with their students in a school day, are not only interested if students learned the subject but also interested all personal characteristics of their students. For this reason they observe their students' house conditions, body, mental health and outside activities. But teachers teaching a certain lesson interest if students learned the subject more than students' personalities.

We should highlight the fact that teacher-student interaction is not only dimension of teacher effectiveness. This concept is multidimensional and also involves organization, workload/difficulty, expected/fairness of grading, instructor knowledge, and perceiving learning. However the quality of teacher-student interaction (teacher liking) has a very strong influence on the overall score when students evaluate their teachers (Marks, 2000).

Teacher effectiveness can be obtained both positive and negative control. The latter will negatively effect the student and will lead to school inactivity, apathy, lack of interest towards school matters, and behavior disorders. The use of fear as a motivator promotes either defensive behaviors or danger control process. Both force students to become motivated to learn in order to control their fear. Neither way represents the best approach when compared to positive control and co-operative attitudes towards children (Witte, 1998; Sava, 2002).

IMPLICATIONS FOR TEACHING

Teachers are pivotal to student perceptions of learning (West, 1994), inhibiting or facilitating student learning. When the literature reviewed it is seen that some of the qualities that lead to effective relationships are positive affection, warm attitude, tact of teaching, teacher immediacy and teacher power, teacher assertiveness and responsiveness, and low differential treatment. Lack of any of these traits may negatively influence teacher-student interactions.

It is probably unrealistic to think that negative control can be totally avoided. In fact, everybody engages in these kinds of behaviors occasionally. However we should limit such control since its use often teaches aggression, causes more physical responses, produces only temporary effects, and determines negative emotional conditioning (Baldwin and Baldwin, 1981).

More importantly, the tone of articles, which are examining teacher misbehaviors, should not criticize teachers for making mistakes, but rather provide a discussion frame of such problems in order to improve the subject knowledge and teacher training programs.

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CHALLENGES IN PREPARING TOMORROWS TEACHERS TO USE TECHNOLOGY: LESSONS TO BE LEARNED FROM RESEARCH

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ABSTRACT
Today one of the most challenging factors for teachers and schools of education around the world is technology. With the advent of new technological tools; educators, parents, politicians, and administrators are seeking alternative ways of successfully educating the new generations to use these new technologies in their daily lives and to develop new skills to better compete with others. This task, of course, requires teachers who have the knowledge and skills to integrate these technologies in their curricula. Research shows that colleges of education are not doing their jobs effectively in preparing such teachers. This article focuses on research findings that address this issue and attempts to extract lessons that could be useful for other teacher education programs all around the world. The article concludes that there is a growing need of research studies which reports the currently utilized technologies and their impacts on the education and training of teacher candidates.

KEYWORDS: Preservice teacher education, technology integration

INTRODUCTION

Not a single day goes by without a new advancement in technology. This dynamic nature of technology, in turn, affects the way teachers teach and learn as well as their responsibilities in schools. As these improvements are getting more prevalent in teachers' and educators' professional lives, concerns are already directed to the importance of colleges of education because these are the places where preservice teachers should learn about technology and the ways to appropriately integrate it into their curricula. As the Office of Technology Assessment (US Congress, 1995) report concludes, preservice teachers should be able to use a range of technological tools to provide effective instruction and help their students become comfortable with and knowledgeable about technology. The most direct and cost-effective way to educate teachers about technology is through the preservice education they receive in colleges of education or other institutions (p.166).

WHAT DOES RESEARCH SAY?

However, recent literature on technology and preservice teacher education indicates that teacher preparation programs are not adequately preparing their graduates to teach with technology (Strudler and Wetzel, 1999; Thurston et.al, 1997; NCATE, 1997) and they have not yet fully integrated technology into their programs for preparing teachers (NCATE, 1997). Consistent with these explanations, a 1995 report by the Office of Technology Assessment (OTA) points out that technology is not central to the teacher preparation experience in most colleges of education. Consequently, most new teachers graduate from teacher preparation institutions with limited knowledge of the ways technology can be used in their professional practice (US Congress, p.165).

Similarly, Willis and Mehlinger (1996) in an attempt to address the current situation of technology and teacher education summarize much of the literature in one sentence: most preservice teachers know very little about effective use of technology in education and leaders believe there is a pressing need to increase substantially the amount and quality of instruction teachers receive about technology.

Regarding the possible reasons for this situation most of the research studies focuses mainly on three factors: colleges of education related factors, faculty related factors, and preservice teachers related factor. Generally, it is evident in the literature that many preservice teachers find that experience with the practical application of computers is lacking. Schools of education often overlook the very basic technology needs of their preservice teachers. Many education faculties do not receive the training they themselves need to model the use of technology effectively. Other higher-education faculties have little understanding of the changes technology is bringing to the K-12 classrooms and have not adjusted their own teaching methodologies to reflect these changes. This lack of modeling to preservice teachers provides little support for the use of technology to enhance learning (Hornung and Bronack, 2000).

Moreover, the report by OTA (1995) reports that most technology instruction in colleges of education is teaching about technology as a separate subject, not teaching with technology across the curriculum. The majority of teacher education faculty do not model technology use to accomplish objectives in the courses they teach, nor do they teach students how to use information technologies for instruction (p.165). According to the report, seldom are students are asked to create lessons using technologies or practice teaching with technological tools (p.165).

Consistent with these findings, a survey by the International Society for Technology in Education (ISTE) and the Milken Family Foundation (1999) reports that most student teachers do not routinely use technology during field experience and do not work under master teachers and supervisors who can advise them on the use of information technology.

As it can be seen from the literature, there is an agreement upon the deficiency of an effective infusion of technology into preservice teacher education. Lewallen (1998) states that instructionally, nearly 80% of faculty require students to use word processors all or most of the time. Approximately 60% use e-mail for instructional purposes some or most of the time. However, no more than 18% of the faculty regularly require students to use technology for any other purpose. Only 22% report modeling the use of technology in their classes frequently or always and 50% say rarely or never.

Based on a large scale survey conducted in 416 teacher preparation programs, Morsound and Bielefeldt (1999) report that more than 70% of respondents required students to take three or more credit hours of technology instruction, with an equivalent amount built into their traditional classes. Yet most faculty did not feel that instructional technology training was adequate or effectively modeled for these future teachers. Moreover, many of the faculty members know quite a lot about using the technologies for their own professional work, but they are uncertain how to integrate it into their classes.

All of those findings portray a much more different picture than what is expected of colleges of education in terms of preparing tomorrow's teachers all equipped with the required technology skills. However, there seems to be a second factor that let researchers question these institutions. Schrum (1999) argues that colleges of education have typically lagged behind the public sector and K-12 schools when it comes to technology implementation. Brooks and Kopp (1990), on the other hand, point out that the best and most consistent exposure for teachers to classroom relevant technologies is often at the inservice or private sector level.

At this point of our discussion, it is important to focus on the types of and differences in what technologies are currently being used by teachers working in schools and in preservice teacher education in the U.S.A.

The Office of Technology Assessment (1995) reports the types of technologies being used by teachers regularly for instruction as follows:

- 64 percent using VCR
- 52 percent using TV monitor
- 42 percent using personal computer
- 32 percent using instructional software
- 25 percent using tool software such as word processing, database management, spreadsheet
- 16 percent using multimedia software
- 5 percent using videodisc
- 3 percent using online database (p.92).

Regarding the technology used in colleges of education, on the other hand, it is difficult to find extensive summaries or survey results. As Betrus and Molenda (2002) state we do not have good information about what media are being used and how they are used by teachers and students in teacher education programs. In another way of saying that, there is no universal agreement on what teachers should be taught or how they should be prepared. (Willis and Mehlinger, 1996, p.979). Willis and Mehlinger also state that a rare type of survey research in this field is a study that looks at what is currently happening in the teacher education programs across the country relative to technology (p.996). In order to portray the technology used in teacher education programs one has to dig into literature and find out specific examples reported by various studies conducted at different colleges of education.

Whetstone and Carr-Chellman (2001) sum up from their survey results that 94% of preservice teachers use word processing primarily for typing papers, 65% use e-mail to correspond with friends, family, or faculty; and 53% use the university’s library information access system to do research. Among these students, the next most

commonly used applications are: 31% Internet, 29% graphics, 24% spreadsheet, 22% content area software, 16% database, and 62% statistics. Lewallen (1998), on the other hand, based on a survey result conducted among college of education faculty portrays the situation from a different perspective. Lewallen states that 47% of the faculty do not use any presentation software, 50% do not use spreadsheet, and 80% do not use database programs. Fifty percent do not use laser/videodiscs, 57% do not use digital cameras, 57% do not use scanners, and 89% do not use CD-ROM burners. Lewallen also notes that instructional use of these applications and hardware is correspondingly low. However, 21% of the faculty uses presentation software frequently or always to create class materials.

Besides, Rizza (2000) argues that teacher education programs have found the integration of computer technology and constructivist strategies, particularly with respect to the use of interactivity, real-world problems, context, and purposeful engagement, to be successful. Rizza notes that interactive techniques like e-mail, discussion groups, and listservs, which have been paired with delivery systems like web pages, Internet searching, and distance learning to implement successfully both theory and methods courses.

Some of the exemplary uses of technology in preservice teacher education in various institutions are as follows:

- Probeware, online computer simulations, an online communication tool, Courseinfo, PIViT: a concept mapping, project planning tool. (Friedrichsen et.al., 2001).
- Power Point, the Internet, (searching for information), scanners and cameras, CD-ROM and software, video editing (Myers et.al, 1997)
- Creating multimedia lessons (Smithey and Hough, 1999)
- Portfolios, HyperStudio, Claris Works (Doty and Hillman, 2000)
- Multimedia presentations, Internet investigations, spreadsheets, desktop publishing, Power Point, WebQuest, word processing (Willis and Raines, 2001)
- Database search, e-mail, Internet, statistical software, WordPerfect, software, spreadsheet (Fox et.al, 1996).
- Word processing, database management, spreadsheet, presentation software, web browsing, telecommunications, educational software, desktop publishing (Yildirim, 2000).
- Software evaluation (Clark et.al, 2000).
- Power Point, HyperStudio, curriculum web pages, software, multimedia development (Krueger et.al, 2000).
- E-mail and word processing documents, databases, digital cameras, web-based journal, HyperStudio, Internet, software (Hornung and Bronack, 2000).
- Multimedia video materials and other digital resources, an interactive multimedia program called ChemWorld (Pellegrino and Altman, 1997).
- Use of e-mail and Eudora, Internet, integration of multimedia into the curriculum, use of such teaching tools as a database and a spreadsheet, use of "wizards" to create presentations and newsletters, use of digitization tools such as scanners and digital cameras, use of hardware such as an LCD panel and presenter box, creation of personal homepages on the Web (Thurston et.al, 1997).
- TeacherLink, a regional telecommunications network; Public Education Network (PEN), one of the nations first statewide K-12 systems; CaseNET, a series of case-based courses on the Internet using the WWW, videoconferencing, electronic discussion groups, and e-mail; the Technology Infusion Project (TIP), pairing preservice teachers with local classroom teachers; and the Collaborative E-Learning Laboratory to be used on a pilot basis to conduct collaborative courses with faculty at other teacher education programs (Beck, 1998).
- Projection device, video player, videodisc player, and network connection (Strudler and Wetzel, 1999).

CONCLUSION

It can be easily seen that colleges of education have some reported problems in terms of effective technology integration into their curricula and in preparing the teachers of the future. Even though there are already some established standards and benchmarks (a good summary of such standards was provided by Mehlinger and Powers, 2002) so as to achieve a promising technology teaching in teacher education programs, there is a growing need of research studies which reports the currently utilized technologies and their impacts on the education and training of teacher candidates. There are lessons to be learned from the literature in preparing tomorrows teachers in colleges of education. Full integration of technology across the curriculum of schools of education looks much more promising than the efforts of individual professors and/or departments. This may require the implementation of institution wide technology change initiatives that involve restructuring of the program, developing a new vision, inservice training for professors, and establishing support structures within the institution. Introducing professors to exemplary uses of technology in other institutions, as addressed in this

article, is also critical in helping them create vision to use technology in their own preservice teacher education programs.

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CULTURAL IDENTITY CRISIS IN THE AGE OF GLOBALIZATION AND TECHNOLOGY

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ABSTRACT
The purpose of this paper is to bring together various elements that portray the complex conceptuality of cultural identity within technological society. It engages in a theoretical inquiry into the questions of how the wide-ranging uses young people are now making of new information and communication technologies and global media may possess the potential to transform their cultural identity and how educational institutions should understand and respond to this evolving cultural reality. In discussing these questions, it refer to recent theories of cultural identity, especially as they relate to the increasing volume of global flows of ideas and ideologies, people, finance and cultural practices, and specific theories about the nature of technology in terms of explicating the relationship between society and technology. Finally, it concludes with implications for educational practices of technology use.

"We now live…in an open space-time, in which there are no more identities, only transformations" (Zygmunt Bauman)

INTRODUCTION

In contemporary academia, it has become a commonplace to emphasize that our world is undergoing an identity crisis. Actually, questioning identity formation has been debated so far; nevertheless, the signs of this crisis particularly in social and cultural studies are abundantly increasing as we go through the global, postmodern and information era in which the concept of identity turns out to be more problematic and complex than ever before. Because of the rapid innovations in information and communication technology (ICT), it is important to examine how identity construction has become increasingly complicated. ICT have minimized geographic limitations and have enabled virtual relationships and new social identities through instantaneous global communications. The development of these relationships and identities radically increases the number of interfaces between people and provides increased opportunities for cultural, social and political exchanges between and among people on a global level regardless of geographic location and time zone. Appadurai (1996) and Castells (1996) propose that we look at the modern network society dynamically in terms of disjunctive, networks of flows of things, people, ideas and finance that get transformed and organized. It is in this sense that the question of how ICT is involved in the transformations of cultural identities in the era of changing patterns of global and local image and information spaces has become one of the emerging issue in these days. I argue that, in order to understand such an issue, one need to analyze it in the time-space contexts and power relations that have shaped our global world. In order to solidify my argument, I shall first explore the notion of identity construction both historically and theoretically as defined from a number of sources. Next, I shall look at the potential consequences of the process of globalization and the wide-ranging uses of ICT. Finally, I will conclude with educational implications for how schools should response to this evolving reality.

WHAT IS IDENTITY AND HOW IS IT CONSTITUTED?

Within the historical evolution of the concept of the identity, there are two common, but opposite, approaches to the questions of what identity means and how it is constituted. In prevalent and traditional approach, especially before the industrial revolution, identity is defined as a constitution based on the recognition of familiar and shared derivations including but not limited to ethnic, linguistic, religious, historical, territorial, cultural and political attributes with other people, groups or ideal (Hall, 1994, 1996). The concepts of *familiarity* and *share* in this definition are also associated with the meanings of *sameness*, *belongingness* and *unity*. From this perspective, cultural identity is a "one, shared culture, a sort of collective 'one true self,' hiding inside the many other, more superficial or artificially imposed 'selves,' which people with a shared history and ancestry hold in common" (p. 394). As Grossberg (1996) contends, the problematic belief in this analysis is that there is some intrinsic and essential content to any identity which is characterized by either a common origin or a common structure of experience or both. One can be deemed to be born along with his or her identity that appears to act as the sign of an identical harmony. In this regard, identity is determined more likely as a naturalistic and static formation that could always be sustained. This conventional view sees individual as a unique, stable and whole entity.

On the other hand, the discursive approach, as Hall (1996) goes on, delineates identification as "a process never completed and logged in contingency" (p. 2) while not denying that identity has a past. It is always in the process

of *becoming* rather than *being*, accordingly, it is constantly changing and transforming within the historical, social and cultural developments and practices such as globalization, modernity, post-colonization, and new innovations in technology. It is not a something to have or to be, yet a resource to use and an action to do. According to this constructionists and discursive view, an individual is a socio-historical and socio-cultural product and identity is not biologically pre-given to a person, instead, he or she occupies it, and more importantly, this occupation may include different and multiple identities at different points of time and settings (Gergen, 1991; Hall, Held & McGrew, 1992).

Although both approaches are trying to explain the same concept, their conflicting point is the existence and sustainability of a true, stable, fixed or authentic identity. While the former view of identity is "fixed and transhistorical", the latter one advocates the identity as being "fluid and contingent" (Woodward, 1997), not an essence but positioning. In social and cultural studies, this debate refers to a tension between essentialists (Descartes, Karl and Husserl) and constructionists/anti-essentialists (Hume, Nietzsche and Sartre) or in recent discussions, a transformation from the conception of modern identity to postmodern identity. This is how Bauman (1996) explains this transformation:

> If the *modern* problem of identity was how to construct an identity and keep it solid and stable, the *postmodern* problem of identity is primarily how to avoid fixation and keep the options open. In the case of identity, as in other cases, the catchword of modernity was creation; the catchword of postmodernity is recycling. (p.18)

From a sociological perspective, on the other hand, Castells (1997) asserts that identity acts as a source of meaning and experience for people through self-construction and individuation particularly on the basis of cultural attributes in a context marked by power relationships. He identifies three forms and origins of identity building each of which leads to a different social association: a) *legitimizing identity* that is introduced by the dominant institutions of society to extend and rationalize their domination over social actors, and it generates a civil society including organized and structured social actors, b) *resistance identity* that is produced by the actors who are in positions of being excluded by the logic of domination, and it leads to building of communities as a response to conditions of oppression, and reinforce the boundaries between the dominant institutions and new ones, and finally c) *project identity* that is a new identity produced by social actors to redefine their position in the society on the basis of whatever cultural materials are available to them. The example he provides for project identity is that of the feminist movement. When it first appeared it was in the form of resistance against the patriarchal society, but eventually developed to produce a different life for women, liberating them and allowing them to form a new independent identity.

Identities are usually produced within the play of power, representation and difference which can be either constructed negatively as the exclusion and marginalization or celebrated as a source of diversity, heterogeneity and hybridity (Laclau, 1990; Butler, 1993; Hall, 1996; Bhabha 1996; Woodward, 1997; Gilroy, 1997), suggesting that they are relational to other identities. This involves the process of persistently distinguishing one identity from others by means of discourse as a symbolic and representative meaning tool which contributes to the identity formation. Gender, race, class and sexual identities can be given as examples of identity construction out of difference, exclusion and subordination. Said`s (1978) work on "Orientalism" and its counterpart which Robertson (1991) describes as "Occidentalism", also demonstrates the very same idea. The identity of Oriental culture is seen as a subaltern culture and constituted through its exclusion from the Western culture; therefore it is the West that has given identity to the Orient. As Sakai (cited in Morley & Robins, 1995) states, "if the West did not exist, the Orient would not exist either" (p. 155).

The notion of difference as a constitutive of identity is integral to an understanding of the cultural construction of identities and has been related to the language and representation including signifying practices and symbolic systems through which the production of identities and meanings take place. Hall (1997) and Woodward (1997) argue that language operates as a representational system and helps us represent to other people our concepts, feelings and ideas. It is in this sense that language as a signifying system that provides possible answers to the questions: who am I?; What group am I belong to?; What do I want to be? Language used here as signifier of identity refers to not only written and spoken language but also texts, advertisements, visual images produced both by hand and technological means, songs, games, clothes, foods and so on. For example, in the case study of a Walkman, Du Gay, Hall, Janes, Mackay and Negus (1997) examine a wide range of artifacts involved in the advertisements of Sony Walkman in order to establish how it has been represented and who would use such a product. They assert that the identities associated with it are youth, mobile, active and so on. Further examples include Ang`s (1985) study of "Dallas viewers", Bennett and Woollacott`s (1987) analysis on the figure of "James Bond", Levi-Strauss's work on the cultural significance of "food" and its role in identity creation (cited

in Leach, 1974), Nixon`s (1997) semiotic analysis of "advertising" and Gledhill`s narrative of "soap opera" to examine gendered identities. What all these studies indicate that production of meaning through representation have an effect on the identity development.

There are two common theoretical approaches to understanding how representation conveys meanings and thus identities in this case. As already mentioned earlier, identity formation operates across the notion of "difference", therefore, the first one is based on Saussure`s (cited in Hall, 1997) "linguistics and structuralist" approach to representation through which he argues that "binary oppositions", a kind of marking difference, are essential to the production of meaning. He maintains that language is a system of signs (signifier) to express or represent ideas and concepts (signified), and all signs are arbitrary; that is, there is no natural relationship between signs and its signified meaning and it is the "difference" between signs that signifies meaning (e.g. "West" does not mean anything without "East"). His theories have been deployed as a foundation for a general approach called "semiotics" that is commonly used in cultural studies. Similar to the linguistic model, the underlying assumption is that all cultural objects and practices treated as signs convey meaning through representation. This implies that, as Woodward (1997) notes, cultural identities are also constructed in relation to or difference from the "other" ones and this construction usually appears in binary oppositions ("us" and "them") or in Durkheim`s notion of "classificatory systems" as described in linguistic and semiotics approaches. However, the recognition of difference in this scientific analysis of representation leads to static and unchanging meanings and identities. Hall (1990, 1997), echoing Derrida`s (1981) notion of "diffarance", suggests that meaning, while being constructed through difference, is not fixed or complete, on the contrary, is always deferred. A signifier may no longer clearly points to thing that is signified. Consequently, he stresses the "fluidity of identity" and introduces the second theoretical framework "discursive" approach to the system of representation. It is obviously inspired by Laclau and Mouffe`s poststructuralist critique of linguistic and Foucauldian concept of "discourse" which is more historically grounded than linguistic approach, and emphasize how discourse constructs and categorizes the ways through which people come to think about themselves. Discourse is concerned with the relationship between power and knowledge and how this relationship operates within what he calls discursive formations. Foucault argues that:

> Here I believe one's point of reference should not be to the great model of language (langue) and signs, but to that of war and battle. The history which bears and determines us has the form of a war rather than that of a language: relations of power not relations of meaning…Neither the dialectic, as logic of contradictions, nor semiotics, as the structure of communication, can account for the intrinsic intelligibility of conflicts. (cited in Hall, 1997)

THE IMPACTS OF ICT AND GLOBALIZATION ON IDENTITY FORMATION

Contemporary consideration of the status of identity has been greatly facilitated by the spread of information technologies (Castells 1997; Turkle, 1997; Poster, 2001). In some cases, the diffusion of a technology developed in an external society has dramatic consequences for our way of life and culture. When a new technology is introduced, we usually consider the artifact itself: its appearance, utility, popularity, aesthetic and cool features; because media compels us to do so. Not often do we think about its history, social shaping, or as Du Gay et al. suggest in their cultural study of the Walkman, how it is represented, what social identities are associated with it, how it is produced and consumed, and what mechanisms regulate its distribution and use. Social changes and identities are influenced if not determined by technological innovations because technology is more than a machine and can very well convey information and embody social and cultural dimensions that shape society.

MacKenzie and Wajcman (1999) remind us that the prevailing way of thinking about technology is still technological determinism that acknowledges a one-way relationship between technology and society in which technology causes social change and impacts on people. Moreover, substantive theory of technology argues that technology is not a good, bad, neutral or apolitical tool (Ellul, 1964; Heidegger, 1977), instead, it is embedded with values and ideologies shaping people's consciousness (Postman, 1993), and "constitutes a new type of cultural system that restructure the entire social world as an object of control" (Pacey, 1992: p. 7). Therefore, technology can bring substantial changes to culture along with it that manipulate the way people communicate both at the material and virtual level, and also how they see the world. As Castells argues:

> The potential integration of text, images, and sounds in the same system, interacting from multiple points, in chosen time (real or delayed) along a global network, in conditions of open and affordable access, does fundamentally change the character of communication. And communication decisively shapes culture…through the powerful influence of the new communication system…, a new culture is emerging: the *culture of real virtuality*...in which reality itself (that is, people's material/symbolic existence) is entirely captured, fully immersed in a virtual image setting, in the world of make believe,

> in which appearances are not just on the screen through which experience is communicated, but they become the experience. (p. 356-404)

Technology is also a driving force behind the process of internationalization and globalization of economy, science and culture; indeed, they have mutually reinforced each other. The decentralizing and liberating nature of information and computer technologies encourage individuals to participate in a "global village" (McLuhan, 1967) or "network society" (Castells, 1996); a condition characterized by the interconnectedness of economic, social, political and cultural activities as well as regions, cities and individuals. Such a condition is profound because it fundamentally challenges the diverse locality and traditional values, reduces the sense of social and cultural distance between communities, and affects our relationship to time and space, the fundamental coordinates of experiential reality (Giddens, 1994).

This conception of "shrinking world" inherent to the process of "time-space compression" (Harvey, 1989) carry insightful implications for the notion of identity. Spatial and temporal relations turn out to be so destabilized as a result of constant flux that these can provide little in the way of anchoring for social relations and formations. ICT and globalization decrease the space between different parts of the world, and in fact, "space of flows" (network-based society) replaced the traditional "space of places" (Castells, 1996). People in the different parts of the world can now get together and experience the same thing at the same time despite not physically but virtually. They can choose any community to interact with from a variety of choices available. People no longer have most of their interactions with people who share their territorial space, whether understood as a village or a continent (Scholte, 2000). Accordingly, there seems to be a fundamental transition in the origins of identity construction from the values of family, community, nation and physical geography to those of global media, technological networks and the asynchronous place of cyberspace and virtuality. As Morley and Robins (1995), referring to Baudrillard and Virilio`s writings on simulation, virtuality and hyperreality, put it:

> What is being created is a new electronic cultural space, a "placeless" geography of image and simulation…a world in which space and time horizons have become collapsed…a world of instantaneous and depthless communication…that is profoundly transforming our apprehension of the world: it is provoking a new senses of placed and placeless identity and a challenge of elaborating a new self-interpretation. (p. 112-121)

Although globalization is often conceptualized as an international economic integration and business transactions among the nations since most of the power and momentum take place in these areas, it is a highly complex process with important consequences for social and cultural dissemination and transformation. Appadurai (1996) argues that globalization deals with certain fundamental disjunctures between economy, culture and politics. He suggests a framework for exploring such disjunctures by classifying global "cultural flows" into "scapes": ethnoscapes (produced by the flows of people, tourists, immigrants, refugees and guest workers), mediascapes (the worldwide distribution of information and images by newspaper, magazine, television and film), technoscapes (the distribution of both mechanical and informational technologies), finacescapes (global capital flows) and ideoscapes (the distribution of ideas, terms and images and political values related freedom, democracy, welfare and rights). The "disjunctures" between the "scapes" are the spaces for the creation of new global affiliations. It is in this sense that international mobility of capital, services and technology can well result in the mobility of ideas, social forms and ultimately cultural integration; therefore, boundaries between cultures and their ties to territory or place become transcended and difficult to determine or maintain. The underlying belief of such a condition is based on the notion of "deterritorialization", a concept first introduced by French philosophers Deleuze and Guattari. Here, it concerns the relationship between location, culture and identity. According to Tomlinson (1999), "a central defining characteristic of deterritorialization is the weakening or dissolution of the connection between everyday lived culture and territorial location" (p. 128) and it is the most essential cultural outcome of globalization. In a similar vein, Clifford (1992) stresses the concept of "traveling cultures" in which identity is not rooted in a particular geographic location but in mobility. As richly evidenced in these arguments, identity can no longer be comprehended as stable or fixed formation since our sense of self as integrated subjects is increasingly undermined as we become decentered and dislocated.

In terms of the impact of media and communication technologies, Giddens (1991) defines globalization as "the intersection of presence and absence, the interlacing of social events and social relations 'at a distance' with local contextualities" (p. 21). Giddens' definition offers an essential point for considering globalization in terms of identity formation because people's relations with absent others can shape their experiences. Globalization consequences a sense of being disembedded from places, in other words, a weakening of affiliation to localities. As Bauman (1992) posits, "the urge for mobility, built into the structure of contemporary life, prevents the

arousal of strong affections for any of the places; places we occupy are no more than temporary stations" (p. 695). Then, through actions "at a distance" with the facilitation of information and computer technologies, individuals may go beyond their physical community and interface, and form multiple identities by means of interactions with diverse cultural beliefs and behaviors on a global scale.

Turkle (1997) suggests that engagement with the new technology "challenge what many people have traditionally called `identity`; a sense of self is recast in terms of multiple windows and parallel lives" (p. 73). The virtual interactive spaces mediated through the synchronous and asynchronous communication tools such as bulletin boards, chat rooms, instant messaging and mailing lists transforms traditional notions of identity (stable, fixed, sameness, etc.) into the notions of multiplicity, fluidity and difference. Turkle (1995) explain this by incorporating Gergen`s (1991) notion of the "saturated self" in which communication technologies allow people to "colonize each others brains" by continuous construction, reconstruction and negotiation of their identities with the ability to have relationships across the globe and the knowledge of other cultures.

Now one can argue that the rapid developments in ICT catalyzing and accelerating the dissemination of information, values, beliefs, and the spread of global culture have far-reaching effects on the development of identities and communities. Some of them may be positive whereas others may be negative. The reduction of time and energy for the information, and the increased communication between cultures of different geographical areas and ethnic backgrounds may be deemed positive and therefore desirable. However, the disruptive and disintegrative effects of global culture on the changing patterns of socio-cultural identities and institutions, such as youth, families, languages, educational settings and religions, may be considered negative and undesirable.

This important and controversial concern in globalization discourse is seen in the reciprocal interaction between global and local that is often interpreted as resulting in either cultural homogenization or heterogenization (Appadurai, 1996). The former one refers to the formation of global culture in the area of late capitalism and proceeded powerfully by such various aspect of life as fashion, film industries, language, media, and music, which are universally consumed. The global culture here means the cultural elements and apparatuses shaping the common lifestyle of humans through the process of globalization. Therefore, it is perceived as an expression of sweeping and overwhelming that undermines local cultures. The latter one, on the other hand, refers to variation and diversity of culture.

Through homogenization of culture, local beliefs and cultural values might become universalized besides demolishing the distinctiveness of local identity. This cultural invasion becomes threatening and causes serious problems for some conservative states by virtue of the fact that such openness to foreign content can erode the traditional values and indigenous cultural identity. In the name of preserving local and regional cultural heritage, social, governmental and religious institutions take various actions including quotas and regulations as bulwarks against global standardization. Castells (1996) regards this as a tension between the "Net" (global cultural flows) and the "Self" (local communal cultures). This tension demonstrates how "sameness" and "difference" in this context manifest themselves as constitutive parameters for the construction of identity as outlined at the beginning of the paper. Castells (1997) notes that such resistances against oppression may result in "resistance identity" formations which he characterizes as the "exclusion of excluders by the excluded" such as religious fundamentalism, territorial communities and nationalist self-affirmation.

Furthermore, some societies are struggling with a dilemma: on the one hand they worry about their traditional social and cultural values and their youth's sense of cultural heritage and identity being negatively affected; on the other hand, they want youth generations to grow up being in contact with the rest of the world and become prepared for and adapt themselves to the economic challenges of affiliation with globalization, the information society and the knowledge and skills they demand. In other words, they are in the process of negotiation on how to find a proper combination of local and global. Again but different from the above, such a dilemma exemplifies the relationship between local and global, which results in neither homogenization nor heteronegization; however, a mixture or a middle way of both. Robertson (1992, 1995) describes this as "glocalization" characterized by the interpenetration between local and global rather than a situation of local being overridden with global. He suggests that both local and global have power to construct each other, and phrases the local-global encounter as both the "universalization of particularism" and "the particularization of universalism". This argument leads to the idea that whereas globalization transforms the local identities, customs and values, inhabitants are also able to transform the global into their local establishments, suggesting that new identities not necessarily belonging to either local or global may be constructed. For example in the case of national identities, the question becomes "where are you between?" rather than "where are you from?" From a postcolonial perspective, Bhabha (1994, 1996) introduces the concept of "hybridity" in order to describe the

construction of such culture and identity, which challenges the authenticity of the essentialist view (binary oppositions). According to him, a new cultural hybrid identity emerges from the continual interface and exchange of cultural performances in-between the colonizer and colonized. His concept plays a central role in contemporary postcolonial, cultural and identity studies. As Hoogvelt (1997) states, it is "celebrated and privileged as a kind of superior cultural intelligence owing to the advantage of in-betweeness, the straddling of two cultures and the consequent ability to negotiate the difference" (p. 158).

IMPLICATIONS FOR EDUCATION

First of all, instead of a positivistic and optimistic approach to technology use in education, which looks for a technological fix to educational problems, the emphasis should be solving educational problems by not advocating computers or other technological tools for the sake of technology, instead, by questioning their proper role in educational settings and reflecting on how technology may cause both positive and unintended negative results in social environments. Since educational technology is a resource that encompasses political, cultural and social dimensions, it needs to be placed in the hands of teachers who are culturally aware of the non-neutral aspect of it. The ways in which children come to understand the world are learned through imagery. Images consume children's daily experiences and are prevalent throughout educational media and computer software. Educators who understand the potential impact of cultural media on children can be influential in teaching students to read representational meanings of media artifacts.

With teens consuming the greatest number of hours watching television and playing video games, kids between the ages of 8-18 spend an equivalent of six hours each day or 40 hours a week using media (Roberts, 1999). Such amount of time that children devote to media exacerbates a growing concern that media sources like television and video games have the potential to distort children's worldviews. This is an important concern for educators and parents because most of the time magazines, television, film, and computer video graphics are incorporated into the curriculum. When such media are associated with youth culture, they construct representations of the world and serve as socializing agents, providing young people with beliefs about the behaviors of the world (Considine & Haley, 1999).

It is also necessary to protect youth from being exposed to inappropriate materials available through the use of technology. Children should be taught through their school curriculum on how to effectively use technology. It is educators` responsibility to teach them through the use of critical surfing to steer clear of the exposures to those that is not suitable to their cultural values and identities. Assuming that advances in technology are far more rapid than what most communities can cope with, positive steps can be taken to enable them to adapt to the change. One way of such an adaptation may be achieved through designing policies to protect the young from the abuse and misuse of information technologies. Schools need to promote a balance way of technology diffusion that youths can properly fit to their own way of life, traditions, customs and cultural heritage at the same time they can adapt themselves to the challenges and realities of the twenty-first century in order to find their own place in the world of globalization.

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EFFECTS OF COMPUTER BASED LEARNING ON STUDENTS' ATTITUDES AND ACHIEVEMENTS TOWARDS ANALYTICAL CHEMISTRY

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ABSTRACT
The aim of this study was to compare the effects of computer-based learning and traditional method on students' attitudes and achievement towards analytical chemistry. Students from Chemistry Education Department at Dokuz Eylul University (D.E.U) were selected randomly and divided into three groups; two experimental (Eg-1 and Eg-2) and a control (Cg). In teaching analytical chemistry topics, two different computer based methods - new analytical chemistry learning software called *HEHAsit* (Method A) and a Microsoft Excel program (Method B)- were prepared by us and applied to Eg-1 and Eg-2, respectively. Whereas the last group (Cg) was taught by the traditional method (Method C). In the comparison of the effects of the three methods, we developed an attitude questionnaire and an achievement test related to Analytical chemistry, and applied to students in all three groups. Students' attitudes towards computers were also tested by a computer attitude test developed by us. As a result of the study, significant differences between control group and both experimental groups and between experimental groups on computer attitudes and analytical chemistry attitudes were found. Furthermore, analytical chemistry achievement in experimental groups was significantly higher from the control group.

KEY-WORDS: *interactive learning, computer assisted learning, simulation, acid-base titration, analytical chemistry*

INTRODUCTION

Computer-based learning is becoming more and more widespread and it has been important especially at difficult subjects in science for over two decades. Nowadays by using computers researchers studying on molecular chemistry, medical chemistry, accounting molecular orbital are managed to ease collecting and processing data and gain speed (Zielinski & Swift, 1997).

> Successful professional educators are not confronted replacing traditional applications with new ones. Gilbert (1996) indicated that instructors must avoid being impatient for integrating information technology in learning and teaching. It is not possible to wait that the replacement of the traditional education completely with an information technology assisted method of instruction in a single semester. Therefore, it can be used the combination of computer technology with traditional method and constituting gradual process instead of a quick change.

Computer is a device, which presents wonderful opportunities for learning and teaching processes. Using to teach, manage, show and communicate made the computer unique compared the other learning devices. However, it has not been used instead of textbook, laboratory and lecture in universities (Tielemans & Collis 1999).Computer has used to be produced for teaching, manage, show and communicate, but other devices, which are used to learn, are less effective than computer.

Computer -based learning (CBL) is a method, which use computer in learning media, strengthening students' motivation and education process. It gives opportunities to both students and teachers to learn by their speed and combine active learning with computer technology. Collette & Collette (1989) explained that using computer increase motivation and desire to lectures and laboratory in the process of learning.

There are a lot of important reasons for using computer and World Wide Web in chemistry education. Educator not only can gather many materials from various centers. But also they can get text, graph, audio, video, picture, animation and simulation in the same media to students. Many studies also supported the idea that computer-based learning has positive effect on students' achievements and attitudes (Aiello & Wolfe, 1980; Burns & Bozeman, 1981; Chang, 2002; Russell et all, 1997; Sanger & Greenbowe, 2000).

The aim of this study is to understand the importance of CBL in analytical chemistry education and its effect on students` attitudes and achievements.

METHOD

Chemistry Teaching Department students of Buca Education Faculty of Dokuz Eylul University (Izmir-Turkey) voluntarily participated in this study. The participants were divided into three groups randomly; experimental group-1 (Eg-1), experimental group-2 (Eg-2) and control group (Cg).

Likert-scale items to measure computer attitudes and analytical attitudes developed and applied as a pretest and posttest. At the same time analytical achievement exam was applied for determining the level of students' analytical chemistry achievement. Then each learning methods was used only one group for teaching acid base titration: the first one was computer-based learning process (Method A), called *HEHAsit*, prepared with Visual Basic, applied to Eg-1, the second process was (Method B) prepared on Microsoft Excel, applied to Eg-2 and the third one was traditional method (Method C), applied to Cg.

HEHAsit thought eg-1 students for 8 hours. *HEHAsit* learning software includes texts, pictures, audios, videos, animations and simulations, in addition to an interactive graph-drawing feature. Eight sequential phases were followed while HEHAsit software has been preparing:

-Determining purpose: Students can read acid base titrations' texts, draw the graphs, study experiments in simulation imaginary laboratory and watch the video which show acid base titration experiments.
-Selecting hardware: Computer must have monitor, keyboard, mouse, speaker and sound blaster for completely operating HEHAsit interactive learning program.
-First planning: The text of HEHAsit included acid-base titration. In addition to this researchers wrote titrimeter analysis, pH, pOH, buffer solution, conjugate acid base pairs and indicators in text. In this section, titles and page order were designed.
-Designing: Researchers put simulation, video, audio, animation and pictures when it necessary and then pages view and background colors were designed.
-Programming and coding: Computer programmer wrote the codes of interactive graph program. First videos, text animations and pictures were prepared and the researchers put in interactive graph program.
-Arrangement screen: Screen view, graph size and animations arranged in the design of software.
-Pilot Study: Researchers tested the design of software on 57 students to understand their opinion, criticism and expectation about software. In terms of the pilot study number of titration sample and critical point on titration graph increased.
-Evaluation: Software was evaluated with 195 analytical chemistry students. After that, changes of students' attitudes toward analytical chemistry were carried out.

Method B does not include pictures, videos, audios, animations and simulations. At the same time, these students attended to traditional method lecture to get extra knowledge. Before beginning study, worksheets were given to students not only to teach Excel accounting program but also to help researchers to follow students` studies. Excel tutoring took two hours.

Measures

-**Analytical Chemistry Attitudes Scale (ACAS):** ACAS is applied for measuring the interest and attitudes of students toward analytical chemistry. Each item in scale did not include more than one idea. ACAS included 25 positive and 25 negative questions. This scale was applied to 142 students. A descriptive analysis was conducted for each variable and correlation tests were performed among variables. After the evaluation, questions 1, 2, 35 and 38 were ignored because their correlation numbers were negative and/or near zero. Cronbach α-reliability coefficient was 0.97 and validity coefficient was 0,95 after removing low-correlation questions for ACAS. Finally ACAS was used as a pretest and posttest

-**Computer Attitudes Scale (CAS):** CAS is applied for measuring the interest and attitudes of students to computer. Each item in scale was not included more than one idea. CAS was included 60 questions, 30 positive and 30 negative. This scale was applied to 142 students. Correlation test were used to analyze the data. After the evaluation, questions 1, 9, 14, 32, 38, 44 and 52 were canceled because their correlation numbers were negative and/or near zero. . Cronbach α-reliability coefficient was 0.93 and validity coefficient was 0,90 after removing low-correlation questions for CAS.

-**Analytical Chemistry Achievement Exam (ACAE):** The purpose of this test was to measure the achievement of students. 9 questions included in the test. Three questions had long answers; six questions had short answers. One of the short answer questions was multiple-choice, one was true false, 4 questions were completing (filling in blank) test.

The data were analyzed using SPSS statistics program. Paired samples t-test was used to investigate significant differences between pre- and post- test in the groups and one-way ANOVA was used to fix significant differences between groups. *p* values were considered in order to understand significant differences between groups and in the groups:

RESULTS

Analytical Chemistry Attitudes Scale (ACAS): Results of analytical chemistry attitudes scale for Cg, Eg-1 and Eg-2 presented in table-1. The test showed that there were not any differences between control groups pre- and post-test on students' attitudes toward analytical chemistry [$t(64) = 1,15$, $p = .0153$], however there were significant differences between experimental groups [$t(66) = -4,43$, $p = .001$] for Eg-1 and [$t(65) = -3,63$, $p = .0005$] for Eg-2 .

Table 1.Analytical Chemistry Attitudes Test Results

Group		N	$\overline{X}$	S.D	δ	t	P
CG	Pretest	64	149,26	25,25	6,52	1,15	0,153
	Posttest	64	147,20	24,85	6,41		
EG-1	Pretest	66	167,61	22,65	6,28	-4,43	0,001
	Posttest	66	172,61	23,19	6,43		
EG-2	Pretest	65	161,30	25,11	7,94	-3,63	0,005
	Posttest	65	164,50	24,73	7,82		

Computer Attitudes Scale (CAS): The results of computer attitude scale for Cg, Eg-1 and Eg-2 are presented in Table.2. There is no significant differences between control groups' pre- and posttest. However, there is a significant difference between experimental groups.

Table 2. Computer Attitudes Test Results

roup		N	$\overline{X}$	S.D	δ	t	p
CG	Pretest	64	185,60	21,40	5,52	1,89	0,080
	Posttest	64	175,33	19,73	5,09		
EG-1	Pretest	66	198,53	27,02	7,49	-2,67	0,020
	Posttest	66	205,46	26,15	7,25		
EG-2	Pretest	65	189,40	24,50	7,74	-3,03	0,014
	Posttest	65	194,10	25,76	8,14		

Analytical Chemistry Achievement Exam (ACAE): Analytical chemistry achievement test analysis for Cg, Eg-1 and Eg-2 is presented in Table3. Significant differences were found t between pre- and post-test for all groups. Maximum difference found in Eg-1 while minimum difference found in Cg.

Table 3. Analytical Chemistry Test Result

Group		N	$\overline{X}$	S.D	δ	t	p
CG	Pretest	64	31,62	5,87	1,46	-7,93	0,000
	Posttest	64	53,43	12,51	3,12		
EG-1	Pretest	66	31,46	10,08	2,79	-10,50	0,000
	Posttest	66	72,46	11,52	3,19		
EG-2	Pretest	65	28,40	6,23	1,97	-8,49	0,000
	Posttest	65	62,10	13,74	4,34		

DISCUSSION

In this study, students' attitudes toward analytical chemistry and achievement on analytical chemistry (acid-base titration) depending on computer-based learning, and traditional teaching methods compared. The computer program that used in computer-based method was presented on http://www.enderyilmaz.com. SPSS program was used to analyze the data.

Although significant and positive changes were found on students' attitudes toward analytical chemistry in method A and B, the results show no significant differences in Cg students' attitudes toward analytical chemistry in traditional teaching method. These results show similarities with previous studies (Kulik & Kulik, 1991; Yates, 2000a, 2000b; Richard & Foust, 2001; Yalçınap, 1993).

The results of analytical chemistry test presented students who were thought by method A and method B, were more successful than the students who were thought by method C. Students' interest and attention can easily attract with multimedia applications in computer. In addition, knowledge is not forgotten because number of using sense organs is increased in learning process. It can be concluded that computer based education is more effective than traditional methods on students' attitude towards analytical chemistry. This finding is consistent with previous studies (Akcay et all, 2003).

Eg-1 showed more success than eg-2 in analytical chemistry exam because of the number of multimedia applications in method A. Simulations and graphs in HEHAsit program were more attractive to students than Excel sheets. Also, Bank (2001) explained that interactive questions were more attractive. The simulations in HEHAsit programs are not similar to the reality and excite the students' imagination. Also Merrill et all (1986) indicated to change amount of closed realty as to effect on phenomena. A lot of computer simulations are not close high degree however using text, graph, animation and sound effect are more important.

Another important benefit to simulation is saving money and time. Students who used method A did the experiment, which needs more money and time, in a shorter time and lower cost. The similar results from different studies were cited (Kulik et all, 1985; Waller & Foster, 2000).

Because of requiring study with computer in using learning methods, students' attitudes were investigated towards computer. Consequently significant differences were found for students who used method A and method B but there is no significant difference observed for students who used method C. This result showed that students who study with computer hesitation and abstention remove at business life after the university education.

The software like HEHAsit program is possible to produce at a lot of chemistry master and found a lot of space in the universities. For example, in United Stated, Virtual Titrate version 1.5-simulation program was designed for second grade chemistry students in Wisconsin-Madison University. This program can be used very easily on internet web page service by students (http://hamers.chem.wisc.edu/chapman/Titrator/). Furthermore, Bruno Herrera's created acid base titration simulation in Southern California University (http://chemmac1.usc.edu/bruno/java/Titrate.html). Many simulation and animation prepared by Bruce Berne et al. are being presented at Colombia University's web page (Berne,).

Universities for both distant education and formal education in Turkey must prepare the education software.

HEHAsit program is the most appropriate to use for universities because experts must work together while preparing the programs. Consequently if using computer and internet become widespread at every education level especially at university education, the quality of education could increase.

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IN PURSUIT OF ALTERNATIVES IN ELT METHODOLOGY: WEBQUESTS

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ABSTRACT
Although the Internet has opened up a vast new source of information for university students to use and explore, many students lack the skills to find, critically evaluate and intelligently exploit web-based resources. This problem is accentuated in English-medium universities where students learn and use English as a foreign language. In these cases, the task of finding and extracting relevant and useful information is daunting for students. Also, they spend too much time looking for information and become demotivated or end up copying and pasting without enough time to think critically about the issues.

In response to the challenges faced by students in effectively exploiting web-based resources, the School of Foreign Languages, Eastern Mediterranean University, has recently begun using a new approach developed in the late nineties in America known as WebQuests. The Modern Languages Division of the SFL provides service English courses for students studying in various departments, and one of its aims is to link English language with concepts used in the departments by benefiting from the resources on the Internet. The underlying principles inherent in the design and implementation of WebQuests provide a reason and motivation for students to use and produce English with real tasks relevant to their departments while exploiting the richness of the Internet. It can be further surmised that the use of WebQuests has broader implications in helping students develop better digital literacy, even when English is not their native language.

This study introduces the idea of WebQuests and the adaptation of this approach using sample tasks which were developed and piloted at the Modern Languages Division, SFL, EMU. In this article the details in the preparation, design, implementation of WebQuests and the results obtained from teacher and student questionnaires are presented.

INTRODUCTION

It is impossible to deny the impact that technology has had on our lives today. The Internet, which has been with us for over forty years, has pervaded almost every orifice of modern society. It transcends cultural, physical and spatial borders; it encompasses developed and developing worlds; having an e-mail address or website has become as commonplace as having a telephone and now ELT practitioners are experimenting with the use of blogs and wikis in their teaching contexts. We use it to communicate with each other on a daily, hourly or instantaneous basis; we turn to it to learn more about issues that concern us; we can travel vicariously to the farthest corners of the world in a flash; we play games to entertain ourselves, download music and videos, and do our banking. Schools, as the prototypes of the communities that we live in, must obviously provide an education that not only embraces the Internet but also equips our students with the ability to use it (or whatever information technology advances it will lead to in the future) wisely, productively and for the benefit of society..

Considering the effect the Internet has had in everyday life, it would be unwise to keep our doors closed to the use of informational technology in our classrooms and not equip our learners with the skills they need to survive in the real world. This is perhaps the single most compelling reason which drives many educators to try integrating informational technology into the classroom; we perceive the need to provide a rational link between 'education' in ours schools and the contribution to society that students will make after graduation. There are plenty of alternatives for teachers who are willing to experiment and incorporate informational technology in

their classroom teaching, both as an instructional aid and as a tool to facilitate learning. In this paper, the focus will be on one of these tools–the WebQuest.

WebQuests

WebQuests were developed in America by Bernie Dodge in 1995, primarily for teachers in the secondary school system and for use with different disciplines regardless of the age groups of its users. Dodge (1995) defines a WebQuest simply as "an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Internet…" He further emphasizes the importance of WebQuests in an interview saying that it is a tool which creates the "great" teacher of the future (Dodge, 2000).

Those teachers who have professional experience in preparing and implementing them in the classroom confirm that the essence of WebQuests lies in the given task which requires a higher order of thinking. In other words, students are not expected to just receive information passively but rather to use it actively to achieve a certain purpose. Fundamental to this approach is that the student should not just sit in front of the computer and answer a list of questions but indulge in critical thinking which involves "problem solving, judgment, analysis or synthesis" as stated by March (1997), who has worked closely with Dodge and made significant contributions to the promotion and development of the concept of WebQuests,.

Here, it is necessary to repeat a well-known fact that the use of technology does not replace the role of the teacher in the classroom. On the contrary, the use of WebQuests highlights the importance of the teacher in setting up the tasks relevant to the needs of the learners. The teacher's primary role is to serve as a facilitor, using their knowledge about the educational background of the students in order to decide on how the students themselves can best advance their own intellect. Despite the fact that the sources on the Internet provide a great learning opportunity, especially through the use of innovative approaches like WebQuests, it is the teachers who play the crucial role in successfully conceiving, designing, implementing and evaluating WebQuests.

Pedagogical implications of WebQuests

The underlying reason to use WebQuests is not simply the popularity of the Internet or the Web but rather the pedagogical implications that its use promises to the innovative teacher. WebQuests present a unique opportunity to combine a wide range of effective instructional practices in one activity, integrating technology, scaffolding, collaborative learning, critical thinking, authentic assessment and constructivism all in one seemless bundle. March (1998) elaborates on this issue in terms of three main contributions that WebQuests have on students learning.

The first of these is increasing students' motivation to learn through the challenge of confronting authentic tasks, which require them to solve a problem, to make a comparison, or to construct a hypothesis in relation to a real-life situation using real sources; they are motivated because the effort that they must put into the given task goes beyond the walls of the classroom. The WebQuest tasks require the students to reflect on their own perspectives, thereby strengthening the link between themselves and the task.

The next is developing critical thinking skills again through the use of a real-life situation which requires the students to construct an appropriate solution to a problem. The elements of cognitive psychology and constructivism are embedded into the WebQuest task as the students are not only required to comprehend the collected information but also analyze, synthesize and transform it into something new by adding their own perspectives which becomes evident in the completion of the given task Scaffolding is another important contribution as students are guided towards the main task step by step, completing one stage at a time.. Together these help students develop an in-depth understanding of the main issues they are confronted with through the consolidation of their prior knowledge with the new information they discover. This provides them with coping strategies to use when they encounter a similar issue again in a different context by activating their schemata.

The last is creating an opportunity for collaboration as students need to work together to complete the given task, an vital element of the learner-centered approach. Collaborative tasks diminish the feeling of isolation students may have when encountering problems for the first time, as there will be peer support provided through group work. This will also help maintain motivation at a higher level as they must continue to work together toward achieving a common goal.

Types of WebQuests

There are two main types of WebQuests defined primarily by the scope of the tasks involved: short term or long term. Both employ similar principles and methods but for different purposes. Short-term WebQuests are designed to be completed within less than two or three lessons with a limited amount of new information for

students to comprehend and process. Long-term WebQuests are usually designed to span a week or a month's period depending on the given tasks, which usually require the learners to analyze new information and show their understanding by elaborating or synthesizing their ideas

Things to be considered while using a WebQuest

There are certain things to be considered carefully during the stages of design, preparation and implementation of the WebQuest tasks.

1. Before embarking on the design and preparation phase, it is crucial that teachers have an in-depth understanding of the rationale for using WebQuests.
2. Next, teachers may adapt an existing WebQuest task that has potential to meet the course objectives. Sometimes it is necessary to start from scratch. In this design phase, it is equally important to consider not only how the task supports the syllabus, but also when to introduce the task to the students. The task should be flexible in order to cater for the differences among learners' understanding of the given task and their ability to reflect on it. So there should be ample potential for learners to come up with creative and diverse solutions and results to the given task through active construction of meaning within the learner's own context.
3. Subsequent to this, the primary resources need to be found on the Internet that will be made available for students to refer to in the appropriate stages of the given task. This is necessary in order to maximize the time and effort towards the contribution to students' critical thinking skills and avoid unnecessary and time-consuming searches.[3] Such guidance will provide them with a 'map' to be followed in order to successfully achieve the aim of the WebQuest. Another important consideration is to provide information sources that require students to construct or interpret a meaning or 'intellectual value' and not simply ask them to process information as 'given' without any reflection on its validity or reliability.
4. A fundamental feature in designing a WebQuest is to give enough time for students to analyze, critically evaluate and assess the collected information in order to incorporate all relevant views and perspectives into their own unique solution to the task. It should be designed in such a way to motivate learners to learn how to effectively use the Web as a source for learning beyond the assigned project.
5. During its implementation the teachers should act as facilitators and try to shift the responsibility of learning within the context of the WebQuest to the students. It is also important to maintain cooperation among students through the use of collaborative group work. Students should not work in isolation as it is important that they share their ideas with other students in their group. The skill and ability to work effectively in a team is increasingly seen as essential in today's workplace. As many students are not accustomed to tasks that not only require creative thinking but also team work, it is important to provide some scaffolding, such as a schedule for students to plan their study in terms of where to work, when to work, and with whom. WebQuests are based on the intensive use of technology, so it may be necessary to help students arrange where and how they will make use of these resources, such as in a scheduled lab hour, in class or at periods when students are not in class.

Essential components of WebQuests

As in all learner-centered learning tools, the use of WebQuests also requires the structured organization of the task as a whole. It shifts the responsibility of learning to the students and therefore it is crucial for the task to be self explanatory. In other words, students should be able to follow the steps involved in the task with ease by following simple and clear instructions. Dodge (1995) suggests the following six issues in building a successful WebQuest:

1. An attractive introduction in order to create curiosity in learners to do the given tasks.
2. A clear statement of the purpose of the given tasks which may sometimes include a "focus question" to better guide the learners and help them to keep on the track.
3. Resources in the form of a list which include relevant Internet links necessary for the given task.
4. Unambiguous descriptions of the process which learners are required to go through to successfully complete the WebQuest, such as direction on how to use the given resources, follow the stages involved in the task, employ the scaffolding provided and keep to the assigned roles or duties to maintain cooperation.

[3] Sometimes the task itself may be to improve students' ability to search for information, an essential skill to be learned in research. However, in general, WebQuests guide students to the resources that are essential for the task, so the task becomes more of an issue of how they exploit this information to solve a problem, rather than tasks based primarily on a retrieval of facts and figures.

5. Providing explicit criteria informing the students about the evaluation process for the given task, often in the guise of a rubric designed by the teacher for authentic assessment.
6. Concluding the task in such a way that students are encouraged to reflect on everything they acquired through different stages of the WebQuest.

BACKGROUND TO THE STUDY

Eastern Mediterranean University (EMU) is an English-medium university with seven faculties and three schools. The School of Foreign Languages (SFL) serves the existing faculties and schools at EMU by offering English courses for general and academic purposes. The general English courses, which incorporate the main academic skills, are offered through the Intensive English Division (IED) for students prior to their departmental study at EMU. In the Modern Languages Division (MLD), students' academic skills in English are focused on in relation to their departmental needs either as compulsory or elective courses.

This experimental mini-scale study on the suitability of WebQuests took place at the Faculty of Communications and Media Studies (FCMS). Although this article concentrates solely on the FCMS experience, WebQuests were also piloted and evaluated in several other faculties and schools at EMU and are still in use in some.

The context of the study, FCMS, has three departments which are Journalism, Radio, TV and Film Studies, and Public Relations and Advertising. During the first two years of study, students in all departments have common courses and the EFL courses are among those which are offered to students in their freshman year regardless of their departmental specialization. Of the five teachers who offer the EFL courses, all have the basic skills in using computers for academic purposes. Two had taken an in-service teacher training course in the use of computers and teacher development (the CCTD) and were well informed about the use of the Internet in language teaching. The other three teachers, although they had not taken any such in-service training, were aware of the importance of the technology in learning and were willing to incorporate technology into language teaching.

The freshmen studying at FCMS are those who have passed the EMU English Proficiency Test, either as graduates of IED or directly after registration to the university. Therefore, for some students, the EFL courses are among the first university courses that they take and therefore not all are aware of the requirements of an academic study environment where English is the medium of instruction.

In terms of the facilities, there are two main laboratories with internet access which are open to students unless they are scheduled for a class. In addition, there are two more computer laboratories which do not have internet access. Unfortunately, in all laboratories there are no sound cards on the computers and consequently no headphones for listening purposes.

Reasons for using the WebQuest Tasks at MLD

As mentioned earlier, Webquests tasks are used as a strategy which serves a variety of purposes, but the specific reasons for using them at FCMS were to:

- increase students' exposure to English language;
- provide a structured assistance in using internet sites as a source of learning;
- improve students' critical thinking skills;
- provide a medium for cooperative learning;
- facilitate students' learning through the use of the WebQuest tasks by showing them how to cope with the Internet
- increase students' motivation by creating a link between the departmental courses and the use of English

The raison d'etre for piloting WebQuests was to motivate the students to use the Internet as a learning tool by providing them with a context that presented a real learning need and task authentic to their discipline. Indirectly, it aimed at increasing students' exposure to English language with materials provided on the Internet. Therefore, the first WebQuest task was introduced to the students and its usefulness was examined through the informal feedback collected from the teachers and students who experienced its implementation at FCMS. The results were interpreted as positive and consequently WebQuests were introduced in MLD courses in the other faculties and schools at EMU, and at upper levels of the IED preparatory program.

Preparation of the WebQuest Tasks

After deciding to use a WebQuest task as a part of the EFL courses due to the reasons pointed out above, first, search engines were visited to find examples of WebQuest tasks available on the Internet.

Then, from the huge numbers found, a few were chosen as appropriate to the FCMS. The EFL teachers teaching at FCMS analyzed these tasks and identified their weaknesses and strengths considering the needs of the students and the requirements of their field of study. Finally, instead of adapting the existing ones, it was decided to create one which was parallel to the course objectives and appropriate to the students' profile. Of course, there were elements of the examples that had been analyzed which provided inspiration and ideas. During this process all EFL teachers teaching at FCMS provided feedback about the wording of the instructions and did the proof reading. They also provided feedback about the quality of the tasks required from learners to complete. After this collaboration it was finally possible to start the web site design of the first WebQuest, which served as a model for the second one using the same approach applied to the first.

Initially, the WebQuest tasks were planned on paper which enabled all the EFL teachers to be fully involved in their conception and design. Then, the WebQuests were discussed in teaching team meetings for EFL teachers at FCMS and within a month they were ready to be published on the Internet. During this stage, a one-on-one refresher session was provided to the designer to revise the use of an HTML editor (FrontPage) in preparing the tasks incorporated into the WebQuest. This process was actually akin to a WebQuest in itself, in that it was an authentic task that required collaborative and cooperative learning strategies in problem solving. Like WebQuests, it was a great challenge to sort out the problems together, and eventually the first one was finalized. As in the other stages of the preparation of the WebQuest tasks, the FCMS colleagues worked collaboratively to provide feedback about the user friendliness of the site and troubleshooting links, etc. after publishing it on the Internet.

For the second WebQuest, it was decided to broaden the WebQuest experience for students by giving them the opportunity to be involved in the process of actually creating the WebQuest they would later be asked to participate in. In particular, they showed an interest in its preparation and contributed to its design in terms of colour, font and graphics.

Implementation of the WebQuest Tasks

Since the course syllabus was already quite full, it was decided not to occupy students for a long period of time. It was also pointed out that the task should allow flexibility and should not clash with other commitments that students had. So, it was decided to complete it in a month. Meanwhile, students were required to write an essay and also do a presentation while they were working on the WebQuests. The topic of the essay and the presentation required them to analyze a media product related to their departments, e.g., a newspaper article, a print media advertisement or a film. Although they were given three options related to their departments, they were free to choose any of these regardless of their departments. Although in the first WebQuest students were asked to prepare a print media advertisement, in the second WebQuest they were given the flexibility to prepare something relevant to their departments.

Where to carry out the WebQuest was one of the major questions that required careful organization. There were not enough computer laboratories with Internet connections for all students to make use of, and nearly all EFL courses were at the same periods which made it impossible to do the WebQuest tasks during class hours. However, since the main aim was not the final result of the tasks, but rather the process that the students were required to go through, this was not a significant problem. Therefore, it was decided to occupy the available laboratories at alternating periods for a week in order to introduce the WebQuest site, the guidelines and the tasks to all students with a hands-on session. As an alternative, in case of technological problems, it was also possible for teachers to introduce the guidelines in class using an overhead projector or a data projector. In the second semester courses, some teachers especially preferred this method as they found it more practical since students were already familiar the nature of the WebQuest tasks. Then it was decided to leave students free to work independently outside the class provided that they submitted their work either through the e-mail or by hand at announced dates for each step in the given WebQuest task. Moreover, it was suggested that students should be informed that they could get in touch with their teachers through e-mail when they encountered problems. It was also decided to give feedback to students' work in class or during office hours in order to better guide them for each step of the assigned WebQuests.

Implementation of the WebQuests in this Study

During the first implementation of the WebQuest tasks, all students, regardless the courses that they had taken at FCMS, were given a WebQuest task called "Preparing a Print Media Advertisement" (See Appendix 1). Then, this was followed by another WebQuest but which was only offered to students who were taking the second semester EFL courses. This WebQuest was called "The Real Truth about Tobacco" (See Appendix 2).

WebQuest 1: Preparing a Print Media Advertisement

- Students were required to prepare a print media advertisement after completing three task sheets.
- They were asked to form pairs in class and give their names to the teacher with their chosen role: either an advertising executive or a graphic designer.
- The first task was for them to read an article and answer the given questions. Although the aim was to help them in planning their project, they had to read the article in order to be able to familiarize themselves with the concepts required to answer the questions.
- Then, according to the responsibilities of the roles they had chosen, either as the advertising executive and the graphic designer, they had to individually fill in two task sheets.
- Finally in the third task given, they had to work together to prepare their own advertisement.
- After all students completed their projects, their work was displayed in the faculty corridors where they could receive informal feedback from their peers and teachers.

WebQuest 2: The Real Truth about Tobacco

- Students were required to create a memorable message highlighting the harmful effects of tobacco to a school boy who was suspected of smoking.
- They were asked to work in groups of three and picked a letter at random from A, B, and C to determine which tasks they should do and then gave their names and roles to the teacher.
- For the first task they had to conduct research on tobacco by visiting the site that they were assigned and, working individually, to answer the questions using the information given in the site.
- Then, for the second task, they were asked as a group to collect advertisements made for or against the use of tobacco and then analyze them individually with the guidance of the questions assigned to them.
- Finally, they were asked to work as a group to convey their message about tobacco use though a poster, or an article, or a song/music video/skit using a scenario/TV commercial.

Evaluation

As said before, the most important thing was the process. So students were asked to go through different stages, working individually and then collaborating with each other. The aim was to assess the process, not the product. Therefore, students were not only guided and given feedback at different stages but they also received a number grade assigned for different steps involved into the WebQuest task, which is contrary the assessment of authentic tasks as in the case of WebQuests. However, all the teaching colleagues at FCMS decided to structure the assessment in a summative way in order to create an instrument for motivation which was thought to be the most appropriate method considering the educational background of the students who were studying at FCMS: mostly from an exam-centered system where the teacher was the authority. It was thought that for the successful completion of the tasks it was necessary to keep the students on track using such a strategy.

For the first WebQuest the first task which was done in pairs was worth two points. The second and the third tasks were done individually and each was worth two points. To get full marks, both students had to complete their individual assignments; if one student did not then both received only two points out of four for this part which appeared as individual work but required them to be responsible for each other. The fourth task was worth three points and the remaining one point was given for punctuality.

The second WebQuest required students to work in groups of three and involved three tasks. For the first two tasks they had to work individually in their assigned tasks, but similar to the first WebQuest, they were encouraged to have group responsibility. These tasks were assigned three points each, but if one of the group members did not do the required task the other group members were penalized for this and they were not awarded any points. The third task was for three points and there was one point for punctuality.

On the internet site for each WebQuest ‘stars’ represented the number grades, in order to create the concept of ‘reaching the stars’ which was a more motivating concept than numerical values. In subsequent uses, some changes were made in the evaluation procedures as teachers did not want to punish the students when their partners did not fulfill their responsibilities. So, both for the first and the second WebQuest tasks, three points were given for each task and one point for punctuality.

QUESTIONNAIRE RESULTS

The authors worked together to prepare the questionnaire used to get feedback on the WebQuest approach. It was first distributed at FCMS, and then administered at the other faculties who had also introduced WebQuests and wanted to evaluate their effectiveness through the same questionnaire.

For this paper only the results of the questionnaires (See Appendix 3 and 4) implemented at FCMS among English I (EFL 109 and EFL 119) and English II (EFL 110 and EFL 120) students and teachers will be reported.

The data was collected from 43 students English I students who were given Preparing a Print Media Advertisement (WQ1) and 34 English II students who were given The Real Truth about Tobacco (WQ 2). Excluding the researcher, 5 teachers from FCMS took part in the study.

The questionnaires given to the teachers and the students were parallel and students were given the opportunity to choose between Turkish and English versions of the questionnaire prepared for them. While the students expressed their personal experiences regarding the WebQuests, the teachers expressed their perceptions on students' experience to do with the WebQuests.

Relevance

Both the students and the teachers were content with the relevance of WQ1 in terms of its usefulness and relevance to FCMS and the EFL courses. However, in WQ2 students felt neutral while the teachers were mostly negative about its relevance. Teachers strongly disagreed that it was related to the EFL courses. In addition to the results obtained from the questionnaire, in the written comments section, teachers stated that WQ1 was more meaningful for students' needs whereas the materials used in WQ2 were not relevant.[4]

Instructions and timing

Students who did WQ1 partly agreed that they were effectively introduced the task, were well informed about its requirements, were confident on what to do, found a logical order and relevance among the steps included into the task and found the instructions useful. They also thought that the starting and the finishing dates of task were at an appropriate place in the syllabus, the given time was sufficient and the language used in the instructions appropriate to their proficiency level. Teachers for WQ1 were again more positive compared to the students. However, in WQ2 teachers were less positive and they were negative towards it concerning the instructions and timing. Unlike teachers, students were mostly neutral about the instructions and timing about WQ2 but they partly disagreed that the starting and the finishing dates were in the most appropriate place in the course syllabus. The written feedback obtained from the teachers concerning this issue was also negative as they stated that the tasks were integrated into the syllabus inefficiently. On the other hand, students raised another issue arguing that the time given for completing the assigned tasks was not sufficient.

Although the instructions and timing of the WebQuests were parallel in both, teachers thought that the instructions and timing were more effective in WQ1. The only difference between the instructions was that the first one was given in laboratories whereas WQ2 was mostly introduced in classrooms for practical reasons such as inadequate technical facilities and not being able to take students to the computer laboratories to introduce them the WQ2. For example, in the written feedback section some students expressed that there should be 'visual explanation' and 'examples' in order to make the tasks more understandable.

Task

In WQ1 students partly agreed that they accomplished the requirements of the WebQuest task, connected to the relevant sites in order to do the task with no difficulty, improved their research skills using the Internet, completed the task with success but they were neutral about its contribution to their language proficiency in English, attractiveness and entertaining aspects. They also preferred to stay neutral when they were asked if they wanted to do such tasks again. Similar to students, teachers were also positive about these issues in relation to WQ1. The students who were involved in doing WQ2 were mostly neutral and they partly disagreed about its contribution to their language proficiency in English, attractiveness and entertaining aspects. However the teachers were mostly negative about WQ2 unlike WQ1 and they strongly disagreed that it was an enjoyable task to do. However, some students expressed their interest in WebQuests defining them as 'enjoyable' and 'good for self-improvement'. These students who expressed positive thoughts about WebQuests also found the final task 'reasonable' compared to the other tasks. Despite these positive ideas there were some students who thought that WebQuests were 'a waste of time' and 'boring'. Teachers said that the students did not benefit

4 Such a response was quite striking as the second WebQuest task offered a chance for students from different departments to create something relevant to their departmental study while the first WebQuest task was aimed at the majority of students who were studying in the Public Relations and Advertising department with a specific area on preparing a print media advertisement. Although 'banning smoking' was not covered either as a departmental or an EFL topic, the final task offered the students an opportunity to create something relevant to their field of study and accomplish the aims highlighted as the reasons for having WebQuest tasks in EFL courses.

from these tasks and felt demotivated. There were some teachers who argued that the prepared websites for the WebQuests were not interesting as a factor for students' unwillingness to do the given tasks..

The main difficulty about WQ2 was that there were certain technical problems which did not exist while doing WQ1. One of these problems was that some of the internet resources chosen for the WebQuests needed a java-enabled browser. This wasn't a problem in the first WebQuest but an unfortunate change in Microsoft's marketing strategy in the updated version of Internet Explorer meant that the second WebQuest, which had also been prepared using web sites with interactive javascripts, ran into an unexpected problem. The updated versions of Microsoft's Internet Explorer required that a Java plug-in had to be downloaded separately. Most of the users were not aware of this which caused failure in their attempts to open the site to do the tasks. Another problem was the lost e-mails. Some students were using Hotmail, some Yahoo and some their student accounts on the university server to send their messages. Due to the university firewalls and priority ranking for communications, messages from students using an external mail server were sometimes delayed or never delivered to the teachers. So some students had difficulty in convincing their teachers that they had in fact done the tasks on time and as required.

Evaluation and feedback

Concerning the evaluation and feedback in WQ1 students partly agreed that they were effectively guided by the teacher, the scoring criteria was appropriate and relevant to the objectives of the given task and scoring was fair. Teachers agreed with the students and they were slightly more positive about the guidance provided to the students though the completion of the task. In WQ2 both the students and the teachers were neutral about these issues concerning evaluation and feedback. In written comments section students suggested that WebQuest tasks 'should not be graded' and should be 'held on voluntary basis'.

Collaborative learning

Students who did WQ1 stated that they were neutral about the task in terms of enabling them to work cooperatively with their classmates, its usefulness and learning from their peers while doing the given task. They partly agreed that they fulfilled their roles in the preparation of the given task. Similar to the students, teachers had nearly the same opinion about WQ1. In WQ2, for collaborative learning, teachers preferred to stay mostly neutral while students were mostly a bit more negative about this issue. Similarly, in the written comments section students expressed that working alone was better compared to working together with their peers and they argued that working alone should also be made possible.

This was an expected feedback since students were not fully aware of the importance of working collaboratively with their peers and they were confident in working with their peers. They mostly could not benefit from each other since they lacked both awareness and skills necessary for collaboration.

Student involvement

Students who did WQ1 preferred to stay neutral about contributing to the preparation of WebQuest tasks but they partly agreed that teachers and students should design the WebQuest tasks together. Teachers were slightly more positive in expressing their interest about contributing to the preparation of these tasks and collaborating with students during their design process. In WQ2, although teachers were more positive in these issues, students partly disagreed to contribute to the preparation of the WebQuest tasks and were neutral in working together with teachers to design such tasks.

Despite the difficulties faced during the implementation of WebQuests, teachers were willing to work on their improvement and design the second task together with the students. Especially in written comments, although there were a few students who suggested replacing WebQuests with something else in the course, teachers stated that in future it would be possible to prepare more relevant and beneficial WebQuest tasks. They also stated that both teachers and students needed time to get used to the idea of WebQuests and self study.

IMPLICATIONS AND CONCLUSION

WebQuests are undoubtedly applicable in an EFL context, but based on our experience and research, the implications for successful implementation suggest that:

- Teachers and students should be made aware of the underlying principles and methodology of WebQuests.
- Wherever possible, WebQuests should afford teachers and students maximum potential for input into their preparation, design and implementation.
- WebQuests should be incorporated into the course syllabus and seen as an integral component by both teachers and students.

- All parties involved in a WebQuest should receive adequate orientation.
- The WebQuests should be scheduled to minimize potential conflicts with deadlines for other major works of assessment.
- The tasks should be meaningful, challenging and enjoyable.
- The tasks should be interrelated with each other.
- Some tasks should be carried out during class period in order to effectively monitor that the overall aims and objectives of WebQuest has been understood.
- The WebQuest tasks and their evaluation should both be sympathetic to the concept of formative assessment of authentic tasks in which the end product is not the sole measure of success, but creativity and development through the process is also considered.
- Technological problems can not always be anticipated, so the guidelines and assessment should be flexible enough to cater for unforeseen complications.

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Appendix 1: Teacher Notes for WebQuest 1

PREPARING A PRINT MEDIA ADVERTISEMENT

Aim: familiarising students with the use of the Internet as a source of information

creating a situation for students to use English language

improving students' field knowledge

How: students will visit the suggested sites and examine them

↓

students will complete certain worksheets in relation to the visited sites

↓

students will use this information as a guide in the successful completion of their group project

When: will start in week ? and will be completed in week ?
(exact dates will be decided on later)

Where: will be started in the labs (lab hours will be assigned for each group)

Topic: creating a print media advertisement

Roles (Pair Work)

Advertising executive : writes the slogan and the body copy of the print advertisement (should work in close relation with the graphic designer)

Graphic designer : designs the print advertisement of the product (by focusing on the design features)

Each Pair : finalise the whole project

SOME POINTS TO BE CONSIDERED:

How will teachers monitor the process of the research on the Internet?

Via e-mail:	students may direct questions to their teachers when they encounter difficulties
Hard copies of the worksheets:	students will be responsible for handing in the online task sheets to their teachers at regular intervals (dates will be specified by class teachers and the first task sheet will be introduced by class teachers)
Regular meetings:	giving feedback to students either in class or in office after the completion of the task sheets
Lab hours:	There will be a lab hour in order to introduce the project to the students which will be on Eagle site

What will be the end product of this project?

a printed version of the prepared advertisement

How to evaluate the completed projects?

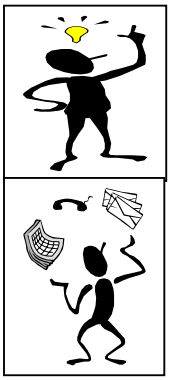
provide the rubric for the whole project

individual grades for each task sheet and then

collect the scores from different students who worked for the same partnership to find out their overall score by referring to the rubric

PROJECT: PREPARING A PRINT MEDIA ADVERTISEMENT

STEP 1: In this project your will work in pairs. Decide who you will work together and then read the responsibilities of each person.



ADVERTISING EXECUTIVE

You will write the slogan and the body copy of the print advertisement of a product that you will decide together with your partner. While doing this you should work in close relation with your partner (the graphic designer).

GRAPHIC DESIGNER

You will work on the design features of the print advertisement of a product that you will decide together with your partner. While doing this you should work in close relation with your partner (the advertising executive).

STEP 2: Decide who will be responsible for which role and start doing the related tasks. Start with Task 1!

TASK 1: BOTH FOR THE GRAPHIC DESIGNER AND THE ADVERTISING EXECUTIVE

In order to prepare a print media advertisement, you need to decide on certain things before you start. Work together with your partner in order to decide on these important issues.

Step 1: Visit the site: http://adbusters.org/spoofads/printad/

Step 2: Complete "TASK SHEET 1"according to the information you collected from this site together with your partner .

TASK SHEET 1

1) What is your communication objective (aim)?

_____
_____

2) Who is your target audience?

_____
_____

3) What is the concept (message) of your advertisement?

_____
_____

STEP 3: After deciding on the major elements of your print advertisement in pairs, now you can start working alone. The Advertising Executive should work on "Task 2" and the Graphic Designer should work on "Task 3".

TASK 2: FOR THE ADVERTISING EXECUTIVE

In order to write a good slogan and an effective body copy for your advertisement you need to collect information on this issue. Visit the following sites and **fill in "TASK SHEET 2"**. Don't forget to discuss the findings with your partner and then show it to your teacher.

After collecting the required information, you can start writing the slogan and the body copy of your own advertisement.

Step 1: Visit sites: **http:www.televisioncommercials.com**
http://www.tootsie.com/memoriesSpots.html

Step 2: **Complete "TASK SHEET 2"according to the information you collected from the sites you visited.**

TASK SHEET 2

Instructions: **Analyse 5 advertisements and answer the following questions. This means you will fill in 5 Task Sheets (one for each advertisement)!!!!!**

1. What product is being advertised?
_____
_____

2. Who is the target audience in this advertisement?
_____
_____

3. Is there a slogan in the advertisement?
If yes, what is it? If no, why not?
_____
_____

4. What was the most important thing that you have learnt about the product after reading its body copy?
_____
_____

TASK 3: FOR THE GRAPHIC DESIGNER

In order to design an effective advertisement you need to collect information on this issue. Visit the following sites and **fill in "TASK SHEET 3"**. Don't forget to discuss the findings with your partner and then show it to your teacher.

After collecting the required information, you can start working on the design features of your own advertisement.

Step 1: Visit sites: **http:www.televisioncommercials.com**
http://www.tootsie.com/memoriesSpots.html

Step 2: **Complete "TASK SHEET 3"according to the information you collected from the sites you visited.**

TASK SHEET 3
Instructions: Analyse 5 advertisements and answer the following questions. This means you will fill in 5 Task Sheets (one for each advertisement)!!!!!

1. What product is being advertised?
_____
_____

1. **What pictures are used in this advertisement and how are they placed?**
_____
_____

2. **What kind of writing style is used in this advertisement?**
_____
_____

3. **What are the other design features used in this advertisement?**
_____
_____

TASK 4: FOR THE FINAL PROJECT

You have already decided "what" to advertise, "for whom" and "why" while doing Task 1!!! Now, you can start thinking about the details of your print media advertisement. Work together with your partner and make use of the advertisements that you have analysed.

EVALUATION

REMINDER!!!!!

YOU WILL GET A PAIR-WORK GRADE FOR THIS PROJECT.

YOU WILL NEED TO COMPLETE ALL FOUR TASKS.

IT IS NECESSARY FOR ALL PARTNERSHIP MEMBERS TO PUT A LOT OF EFFORT INTO THIS PROJECT.

RUBRIC IS AS FOLLOWS

TASK 1: ONE STAR (PAIR-WORK)
TASK 2: ONE STAR (INDIVIDUAL)
TASK 3: ONE STAR (INDIVIDUAL)
TASK 4: TWO SARS (PAIR-WORK)

TOTAL: FIVE STARS ( ) = 5 POINTS

EXCELLENT WORK

VERY GOOD JOB

GOOD JOB

OKAY, but…??

??

Appendix 2: Teacher Notes for WebQuest 2

THE REAL TRUTH ABOUT TOBACCO

Aim: familiarizing students with the use of the Internet as a source of information

creating a contextualized situation for students to use the English language

improving students' subject-matter knowledge

How: students will visit the suggested sites and examine them

students will complete certain worksheets in relation to the visited sites

students will use the collected information as a guide in the successful completion of their group project

When: Students will have one week to complete each task
The whole project will be completed in three weeks

Where: The project will be started in class (deadlines/procedures) and the tasks will be completed **outside** the class.

Introduction:

Ali is a secondary school student who is 15 years old.
His parents think that he smokes. Everybody around him, his parents and teachers, tried to explain the harms of tobacco but he still thinks that it isn't really so bad.
In fact, he thinks it's pretty cool. But he might listen to you. After all, you're a university student and you are young enough to understand his feelings as a friend.
His parents believe that **only you** can help him They've asked you to convince him to quit smoking.
To do so, you must fight against young people using tobacco. So, create a memorable message for Ali. Do a good job - it could be a matter of life and death!!!

The Task

Ali, like most young teenagers, doesn't particularly like to read, so you must approach him in a more creative way.
He is, after all a member of the MTV generation. He'll listen to a rap song; he'll hang a poster in his room.
But to earn his respect, you must first demonstrate your knowledge of tobacco and your commitment to fight its use by young people.
So here's what you've got to do:

- Become an expert about tobacco use and issues surrounding its use.
- Create an ad or poster that visually conveys the message you want to get across.
- Demonstrate your commitment to fight tobacco use by writing a letter to a tobacco company and an editorial for the local paper.
- Get Ali's attention and give him a memorable message using a music video, skit, or TV commercial.

Responsibilities:

You are going to work in groups of three and you have to work together for each task by following the **guidelines.**

Task 1:

Step 1: Conduct research on tobacco by visiting the following sites.
Each student should visit a site.

(Student A) Site 1: How Tobacco Harms Your Body
(Student B) Site 2: The Harms of Tobacco
(Student C) Site 3: Smoking and the Work Environment

Step 2: Answer the following questions after reading the information given in the articles.

Step 3: Come together and decide which facts from the collected information can be used to convince Ali to stop smoking.

Think about the following questions:

1. What diseases are caused by smoking cigarettes? Smoking cigars? Chewing tobacco?
2. Why do people smoke?
3. Why is it difficult to stop smoking?
4. What are the facts about nicotine?

Task 2:

Step 1: Collect tobacco advertisements, posters, etc., from the Internet by using search engines e.g. Google, Yahoo, Altavista.

Step 2: Then write the name of the brand whose advertisements you want to analyse,
e.g. "Marlboro advertisements".

Step 3: Finally, click on the search button.
From the list given, visit some sites and choose two advertisements to compare and contrast according to the following criteria:

Student A: What graphic design techniques did they use to appeal to you?

Student B: What does the copy of the advertisement say? What information is given in the copy to appeal to you?

Student C: What does the image of these advertisements say? What is being implied through these advertisements?

Task 3:
Design an advertisement or poster to convey your message about tobacco use.
OR
Write an article for "Gundem" which is a magazine published in the faculty of Communications and Media Studies.
OR
Create a song and a music video for it.
Create a skit using a scenario related to youth using tobacco.
Create a TV commercial.

Feedback: After completing each task, students will receive feedback.

Evaluation: Task 1: accurate and relevant information (3 points, one for each site)
Task 2: analysis of the advertisements (3 points; one for each question)
Task 3: creative, appealing and professional presentation (3 points)
Punctuality (1 point)

Appendix 3: Summary of Questionnaire Results

	SD 1	D 2	PD 3	N 4	PA 5	A 6	SA 7
1. In general terms, I found the WebQuest task useful.		T2		S2	S1 T1		
2. The WebQuest task was related to my departmental needs.			T2	S2	S1	T1	
3. The WebQuest task was related to the content of the EFL course.	T2			S2	S1	T1	
4. I was effectively introduced to the WebQuest task before I started doing it.			T2	S2	S1		T1
5. I was well informed about the requirements of the WebQuest task before I started doing it.			T2	S2	S1		T1
6. I was confident in terms of what to do when I started doing the WebQuest task.		T2		S2	S1		T1
7. The steps of the WebQuest task had a logical order.				S2 T2	S1		T1
8. The steps of the WebQuest task were interrelated with each other.				S2 T2	S1	T1	
9. The instructions given at different stages of the WebQuest task were useful in guiding me to complete the whole task successfully.				T2	S1 S2	T1	
10. The starting and the finishing dates of the WebQuest task were in the most appropriate place in the course syllabus.	T2		S2	T1	S1		
11. The time allocated for the completion of the WebQuest task was sufficient.		T2		S2	S1 T1		
12. The difficulty level of the language used in the instructions of the WebQuest task (and in related sites) was appropriate to my proficiency level of English.		T2		S2	S1	T1	
13. I was able to accomplish the requirements of the WebQuest task.		T2		S2	S1 T1		
14. I faced no difficulty in connecting to the relevant sites to do the WebQuest task.		T2		S2	S1 T1		
15. The WebQuest task contributed to my research skills using the Internet.		T2		S2	S1	T1	
16. The WebQuest task contributed to my proficiency in English language.		T2	S2	S1	T1		
17. I successfully completed the WebQuest task.			T2	S2	S1	T1	
18. The WebQuest task was good enough to capture my attention and interest.			S2 T2	S1	T1		

19. I enjoyed doing this WebQuest task and I want to do in future, too.	T2		S2	S1	T1		
20. I was effectively guided by teacher feedback through the completion of the WebQuest task.				S2 T2	S1	T1	
21. The scoring criteria were appropriate and relevant to the objectives of the Webquest task.				S2 T2	S1 T1		
22. Scoring of the WebQuest task was fair.				S2 T2	S1 T1		
23. The WebQuest task enabled me to work cooperatively with my classmates.			S2	S1	T1 T2		
24. I found it useful to work together with my friends during the completion of this WebQuest task.			S2	S1 T2	T1		
25. I learned a lot from my friends while doing this WebQuest task.			S2	S1 T1 T2			
26. I fulfilled my role in the preparation of this WebQuest task.			T2	S2 T1	S1		
27. In future, I want to contribute to the preparation of the WebQuest tasks.			S2	S1	T2	T1	
28. I believe that students and teachers should design the WebQuest tasks together.				S2	S1	T1 T2	

Appendix 4: Summary of written comments

	FCMS Teachers	FCMS Students
appropriacy	Meaningful for Ss needs (WQ1) Material not relevant and websites not interesting (WQ2)	Working alone is better
timing	Inefficient allocation into the syllabus	The time given for completing the assigned tasks was not sufficient
likes		Enjoyable and good for self-improvement The final task was reasonable
dislikes	Ss did not benefit Ss felt demotivated	Waste of time Boring
comments/suggestions	Must be integrated into the course syllabus (WQ1) In future we will be able to prepare more relevant and beneficial WQs (WQ1) Ts and Sts need time to get used to WQs and self study (WQ1) Need to be re-designed/re-scheduled WQ2	Other things should be done instead of WQs Should not be graded and should be on voluntary basis There should be visual explanation and examples Working alone should be possible

OPEN SOURCE SOFTWARE IN TEACHING PHYSICS: A CASE STUDY ON VECTOR ALGEBRA AND VISUAL REPRESENTATIONS

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ABSTRACT
This study aims to report the effort on teaching vector algebra using free open source software (FOSS). Recent studies showed that students have difficulties in learning basic physics concepts. Constructivist learning theories suggest the use of visual and hands-on activities in learning. We will report on the software used for this purpose. The effect of FOSS on students understanding of vector algebra was determined by a non-equivalent control group design. A total number of 113 freshman students from two classes of introductory level physics courses were involved. The experimental group's students learning processes were supplemented by instruction utilizing FOSS while the control group was taught in traditional manner. A significant difference in students' performance was found that could be attributed to the treatment. Consequently, visualization of vector and related concepts by FOSS simulations helped students to understand them well and contributed to shorten the time needed to learn these concepts.

1. INTRODUCTION

Teaching and learning is a complex process which is being studied intensively. Important studies regarding human learning effects learning theories especially those related to school learning. Learning models based on are now being scrutinized. Many problems have been identified with traditional teaching approaches which was based behaviorism. In traditional teaching, the teacher is the authority and the students are passive learners. This type of structure favors the world view of "one type correct" answers even to complex problems (e.g. Environment & pollution), and has an elitist approach towards students. While some students are able to perform and solve complex problems in physics they fail to apply basic knowledge in novel situations (Driver et al., 1994).

Recent theories focusing on the nature of learning promote the constructivist theory. This theory arose out of Piaget's works in developmental psychology. Briefly constructivism regards the learning processes as a continuous construction and reconstructions of concepts. Throughout these procedures the students are actively involved in their own learning processes. Students are put into a situation where an engaging environment is being created by stimulating, challenging, and provoking the interest of the students. Teaching strategies should be structured in such a way that the students are active participants and the teachers act more as a guide rather then the all knower. Constructivist teaching and learning theories emphasize that teaching should be build around open ended problems where students are allowed to explore different paths to reach desired conclusions. Another important factor to consider is that learning takes place in social environments. Therefore, peer interaction is viewed as an essential component in cognitive development (i.e., learning) Feltovich et al. (1996).

Accordingly, contemporary learning theories in education, emphasize the need to provide the learners with a variety of learning opportunities. These environments should also include the possibility of peer interaction and collaboration opportunities.

2. RATIONALE

Reaching a meaningful understanding of Vectors is essential to be able to learn the concepts presented in physics, algebra and geometry. In physics, vectors are defined as physical quantities that have both magnitude and associated direction to it. Displacement, velocity, acceleration, force, momentum, and impulse are all examples of vectorial quantities. Unlike scalar quantities such as temperature, mass, time, energy, power, and work, the mathematical manipulation of vectors is somewhat more complicated. For a typical introductory mechanics course the topics to be studied include areas such as kinematics, dynamics and Newton's Law of motion, work and energy, impulse and momentum, and rotational motion. In order to reach a sound understanding of the concepts presented in these topics a basic understanding of vector algebra is also needed.

Online tutorials and aids can help the students foster their understanding of vector mathematics by providing immediate feedback in a structured environment. Rothney, Roselli and Howard (2003) developed "Courseware Authoring and Packaging Environment" software (CAPE) that supplied diagnostic correction mechanisms that identified common student errors. This tool also provided specific feedbacks based on the type of mistake encountered for a biomechanics course. This study aims to develop a teaching model that extends traditional

teaching by making use of a series of additional tools to help the students understand the concepts of vector algebra for introductory mechanics. Visualization was a key factor while deciding on theses tools. Interactivity was another important factor. Finally we also opt for tools that would be available to the students in class hours as well as out of class. This way we also opted to provide the opportunity for the students to work outside of class with their peers. However, we did not mandate the collaboration outside of class.

For this study we utilized non-commercial software for obvious reasons. We wanted to build an additional learning tool for our students besides what they have been already using. As it is in many introductory physics classes, students use books and to some extend calculators depending on the level of physics being taught. Besides these tools, the students have nothing else, especially outside of class hours, to help them aid their learning process of vector mathematics. Students' misconceptions in vectors can hinder their ability to advance in successive topics in mechanics because the concepts presented in kinematics, dynamics, momentum & impulse, and rotational motion all depend on a sound understanding of vector algebra. The software used were Octave & goOctave.cgi, Java applets, GNU plot, putty, ssh & bash and apache web server all running on a Linux operating system. A somewhat extended explanation will follow on Octave, GNU plot and the java applets whereas a discussion on the later software (i.e., apache, ssh, bash etc) will be omitted since we believe they are all well know. More information about Octave follows as it relates to vector algebra.

2.1. Octave

Octave is a powerful mathematics tool, in some references it also defined and known as a high-level language. It uses the command line interface (CLI) as its main source of interaction. It is a tool especially designed to manipulate matrices. The tool can be used to accomplish numerical computations as well. MatLab, for example, would be a commercial equivalent of Octave, in fact, the description in its LSM entry reads ``GNU Matlab--A numerical matrix mathematics program."

Initially Octave was designed in educational settings. The goal was to construct Octave as a pedagogical instrument to help to teach better chemical reactor and problems related to this subject. The first version was released in 1994 and since then has been undergone numerous revisions. The authors "wanted to create something that would enable students to solve realistic problems, and that they could use for many things other than chemical reactor design problems". Octave is now included with Debian GNU/Linux and SuSE Linux distributions, Redhat Package Management (RPM) binaries for RedHat and Fedora distribution are also available. Hence octave seems to have accomplished a major success. "Today, thousands of people worldwide are using Octave in teaching, research, and commercial applications" (http://www.octave.org/history.html)

Information regarding how to use Octave can be easily located at their website. They do provide an exhaustive manual on how to use this tool. A WIKI website provides additional help topics ranging from how to do simple compiling and installation issues to complex scripting and advanced batch programming. Finally, as mentioned previously, Octave is similar to Matlab. Because of this similarity, tutorial's regarding Matlab are also to a great extend valid for Octave. Especially those that use the CLI as the main input and manipulation interface.

2.2. goOctave.cgi

The goOctave.cgi script is a code written by Mai Zhou (http://www.ms.uky.edu/~statweb/testOctave.html). The script lets the students interface with Octave over the web through a simple html form. By means of such an interface, the students have direct access to Octave any time out of class. Students can run examples and experiment with the examples from anywhere provided they have web access. Another major advantage of employing this script is to have the tool ready for teaching without the need for complex and tedious setups. Finally, having the tool up on the web provides students who do not own a computer with octave

The goOctave.cgi script provides the students with a form where they are allowed to type in the equations. The result is being rendered on the same webpage. Moreover, goOctave.cgi can render also graphs if desired. The graphs are produced in png format and rendered as such on the webpage. The students can save these rendered graphs on their local hard drives and if needed import them to their favorite word processor. goOctave.cgi script had some limitations which were easily overcome. The authors made some coding modifications to meet our needs. For example, the script could not run in multiple-user mode. The code was modify so that it could render graphs while simultaneous other users were working on the webpage. Additionally all descriptions were translated into native language, i.e., Turkish. The webpage can be accessed through the following URL: http://per.ibu.edu.tr/cgi-bin/goOctave.cgi.

Figure 1. Modified Web Interface of goOctave.cgi

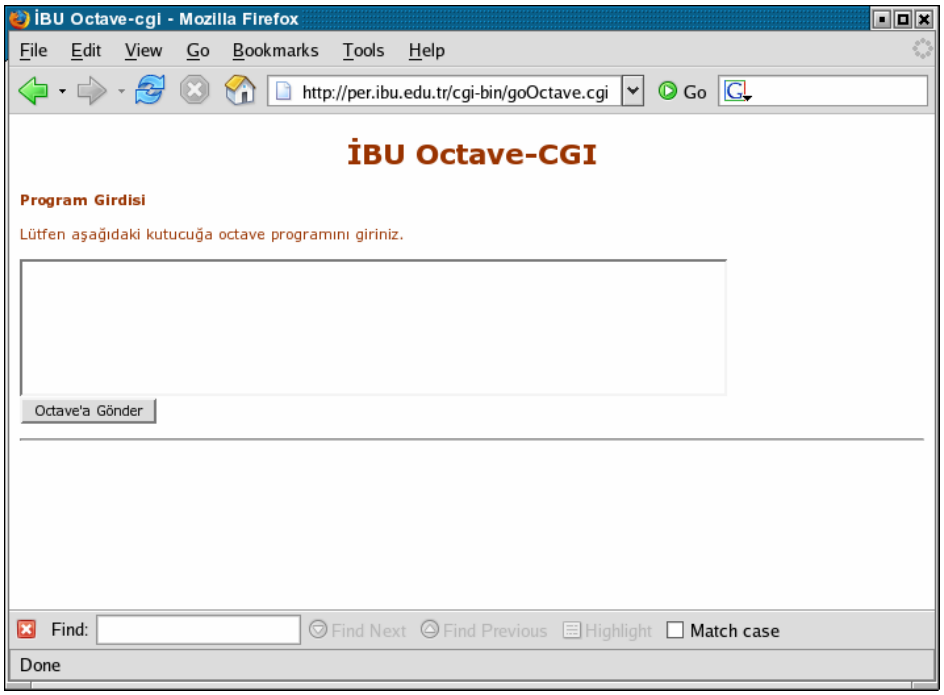
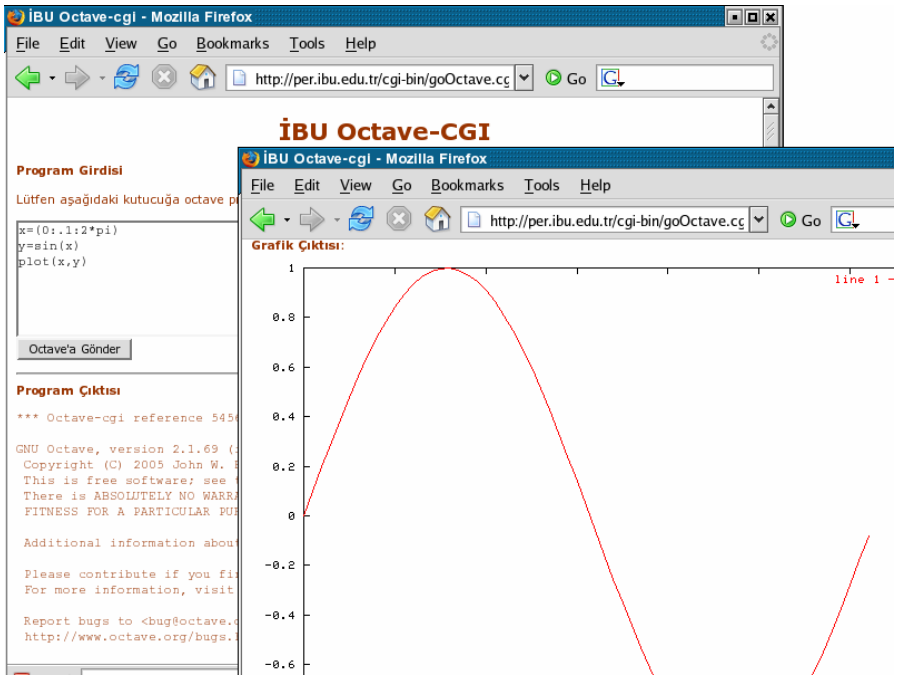


Figure 2. Web Interface: Sample Output



2.3. Example on Basic Vector Algebra and Octave

Since vectors can be expressed as column matrix Octave is an ideal candidate for basic vector algebra. Vectors are simple to enter into Octave. To input a one dimensional vector one needs to type in the following text

a = [0,3;0,0]

for the above example **a** is a vector parallel to the x-axis that is 3 units in length

b = [0,0;4,0]

here, b is a vector parallel to the y-axis that is 4 units in length
Now adding these two vectors is a simple task. One only needs to type in the following expression:

c= a + b

In order to compute the magnitude of the new vector c, one has to type the following expression:

d= mag(c)

here, "mag" stands for magnitude which is a slightly modified function of trace; a build in function of Octave. For the above example, Octave returns the magnitude of the vector addition i.e., the resultant vector as:

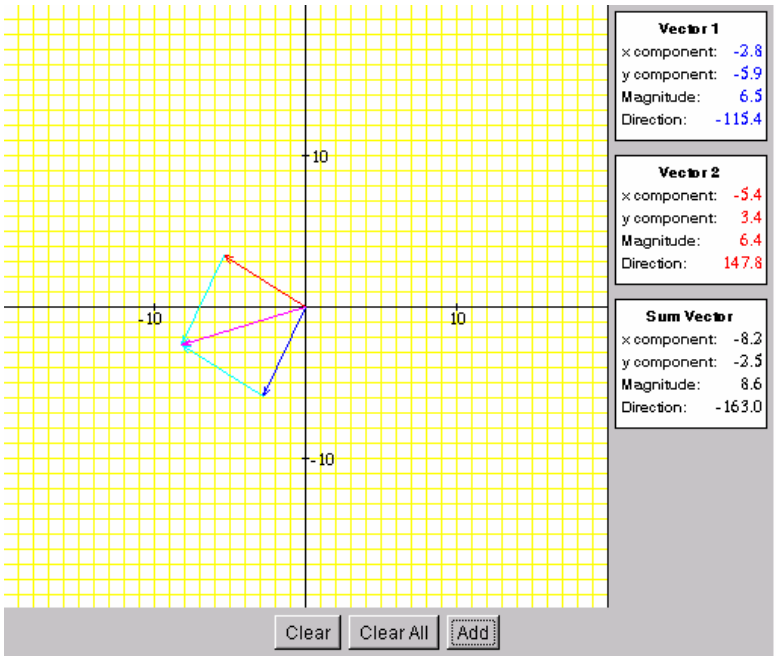
d = 5

2.4. Java Applets

Java applets provide powerful visualization aids especially in physics education. Since the Java technology has emerged, many applets have been created for physics instruction. These applets range from simple cases to complex modeling of physical phenomena. For example a very complex modeling example real time 3D physics simulator applet can be located at http://www.ambromley.co.uk/fizz.html.

Regarding the numerous benefits Java Applets can bring into a physics classroom and its relative easiness to employ lead to many applets available for physics instruction. Physlets resource pages (http://webphysics.davidson.edu/Applets/Applets.html) is one such example. Many interactive examples ranging from introductory level physics to quantum mechanics can be found at this resource.

Figure 3. Vector Applet



3. METHOD

The study took place during the Summer School of 2005 at Abant Izzet Baysal University. A total of 113 students were divided into two groups (experimental & control group) participated in the study. (# of students in experimental group 55; # of students in control group 58) General Physics 1 is a one semester long mandatory freshmen-level introductory mechanics course with three 50 minutes lectures per week and no laboratory work. Most of the students took the course for the first time (68%) while some of the students took the course for the second or more times. The number of female students (female=62) was slightly more then the number of male students (male=51).

3.a INSTRUMENTS

Two instruments were utilized in study to collect data. The first one was a vectors test that consisted of five open-ended question. This test was administered at the beginning of the unit of vectors as a pre-test. The same test was administered as a posttest at the end of the kinematics unit. The questions asked the students to do basic vector calculation which they are expected to encounter on a regular basis in the forthcoming topics. The first

question asked the students to add two given vectors **A** and **B**. The second question asked the students to find the components (i.ei, $\mathbf{R_x}$ and $\mathbf{R_y}$) of a given vector **R**. The third question asked the students to compute the magnitude of a two dimensional vector. The fourth and fifth questions asked the students to perform a dot product and cross product respectively of two vectors $\mathbf{A_x}+\mathbf{A_y}+\mathbf{A_z}$ and $\mathbf{B_x}+\mathbf{B_y}+\mathbf{B_z}$. To ensure the reliability of the test, they were graded by two instructors independently. The reliability of test-retest coefficient for the vector test was found to be 0.85, indicating a relatively high internal consistence of the scores. In addition, to the vector algebra test, an open ended 5 items questionnaire was administered to the experimental group after the instruction regarding their experience and perceived benefits in using FOSS.

The experimental group received a handout detailing on how to use the web interface, java applet, and how to use CLI by login into to server where octave was installed (ssh through putty were used to login to the server). Additionally, office hours were provided for students who needed further assistance.

4. DATA ANALYSIS AND RESULTS

The data for this study were the pre-and posttest scores of the 113 freshmen students including gender. The data were analyzed by using SPSS statistical package. Data analysis and results for this study were reported in two subsections. The first subsection provided an initial descriptive analysis reporting on the overall mean scores, mean score distributions with respect to treatment, and female male score distributions. The second part reports on a univariate analysis by comparing the posttest mean score as the dependent variable, posttest scores as covariate, and treatment as the fixed factor.

Table 1. Summary of Pre-and Posttest Data results with respect to gender

Group	Gender		Pretest	Posttest
Experimental	Female	N	31	31
		Mean	17.74	31.45
		Std. Dev.	12.17	10.89
	Male	N	24	24
		Mean	15.42	33.54
		Std. Dev.	11.41	10.78
	Total	N	55	55
		Mean	16.73	32.36
		Std. Dev.	11.79	10.79
Control	Female	N	31	31
		Mean	14.35	24.68
		Std. Dev.	11.24	10.32
	Male	N	27	27
		Mean	21.67	30.93
		Std. Dev.	10.92	11.44
	Total	N	58	58
		Mean	17.76	27.59
		Std. Dev.	11.59	11.21
Cumulative	Female	N	62	62
		Mean	16.05	28.06
		Std. Dev.	11.74	11.06
	Male	N	51	51
		Mean	18.73	32.16
		Std. Dev.	11.48	11.10
	Total	N	113	113
		Mean	17.26	29.91
		Std. Dev.	11.65	11.22

The descriptive analysis revealed that the control group pretest mean score ($\bar{x}_{\text{control}} = 17.76$) was about one point higher than the experimental group mean score ($\bar{x}_{\text{experimental}} = 16.73$). When analyzed with respect to gender the control group mean scores for both female and male students were substantially higher than the experimental group female and male mean scores. However, after treatment we observed the overall mean score difference in favor of the experimental group. The same positive trend was observed for gender as well. Another interesting point was that the female scores before treatment of the experimental group were higher than those of the male students.

Table 2. ANOVA source table of posttest scores by treatment

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11171.027	2	5585.513	209.832	.000
Intercept	8564.394	1	8564.394	321.740	.000
Pretest	10526.708	1	10526.708	395.459	.000
Treatment	895.125	1	895.125	33.627	.000
Error	2928.088	110	26.619		
Total	115200.000	113			
Corrected Total	14099.115	112			

a R Squared = .792 (Adjusted R Squared = .789)

Table 2 shows the results of the analyses of covariance (ANCOVA) on the dependent variable which was the posttest scores and the covariate which were the prettest scores, in this analyses the independent variable is treatment. This result showed that there was a statistically significant difference between posttest scores of students in experimental group and control group i.e., treatment. For our case, it can be argued that, utilizing Octave -Free Open Source Software in teaching vector algebra is more effective than traditional teaching method. In addition, to the vector algebra test, an open ended questionnaire was administered to the experimental group after the instruction. The questionnaire questions and common answer given by students is provided in Table 3.

Table 3. Questionnaire and Answers

Question	***Common Answers***
Did you like or dislike the software used in this course. If your answer is No, please specify why.	58% of the students liked the software. Some of the students thought that is was somewhat difficult to use and.
Do you think the software used in this course is easy to use? Please explain your ideas.	47.3% of the students stated that the use of software was not easy.
Would you recommend this instruction for the next semester's students in freshmen physics course. If your answer in No, please explain why?	40.0% of the students recommended for the new students. 34% of the students stated that, software used in this course should be modified to make it more user friendly.
Do you think the software used in this course increased your understanding in vector algebra? If your answer in No, please explain why?	56.4% of the students answered YES to these questions. 16.4% of the students didn't perceive any value using this tool; moreover they felt that it did not make any substantial contribution to their understanding of vector algebra.

Although, some students had negative attitudes toward the utilization of the software, still an important number of the students' answers were relatively positive (see Table 3).

5. CONCLUSION AND FINAL REMARKS

Ann Thompson points out the importance of FOSS "open source software will provide new and exciting possibilities for educators. Obviously, the free or low-cost availability of open source software has great appeal for educators at all levels, and the Linux [operating] system is already gaining popularity in schools and districts around the country [USA]. Equally important to the coast issue, however, is the opportunity provided by open source software for education to adapt software to the needs of their students. In the same way a teacher might adapt a lesson plan to his or her needs, open source software may provide the opportunity to adapt a software program" Thompson (2002).

In this study we attempted to provide our students the ability to use advanced FOSS through octave and Java applet in order to help them to construct a better understanding of the concept of vectors. Needless to say, a sound understanding of vector algebra in introductory mechanics is crucial and will help the students further

towards a better construction of the concepts presented in topics such as kinematics and dynamics physics units. It is our belief as science educators, that we are responsible to provide our students with as many learning tools as possible. Octave and goOctave.cgi are examples of such learning tools, they are readily available, and are relatively easy to setup. Although, not a part of this study, it was also our experience that octave through CLI management helped the students to develop an understanding another aspect of computers, namely that computers are actually computing devices that do recursive tasks, beyond the students accustomed point and click use provided by so many GUI applications. The use of web application is also important, because it provides access to computer software beyond the school laboratory facilities. This way the educators and schools can provide the students advanced software, as it was in our case with goOctave.cgi and Java vector applet, the ability to study and work outside of class hours. Therefore, FOSS helps to foster the use of asynchronous teaching methods. Clearly, one can envision that the deployment of FOSS towards specific needs, will facilitated broadening the classical learning environment which will incorporate asynchronous teaching methods beyond traditional Learning management system (LMS) which are more generic in nature. A major limitation of LMS for physics education is that they lack mathematical learning tools.

The findings of this study suggested that by utilizing FOSS students were able to achieve higher level of understanding of vector algebra. Although one can argue on actually what main factor contributed to these high achievement with respect to the control group mean posttest scores, one point is clear; the students involved in the experimental group spent more time on the vector unit. The students had also the opportunity to work outside of class with their peers. Technologies such as octave may also have led to a positive motivation about the subject taught. Another important factor was the explicit use and need of the Cartesian coordinate system in order to do basic vector algebra.

Visualization through Java Applet technology was also beneficial. This technology provided instant visual aids as how the resultant vector with respect to the vector components changed. The students liked, especially the java applet. In overall, we feel that we added some more valuable learning tools for the students although some negative feedback was voiced by the students.

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THE EFFECT OF COMPUTERS ON THE TEST AND INTER-RATER RELIABILITY OF WRITING TESTS OF ESL LEARNERS

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ABSTRACT
This research aimed to investigate the effect of computers on the test and inter-rater reliability of writing test scores of ESL learners. Writing samples of 20 pen-paper and 20 computer group students were scored in analytic scoring method by two scorers, and then the scores were analyzed in Alpha (Cronbach) model. The results showed that the test and inter-rater reliability of the writing samples of the computer group students were significantly higher than the ones of the pen-paper group participants.

Key Words: English as a second language, computers, writing test, test reliability, inter-rater reliability

INTRODUCTION

Since the 1970s, computers have been in schools, in homes, and computer use has a considerable influence on education (Zandvliet and Farragher, 1997). Thus, for three decades, educational theorists and researchers have proposed many ways in which computers influence education. As a result of this influence, in recent years, there has been an explosion of interest in using computers in language teaching, learning and testing. Today, the role of computers in language instruction is a significant issue confronting large numbers of language teachers throughout the world (Warschauer and Healey, 1998).

The turning point on computer use in language testing is item response theory that has made individual test taking possible. The advances in item response theory and computer technology played a greater role in the development of language testing in 1990s, and extensive literature has been developed to examine the effectiveness of CALL (Brown, 1997). The literature on computers and language testing focused on four issues: item banking, computer-assisted language testing, computer-adaptive language testing, and the effectiveness of computers in language testing. However, computer use in language testing is still a specific area (Brown, 1997).

Computers have also become an accepted tool in writing classes, and research on various aspects of the writing process on computer has mushroomed in the last decade (Phinney, 1991). Researchers have argued that computer use helps students to prevent anxiety about writing and premature editing, to change revision strategies (Daiute, 1985), and improves attitudes towards writing (Dalton and Hannafin, 1987; Hawisher, 1987). However, little research has appeared on computer use with second language writers, although many studies on writing have been conducted for native speakers. Few studies on second language writing showed that second language writers are often assumed to have more apprehension than native language writers, to monitor their output (Krashen, 1982), to be more likely to edit prematurely, and to have more negative attitudes toward writing in their second language than first language writers. On the other hand, according to some studies, computer use seems to have positive effects on second language writers (Phinney, 1991), although research level in second language writing and computers does not come near the activity in first language writing. For instance, According to Phinney and Mathis (1991), the second language learners felt that the computer improved their attitudes toward writing in English. The learners also seemed to spend more time writing than the students who did not use a computer and produced longer papers (Phinney, 1988). Neu and Scarcella (1991) also noted similar results in their study. In sum, when these conflicting results are considered, it can be said that few researches on second language writing have not given an idea on composing on computer for second language learners, and there has not been a consensus on computer effects on writing test scores.

The research on the test and the inter-rater reliability of writing tests of ESL students shows that the results are also conflicting and not conclusive (McNamara, 1996). Some studies showed that scorers assigned lower scores to computer versions of the tests than the pen-paper ones (Bridgeman and Cooper, 1988; Sweedler-Brown, 1991). In another study, there was no difference between the typed and handwritten versions of the paper in the process of grading (Powers, Fowles, Farnum, and Ramsey, 1994).

Finally, this study was guided by the following reasons:

1. Although many studies have been conducted on computer use in native language writing, little research has appeared on second language writing.
2. The studies have not established a consensus on the computer effects in the testing of writing skills of ESL writers.
3. There is not certain empirical data on the effect of computers on the test and inter-rater reliability of writing tests of ESL learners.

In sum, these concerns show that it is a necessity to study the effects of computers on the test and inter-rater reliability of writing tests of ESL learners. In other words, the study has one research question: What is the effect of the computer on the test and inter-rater reliability of writing tests of ESL learners in analytic scoring?

METHOD

The sample groups consisted of 40 second-year students in the English Language Teaching Department at the Faculty of Education at Atatürk University in Erzurum, Turkey. The reason why second year students were chosen was that they had writing and computer classes in the same term, spring 2002 – 2003. 20 students participated in the pen-paper tests in the classroom environment, and 20 wrote electronically their compositions in the computer lab. Two limitations, number of participants and the gender distribution (28 females 12 males) were closely related to the computer laboratory capacity at the faculty and the gender distribution of the student population at the ELT department.

Since writing ability between the participants in the pen-paper in computer groups seemed a significant variable that affects the reliability, the students were assigned according to their equal writing abilities. Thus, the final exam scores of the writing and computer classes of the previous term were used as criteria. Then, computer versions of the pre- and posttests were administered to the participants in the computer group. Similarly, pen-papers versions of the pre- and posttests were administered to the students in the pen-paper group.

All the participants were Turkish students who were ESL learners at upper-intermediate level. The three topics, chosen from the TOEFL practice tests (See Appendix 1), for the pretest and three for the posttest were given to the participants in the pen-paper and computer groups. The participants were asked to respond only one topic and to write in free writing style.

The computer lab consisted of 20 computers with the Windows operating system. The participants in the pen-paper group wrote their compositions in classroom environment, and the students in computer group produced texts on computers in computer laboratory. The participants in the computer group used Word 2002 to write their compositions.

Since the study focused on the test and inter-rater reliability of writing samples, the duration between the administration of the pre- and posttests was one week and the participants did not receive writing instruction during this time. In other words, students' progress was not a variable in the research. Then, pen-paper and computer versions of the tests after printing were delivered to the scorers.

The two scorers were teachers in the ELT department with PhD degrees in English language teaching. They have taught writing individually, administered and scored writing tests at ELT department for at least fifteen years. They scored the tests without seeing the ones given by the other. A scoring rubric for writing proficiency in a range of 0 – 100 points was developed (See Appendix 2). Analytical scoring procedure was applied by the scorers according to the writing proficiency grading table. Finally, after scoring, the raw scores were analyzed to find the test and inter-rater reliability coefficients in Alpha (Cronbach) model, a reliability analysis that allows to find the properties of measurement scales and that is used as a model of consistency. The Alpha (Cronbach) was computed to see the consistency between the scores of pre- and posttests and the reliability between the scores assigned by two scorers. The mean and standard deviations of the tests were also computed in order to see the consistency of the scores.

DATA ANALYSIS

Since the writing ability and computer familiarity of the participants could affect the reliability of writing tests administered in the study, the mean and standard deviations of the final examination scores of writing and computer classes in the previous instruction semester were analyzed and presented in Table 1. The mean differences between the previous semester scores of the participants were 1.3 in writing and 0.4 in computer

class in the scale of 0–100. The data showed that there were no significant mean differences between the groups on both writing ability and computer familiarity.

Table 1. The Mean and Standard Deviations of the Previous Writing and Computer Exam Scores

	Groups								
	Pen-paper			Computer			Total		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Writing Test	20	69.3	4.01	20	70.6	5.59	40	69.95	4.85
Computer Test	20	65.95	9.19	20	66.35	9.22	40	66.15	9.09

The means of the pre- and posttest scores given by two scores were presented in Table 2. When the values in Table 1 were compared to the ones in Table 2, it was seen that the participants had lower scores in the pre- and posttests. As Phinney (1991) noted that computer use seemed to have positive effects on second language writers, the computer group participants had higher scores of which the mean differences between the groups, 0.53 for the pre- and 3.57 for the posttest.

Table 2. The Mean of the Pre- and Posttests

Groups		Pretest[a]	Pretest[b]	Pretest[c]	Posttest[d]	Posttest[e]	Posttest[f]
Pen-paper (N=20)	Mean	57.95	56.05	57.0	53.25	52.7	52.98
Computer (N=20)	Mean	58.3	56.75	57.53	56.8	56.3	56.55

a. First Scorer

b. Second Scorer

c. The average of the scores assigned by the first and second scorer

d. First Scorer

e. Second Scorer

f. The average of the scores assigned by the first and second scorer

The means of the text length were 226.5 for the pen-paper and 281.2 words for the computer group participants. Although the text lengths are related to the writing quality rather than the reliability of the tests, the significant point was that the computer group students produced longer texts, as Phinney (1988) noted.

Table 3. The Word Length of the Texts

	Pen-Paper	Computer
N	20	20
Minimum	195.0	240.0
Maximum	279.0	341.0
Mean	226.5	281.2
Std. Deviation	23.2	30.1

The average of pre- and posttest scores given by two scorers for each paper were computed to find the test reliability in Alpha (Cronbach), a model of internal consistency, based on the average inter-item correlation. Depending on the means, standard deviations and pre- and posttest Alpha (Cronbach) values presented in Table 4, three results can be discussed: First, for both groups, the posttest means were lower than pretest means. However, since analytic scoring procedure was applied for both groups, scoring method was not the factor that affects the results. The different topics given for the pre- and posttests, writing medium and the scorers' experience on the scoring table could have been an influence on the scores. However, since the issue in the

research focused on the test reliability, the mean differences were significant to see the consistency between the tests. Second, the mean difference between pre- and posttest in the pen-paper group was higher than the one in the computer group. When the data in Table 1 and 4 was considered, it would be seen that the computer group participants had higher scores. Third, the reliability analysis showed that the computer group scores were more consistent when the Alpha (Cronbach) value and standard deviations were considered, and that the reliability coefficient of the computerized papers was significantly higher than the one of the hand-written ones. In sum, it seemed that the computer has a considerable effect on the test reliability in analytic scoring.

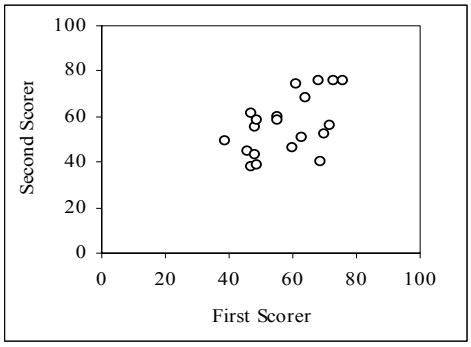
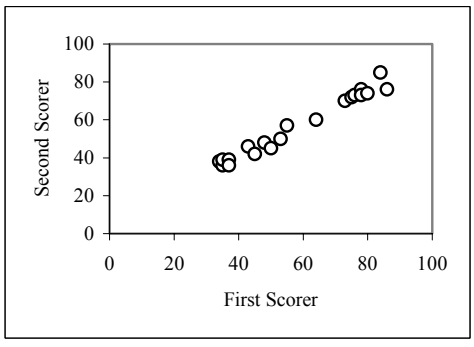
Table 4. Test Reliability Coefficients

Groups	Tests	Mean	Standard Deviation	Alpha (Cronbach)
Pen-paper	Pretest	57.00	10.35	0.6111
	Posttest	52.98	12.20	
Computer	Pretest	57.53	17.63	0.9857
	Posttest	56.55	16.93	

The inter-rater reliability coefficients of the scores were computed between the scores given by the two scorers in analytic scoring. In Table 5 and Figure 1, the means, standard deviations and inter-rater reliability coefficients in Alpha model were compared among the pre- and posttests scores of the pen-paper and computer group participants. The scores given by the first and second scorers for each paper were used to compute the Alpha value. The findings presented in Table 5 and Figure 1 suggested that the inter-rater reliability coefficients of the computerized versions of the papers were considerably higher than the ones of hand-written papers. In sum, it seemed that the computer had a significant effect on the inter-rater reliability of the writing tests of ESL learners in analytic scoring, on the contrary of the studies that showed scorers assigned lower scores to computer versions of the tests than the pen-paper ones (Bridgeman and Cooper, 1988; Sweedler-Brown, 1991) and that found there was no difference between the typed and handwritten versions of the paper in the process of grading (Powers, Fowles, Farnum, and Ramsey, 1994).

Table 5. Inter-rater Reliability Coefficients of the Tests

Groups	Tests	Scoring	Mean	Standard Deviation	Alpha (Cronbach)
Pen-paper	Pretest	First	57.95	11.03	0.6790
		Second	56.05	12.71	
	Posttest	First	53.25	13.15	0.8752
		Second	52.70	12.72	
Computer	Pretest	First	58.30	18.81	0.9892
		Second	56.75	16.57	
	Posttest	First	56.80	17.37	0.9929
		Second	56.30	16.52	

Pen-paper Group	Computer Group
Pretest (Alpha=0,6790)	The Pretest (Alpha=0,9892)
	
Posttest (Alpha=0,8752)	Posttest (Alpha=0,9929)

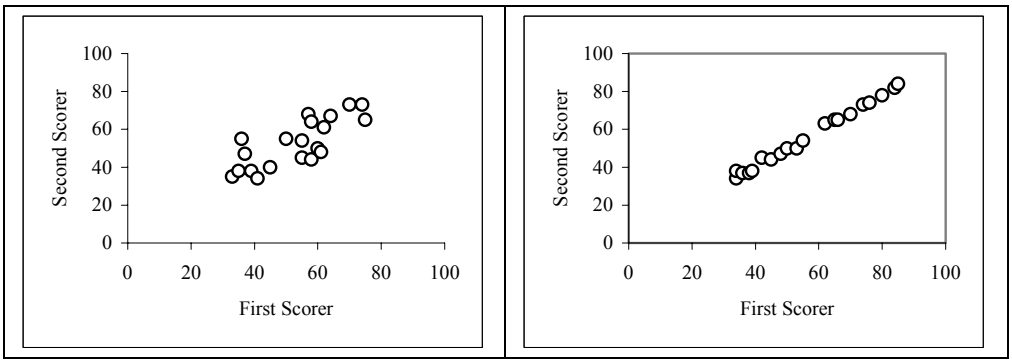


Figure 1. The Consistency between the Scorers

CONCLUSION AND DISCUSSION

One of the results was that the scores of the computer versions were higher than the pen-paper ones. However, in some studies (Bridgeman and Cooper, 1988; Sweedler-Brown, 1991), it was found that scorers assigned lower scores to computer version of the tests than the pen-paper ones. In other studies (Powers, Fowles, Farnum, and Ramsey, 1994), there was no difference between the computer and hand-written versions of the tests in the process of scoring. In another study, Russell and Haney (1997) compared students' responses on writing assessment items and found that writing on computer had a positive impact on students' writing scores. Finally, although the research in this area is not conclusive, and has not established a consensus on test medium on scores (Bunderson, Inouye, and Olsen, 1989), in this study, it was found that the scores of the computer versions were higher than the pen-paper ones.

The findings in the study showed that the test and inter-rater reliability of the writing test scores of ESL learners in analytic scoring were significantly higher than the ones of the pen-paper group participants. Indeed, the reliability of a test depends on some factors; scoring method, scale length, text length, writing approach or method, topic, writing abilities and progress level of writers, and raters (Penny, Johnson and Gordon, 2000). Two of the variables that affect reliability were scoring method and raters' react to writing on computer. Breland (1983) found the higher levels of inter-rater reliability were associated with analytic scoring. Since the same scoring procedure was used for both versions of the tests, the scoring method was not a factor that affects the scores. On the other hand, in Hee-Kyung's (2004) study on comparison among the hand-written, transcribed and computer generated essays in analytic and holistic scoring of writing tests of ESL writers, it was found that hand-written essays were more reliable than transcribed and computer-generated essays. In sum, in this study, the scores of both the handwritten and computer versions of the tests in analytic scoring were reliable. However, the reliability coefficient of the tests administered on computer was significantly higher than the ones of pen-paper tests. On the other hand, since the duration between pre- and posttests was one week and the students did not receive any writing instruction, the progress level of the participants was not a variable that affects the reliability. Finally, writing ability was not also a factor that affects the scores since the sample group consisted of the students that have equal writing abilities. In conclusion, the results in this study showed that computer use in the writing tests of ESL writers had an effect that increases the test and inter-rater reliability when the writing tests of ESL learners are scored analytically. However, the research on the test and inter-rater reliability of writing tests of ESL students seems conflicting and not conclusive as McNamara (1996) points out that the reliability is an unresolved issue in writing assessment.

Some limitations of the research can be noted. First of all, the study is limited to the ESL learners at ELT Department of the Education Faculty of Ataturk University, Erzurum, Turkey. Second, the compositions were written in free writing approach, and the tests were scored analytically. Third, the different topics presented as pre- and posttest might be a factor that affects the scores. In sum, the results in the study are limited to the ESL writers of upper-intermediate level, free writing approach, the scale presented below, and analytic scoring.

Considering that the study is limited to the test and inter-rater reliability of writing tests of ESL writers, further research should be focused on the factors that affect the attitudes of scorers and writers. The scoring scale, the comparison of holistic and analytic scoring, different writing approaches and methods, and the topics of writing exams are other areas to be investigated. Finally, the writing abilities and progress level of participants are also other factors that should be researched.

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APPENDIX 1: Writing Topics

1. Pretest items for the pen-paper and computer group participants:
   a. When choosing a place to live, what do you consider most important: location, size, style, number of rooms, types of rooms, or other features? Use reasons and specific examples to support your answer.
   b. Films can tell us a lot about the country in which they were made. What have you learned about a country from watching its movies? Use specific examples and details to support your response.
   c. Because of developments in communication and transportation, countries are becoming more and more alike. How is your country becoming more similar to other places in the world? Use specific examples and details to support your answer.
2. Posttest items for the pen-paper and computer group participants:
   a. People attend colleges or universities for many different reasons (for example, new experiences, career preparation, and increased knowledge). Why do you think people attend colleges? Use specific reasons and examples to support your answer.
   b. If you could change one important thing about your hometown, what would you change? Use specific reasons and examples to support your answer.
   c. If you had the time and money to invent something new, what product would you develop? Use specific details to explain why this product is needed.

APPENDIX 2: Writing Proficiency Scoring Table

Writing Proficiency Scoring Table			
Student's Name		Scorer's Name	
Student's Number			

Criteria / Point	10	9	8	7	6	5	4	3	2	1	0
Vocabulary											
Accuracy (Grammar and structure)											
Organization											
Originality and Creativity											
Unity and Coherence											
Relevance											
Mechanics											
Fluency											
Content											
Language Control											
Score											
Total Score											

THE REALITY OF WEB-BASED INTERACTION IN AN EGYPTIAN DISTANCE EDUCATION COURSE

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ABSTRACT
This paper reports the results of a study conducted to evaluate the reality of interaction in a web-based distance education course. The learners were Egyptian first-grade secondary school students (15-16 years old) and the learning subject is mathematics. To investigate students' interactions via the Web, a Web-based learning environment was designed and implemented, called Wired Class, based on Willis' (1995, 2000) R2D2 instructional design model and constructivist principles. Quantitative and qualitative analyses were used to investigate the quantity and quality of learner-learner and learner-teacher interaction based on Mason's (1991) model.

INTRODUCTION

Researchers always emphasise the importance of interaction in education (Ritchie and Newby 1989; Harris 1999). Interaction is defined as a process that happens between the learner and the learning environment, in which the learner takes a more positive role (Berge, 1997). Interactivity has been described as a key to success in traditional classrooms to enhance learning and motivate learners (Fulford and Zhang, 1993; Wagner, 1994; Flottemesch, 2000). In a distance education context, studies found that students who enrolled in programmes that support and encourage interaction have highly positive attitudes toward learning, higher levels of achievement and less dropout rates than others in one-way systems (Ritchie and Newby, 1989; Comeaux, 1999; Garrison and Shale, 1990).

Holmberg (1990) believes that the ability of the medium to conduct interaction between the tutor and students is the essential criterion in selection among distance education technologies. He pointed out that any distance education medium should be able to provide the tutor and students with means of bringing about their experience, create rapport between them and offer opportunities for discussion.

To achieve social interaction in education programmes, usually a real-time (synchronous) communication technology (e.g., telephone and video conferencing) were being used. However, with the development in communication technology (like the Internet), these kinds of interaction do not necessarily require real-time communication. Interaction can be independent of time (asynchronous), using communication tools (e.g., e-mail and discussion boards). One of the important factors that have encouraged educators to use the Web in distance education is its ability to engage students in an interactive learning experience. The Web provides many mechanisms to facilitate dialogue between the learner and the course content and between the learner and others (Fisher, 2000).

However, implementing interactive technology, like the Web, and its components is not enough. Since distance education is characterised by the physical isolation of the learner from the tutor and peers by space and time (Rumble, 1989), it means less involvement and less possibility to ask questions. To solve these problems Trentin (2000) suggested that:

> 'One of the key ingredients for raising the quality of an online course is strong interaction between the players in the process; organized in full-fledged virtual classes, the participants must obviously respect schedules and deadlines if a collaborative working strategy is to be successful' (p. 20).

Many suggestions have been offered in the literature showing how to conduct successful interaction between learners, such as group-based collaborative projects, presentation boards and tutor questioning using interactive communication tools such as e-mail and discussion boards (Anderson, 1987; Moore, 1989).

Reviewing the literature has shown that the Web supports two different forms of student-student and student-tutor interaction; each form can be achieved using different methods: asynchronous interaction and synchronous interaction (Huang, 2000). Asynchronous interaction is time-independent and does not require real-time

dialogue. It enables the tutor and learners to send and receive messages at any time, without the need for immediate response and gives them the chance to read, reflect and do more critical thinking (Liaw and Huang, 2000). E-mail, listservs and discussion groups, or forums, are the most common asynchronous methods used in the Internet. The distinct advantage of this type of interaction is that anyone can send a message to a group of people or read others' participations to a discussion forum at anytime, particularly with the 'threading' style, which are suitable for debating more than one idea under many sub-titles.

However, the most popular and widely used method for transmitting asynchronous information messages on the Internet is e-mail. There are many purposes for which students can use e-mail in distance education to interact with the tutor and peers. Students can send questions, submit assignments and receive evaluation results, prepare for real-time discussion, share ideas, receive materials or ask the instructor for help and receive feedback (Simpson, 2000). In addition, since e-mail is relatively cheap and simple to use, it facilitates and encourages collaborative work and exchanging of ideas and information (Stevens, 1994).

Although e-mail is the most popular and widely used method for individual asynchronous interaction, discussion boards and bulletin boards are also common group-based approach used in online learning (Carr-Chellman and Duchastel, 2000). Asynchronous interaction via discussion boards refer to 'the posting of messages in a common area for participants to read and respond to' (Huang, 2000, p. 42). Often, discussion boards focus on the subject matter and aim to encourage student-student dialogue and learning from others' experiences. Berge (2000) believes that on-line discussions have the same purposes as face-to-face discussions. For example, asynchronous discussions could be used to focus attention on an issue, diagnose specific learning difficulties, encourage reflection and self-evaluation and teach via students' answers. In addition, students can learn 'by expressing their ideas, opinions, or solutions to others, by critiquing one another's proposed models, and by defending or modifying their initial models' (Oliver, 2000, p. 9).

On the other hand, synchronous interaction is similar to telephone communication or audio-video conferencing systems. Many protocols are available on the Web for conducting real-time conferencing. Internet Relay Chat (IRC), for example, enables students to discuss in a real-time status via an audio-visual window or using text. Aoki and Pogroszewski (1998) indicated that synchronous interaction has the ability to motivate learners to learn, provide feedback and support immediately and encourage student interaction. Text-based chat is a simple and popular technique for communication on the Web. It fosters immediacy and social presence, is useful for brainstorming and decision-making and helps in building a community of learners (Murphy, 1997). Developers can easily integrate chat rooms into their courses to hold conferences between students and experts, monitor students' participation and encourage them to work collaboratively (Liaw and Huang, 2000).

However, although Web-based synchronous interaction offers a chance for real-time communication on the Web, it often requires sophisticated software and hardware to be installed, which are usually more expensive than asynchronous delivery systems. In addition, one of the critical limitations of this type of interaction is that it is restricted by time zones and students' typing and communication skills.

Lastly, since students access Wired Class at different times during the day, the on-line students' page presents a list of students who has logged-in to the class, with the time of logging-in/logging-out and links to those students' personal pages. The importance of this tool is that it allows the learner to know who is on-line while he/she studying encourages students to contact each other and minimises the sense that everyone is studying alone.

PARTICIPANTS

The learners were Egyptian first-grade secondary school students (15-16 years old), assigned randomly. Random selection of students at each school was made using alphabetical menus to control threats to external validity. By using random sampling, the researcher ensured that not only students with special interest in using the Internet or who had a high level of achievement or ambition were involved in the experiment. Due to the practical circumstances of implementation, only 32 students (24 boys and 8 girls) participated in this study.

The first step in the design and development phase is to understand students' needs, have information about their educational and cultural background and determine why they need to study at a distance. In Egypt, two types of public secondary schools are available. The first type of school is government-run and uses the Arabic language as a first language. Students at these schools study all subjects in Arabic. However, the English language is the second language. These schools account for more than 90 per cent of secondary schools in Egypt. The other type of schools, which may be government-run or private, uses the English language as a first language; therefore

these schools are called 'language schools'. Students at these schools study in English. These schools are estimated to constitute less than 10 per cent of secondary schools in Egypt.

In the present study, participants were students of the second type (language schools). Those students are a small minority and have many educational problems. For example: there is an insufficient number of well qualified teachers to teach at these language schools, particularly for vital subjects, such as mathematics and science, there is a lack of support provided to those students, as the official language of the educational authority is Arabic and most resources and well-designed instructional materials (such as broadcasting radio and television, videotape programmes and CD-ROMs) are available in Arabic.

Therefore, students wishing to develop their academic attainment and experience commonly use additional information sources, such as satellite television programmes and the Internet. Well-designed Web-based distance education programmes could be an efficient way to help those students to learn and interact with the world. Usually, language schools are well equipped with computers and the Internet to take advantage of the world-wide knowledge available in English and to interact with others around the world. Often, students at these schools have good skills and experience in using computers, WIMP-based programmes [(*)] and the Internet. This background is sufficient to allow them to use the Web and attend on-line classes in any subject, access remote resources and interact with others around the world using the English language.

INSTRUCTION AND TEACHING/LEARNING APPROACH

The learning subject is mathematics. This subject was chosen since it is probably the second most important subject in schools after language, important as an international language of communication and the nature of mathematics is such that it is not restricted by cultural, political or geographical boundaries like other subjects (such as languages and history). Algebra, in particular, was chosen because it is an important step in the learning of mathematics. It involves new and important concepts for studying mathematics, such as the concepts of formula, equation, function and variable. Functions, equations, co-ordinate systems and graphs are important topics in algebra in the secondary school curriculum. Linear and quadratic equations and functions, in particular, are fundamental lessons in this curriculum. Therefore, the topics, which were chosen to be learned in Wired Class, were functions and equations.

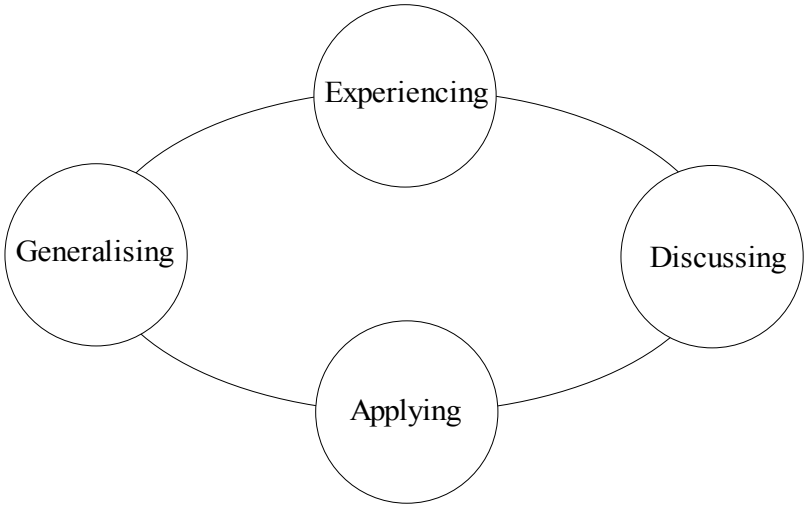
Based on the constructivist epistemology, constructivist theory seems to be the most suitable approach to design instruction for the Web. One of the key features of constructivism is that learning is not a passive operation, but a process in which learners construct their own learning. Constructivists believe that learning becomes more effective through learners' active participation in the learning situation. In addition, social interactions between learners and the teacher and among learners themselves is a key issue in designing constructivist learning.

In the last few years, many frameworks and models have been developed and a variety of guidelines proposed for developing learning environments which support a constructivist approach. Honebein (1996) indicated that the constructivist-based learning environment is one in which the learner participates actively and on which he/she has a major impact. More recently, Nakahara (1997) has emphasised the designer's role of challenging the learners' thinking, active participation and social interaction to help learners to construct their own knowledge. Howe et al. (1995) suggested a constructivist-based approach for teaching and learning mathematics. This approach uses principles of co-operative and problem-centred learning. Howe et al. diagrammed the learning cycle in which learners can be involved to pass through these experience (Figure 1). Via discussion boards, viewpoints arising from the experiences need to be discussed with peers in order to be evaluated and validated.

In Wired Class, grading was based on test scores, class discussion, attendance, completion of activities and written assignments.

Figure 1: The constructivist learning cycle (adapted from Howe et al., 1995)

[(*)] WIMP means Windows, Icons, Menu and Pointer systems which is supported by both MS Windows and Mac systems.



THE DESIGN OF INTERACTION TOOLS

To investigate students' interactions via the Web, the need was emphasised to employ a Web-based learning environment. The design and development of the learning environment, called Wired Class, was based on Willis' (1995, 2000) R2D2 instructional design model and constructivist principles. In the definition focus, many pre-requirements were investigated and defined, including learners' needs, subject matter, front-analysis and technical requirements.

Constructing the learning environment required designing and developing tutorials and assessment elements, instructional support utilities, interaction tools, management and monitoring tools, help and support topics and a navigation system. The tutorial component was arranged in modules and lessons. Each lesson was arranged in a hierarchy of new concepts, examples, self-assessment, exercises, links to related Web sites and discussion areas. Management and administration tools were designed to help the on-line tutor to control/understand how the on-line class operated and to track students' progress. The interaction components (e-mail, chat rooms and discussion boards) were designed and integrated within the learning environment to facilitate student-tutor and student-student interaction.

First, to use e-mail via Wired Class, there were two possible ways. The first was to install e-mail server software in Wired Class server to work as an independent Web-based e-mail service, taking domain name of Wired Class Web server. Although this option allows a full control over the e-mail service, it is very costly and only suitable for big organisations. The second option was to ask students who have not e-mail account to subscribe to one of the free Web-based e-mail services (like Hotmail, Yahoo, Egypt.Net, etc.). The search for the most suitable free Web-based e-mail service for Wired Class students revealed that that Egypt Network offers an appropriate service. This service was selected for many reasons:

1. It offers a non-restricted e-mail address: Most e-mail service providers control the way in which the user can choose his/her e-mail address. For example, Microsoft Hotmail does not allow users to use special characters, such as the point (.) and hyphen (-). However these characters are allowed in Egypt Network e-mail.
2. Egypt Network offers a suitable and easy to remember domain for target users using the domain <username@egypt.net>.
3. Most e-mail servers have a high traffic rate. However, Egypt Network is favoured only by Egyptian users, allowing it to get a relatively low traffic rate.
4. The e-mail server is located in Egypt, which makes access to the server faster than other world servers (such as Hotmail and Yahoo).

For these reasons, Egypt Network was chosen as the Wired Class e-mail service provider. This enables every student in the class to get an e-mail address as soon as he/she registers. To use the e-mail service, learners are asked to enter their username and password within a form located in the Wired Class site. Students can use e-mail to prepare for real-time chat, share ideas, send questions to the teacher and receive feedback. In addition,

unlike other learning environments (e.g., WebCT and TopClass), students are able to contact each other within Wired Class or other people who are not members in the learning environment.

Second, although there are numerous chatting systems available which vary in their capabilities (using text, audio and video), most of them are not suitable, either technically or educationally, to the students' level or to be hosted in Wired Class Web server. However, suitable chatting systems were found to be too expensive to be used in small-scale educational applications or at schools. For these reasons, it was necessary to design and develop a simple, and efficient, chat system for Wired Class students.

A text-based chat system was found to be the most popular type for easy and fast interaction via the Web. This kind does not require a high-speed connection or specifications or any additional software in the user's machine except the Web browser.

Technically, conducting a chat room requires running a script in the Web server to be used by two users, or more, at the same time. The main functions of this script are receiving one participant's inputs, using HTML form, and then forwarding them to the other participant browser who are running the same chat script. The chat system was designed as two windows in the student's Web browser. The upper window allows the student to input his/her information and a short message. At the same time, the lower one shows students' names and their participation.

The essential idea behind this simple design is that a CGI script handles each participant's inputs from the upper form, saves them in a temporary text file, then forwards them (after 5 seconds for example) to the other participant's lower window. The last task is achieved by involving the HTML command 'refresh' in the HTML code in the lower window. The complete CGI scripts in conjunction with HTML forms were designed and developed with students' needs and level in mind. Additional features were added to the chat system make it easy to use and interesting. For example, the learner can establish any number of new rooms and invite others for conversation. Alternatively, others can access a room already established already by the teacher or someone else using the option 'enter a room'.

Third, an investigation of discussion board programs available on the Web showed that using one of them in Wired Class would not be suitable to the students' level and discussion objectives. Although these discussion boards are 'threaded' discussions, which are suitable for debating more than one idea or topic in the same board, the developmental testing of Wired Class showed that the thread style discussion was taught to be unfamiliar to students and it would not allow them to take advantage of many messages presented under sub-titles. For these reasons, a simple discussion board was designed and developed for Wired Class students.

The design of the discussion board interface consists of two parts: The 'send' form and list of participants' messages to the board. This design allows the learner to submit his/her message to be added below at the top of the list. So, the learner can read others' messages to the board and compare his/her point of view against theirs. Technically, all posted messages are organised and saved in a HTML file in the Web server called a 'discussion file'. Every 'discussion file' in the server has a unique name. Every time the learner executes a discussion board script in the server side, the script generates an HTML page combining the HTML form (for inputs) and the specified 'discussion file' to appear on the same page in the user's browser.

METHOD

First, to solicit students' perceptions of ease of interaction with the tutor and peers using asynchronous and synchronous interaction tools (e-mail, discussion boards and chat), a questionnaire with closed-ended and open-ended items was constructed. The development of the students' questionnaire was based on the four phases of development (review of the literature, establishing content validity, construct the questionnaire and establishing scale reliability).

In addition, an on-line feedback form was made available throughout the eight weeks of the field-testing, to encourage students to send their own feedback and report any problem they might encounter instantly. The importance of this evaluation form is that it provides an on-demand and easy-to-use evaluation tool to students to provide their feedback, instead of waiting until the end of the course.

Second, to investigate students' interactions, both the quantity and quality of students' messages was analysed. Quantitative analysis was used to calculate the number of messages and investigate by whom they were sent, time of logons and length of messages. In addition, the qualitative approach was used to analyse the discussion content according to educational criteria, to enable conclusions to be drawn about the educational value of this

activity. To analyse students' responses, a coding system was constructed based on research in computer conferencing and discussion content analysis by Mason (1991), Henri (1991), Fulford and Zhang (1993) and Berge (1997). Mason (1991), for example, suggested many questions to analyse students' responses, for example:

- Do they build on previous messages?
- Do they draw on their own experience?
- Do they refer to course materials?
- Do they refer to relevant materials outside the course (Mason, 1991)?

However, Henri (1991) categorised and coded students' responses in discussion boards using a more practical and comprehensive model for better understanding of the content of messages. This model highlighted five dimensions of the learning process exteriorised in students' messages. These dimensions, their definitions and indicators to them, are shown below (Table 1).

Table 1: Henri's analytical framework (Henri, 1991, p.125)

Dimension	Definition	Indicators
Participate	Compilation of the number of messages or statements transmitted by one person or group	Number of messages Number of statements
Social	Statement or part of statement not related to formal content of subject matter	Self introduction Verbal support "I'm feeling great…"
Interactive	Chain of connected messages	"in response to Celine…" "As we said earlier…"
Cognitive	Statement exhibiting knowledge and skills related to the learning process	Asking questions Making inferences Formulating hypotheses
Metacognitive	Statement related to general knowledge and skills and showing awareness, self-control, and self-regulation of learning.	"I understand…" "I wonder…"

Considering Mason's earlier typology and Henri's analytical framework, on the one hand, and students' level, the nature of the subject and the objectives of Wired Class discussion boards, on the other, these two approaches were adapted to build a new three-dimensional model. These dimensions are participation, interaction and cognition and content-related. Participation indicators provide information about the number of messages sent by students to every single discussion board, length of messages and time of posting. This information could help in identifying the type of discussion topic (e.g., low-level discussion topics, moderate-level discussion topics and high-level discussion topics) in which students are most active and clarifying the importance of on-line tutor participation in student participation.

In addition, the qualitative analysis of student-peers interaction shows how students worked together and exchanged their ideas to learn and construct their own learning. However, the cognitive and content-related dimension describes what is said about the subject and how it is said. This analysis, in relation to the cognitive tasks assigned in discussion topics, makes it possible to evaluate the level of information processing and thinking applied by learners and how this contributed to their learning.

The dimensions of this model and their indicators are shown below (Table 2). After the development of the coding system, messages were printed out and each message was divided into units of meaning. These units were analysed in the light of interaction and cognitive and content-related indicators to the answer the research question: How do students interact in the Wired Class? The results of the analysis, in conjunction with the results from the achievement test and perception questionnaire, would provide useful information about the contribution of on-line interaction to student learning and success in on-line learning.

Table 2: **An analytical framework for discussion messages**

Dimension	Indicators
Participation	· Number of messages per student in every discussion topic · The total number of messages per student in the course · Number of messages in earlier lessons · Number of messages in later lessons · Lengths of message per student (in statements) · Time of logons
Interaction	· Self-introduction · Statements that social in nature · Statements that comment in another message · Repeating information in another message · Responding to the tutor's views or advises · Responding to accept others' views and opinions without explanation · Responding to accept others' views and opinions with more explanation · Other statements that social in nature
Cognitive and content-related	· Providing solution without explanation · Providing solution with explanation · Providing more than one solution · Asking question related to the discussion topic · Asking question unrelated to the current discussion problem · Asking for more clarification · Judging the relevance of solution · Repeating information contained in the course materials · Repeating information contained in the discussion topic · Drawing conclusions

RESEARCH RESULTS

- **Ease of interaction with the tutor and peers**

In terms of ease of interaction with the on-line tutor and peers, a high majority of students (96.88%) indicated that they did not feel that they were isolated from the tutor during studying. In addition, 87.5% of students found the discussion boards were a very useful place for interaction and information exchange with classmates in Wired Class. However, the majority of students showed negative perceptions toward using e-mail as an individual tool for asynchronous student-student interaction. About 60% of students disagreed and strongly disagreed that e-mail is an easy way to communicate with other students in Wired Class (Table 3).

Table 3: Students' perceptions of ease of interaction with the tutor and peers

Statement	Response Distributions					% Choosing SA or A	Mean	Std. Deviation
	SA	A	N	D	SD			
I feel that the teacher is near to me whenever I am studying.	20	11	1	0	0	96.88	4.59	0.5599
Using e-mail, I can contact anyone in Wired Class easily.	5	4	4	14	5	28.13	2.69	1.3305
Discussion board is a good place to meet and talk to my classmates.	18	10	2	1	1	87.50	4.34	0.9708

Students' comments implied that they did not feel much geographical isolation from the tutor due to his regular messages and they appreciated his help and support.

> 'The online teacher is very good. He gives me a lot of lessons and examples and helps me to understand these lessons'.
> And
> 'I liked Wired Class because when I don't understand or have a question about something I can ask Mr […]'.

In addition, students preferred discussion boards to e-mail as a course-centred interaction approach. A student expressed that:

> 'I liked communication with classmates through the discussion board. It is really nice'.

Second, feedback from a student who did not think that using e-mail is a good method for student-student interaction indicated that:

> 'To contact my classmates I have to use the e-mail but only few students get into email and use it. Contacting them is very difficult'.

In addition, students showed less satisfaction with chat, as a real-time interaction tool, and the majority of them (93.75%) preferred e-mail to chat for peer-interaction and reported critical difficulties in using and communicating with others via chat rooms (Table 4).

Table 4: Students' responses to the ease of use

Statement	Response Distributions					% Choosing SA or A	Mean	Std Deviation
	SA	A	N	D	SD			
E-mail program is easy to use.	11	15	1	5	0	81.25	4.00	1.0160
Chat room is an easy way to communication with others in Wired Class.	7	10	4	11	0	53.13	3.41	1.1876
E-mail is easier than chat to communicate with others in Wired Class.	15	15	2	0	0	93.75	4.40	0.6148

In addition, students reported that:

1. 'I could not participate in chat meetings because I need to type very quickly and I am not very good at spelling'.
2. 'Other students couldn't enter chat'.
3. 'We were able to chat if only for a short time'.

- **Quantitative and qualitative analysis of interaction**

Quantitative analysis

Wired Class records and students' feedback revealed that conducting and facilitating synchronous interaction via chat rooms required planning and determining the time of chatting in advance using other medium, such as e-mail. However, since students are different in their abilities and rates of progress, it was difficult for many of them to manage their time to join real-time discussions about a particular topic. In addition, students could not arrange for chat sessions themselves, since they could not find peers who had time for real time conversation or who were interested in the same discussion topic.

Problems of access to chat rooms, occasional Internet connection problems and speed of conversation were very confusing to many students, according to students' feedback and chat transcripts. One chat transcript, for example, showed that while the tutor, or a student, was asking a question and responses were scrolling-down on the screen, other students seemed to be very engaged in thinking about and typing replies to previous entries. Those students confused others and affected the flow of chat, since contributions related to different issues were being sent concurrently.

In this chat session, the tutor sent an e-mail message to a group of twelve students asking them to join a chat room already opened by the tutor to talk about issues in functions and graphs. The tutor began by asking students to provide examples of functions. The purpose was to help students and introduce them to elementary functions, their graphs and their applications to real life situations. The chat transcript showed that only eight out of twelve students logged on and participated successfully in the conversation. In the 25 minute session, the number of messages sent by the tutor was 8 out of a total of 26 messages, representing more than 30% of the total number of messages, and only two main questions were asked.

In addition, multiple teacher's questions and students' responses occurred simultaneously, while the continued flow of students' responses to previous questions might be difficult for students to understand and follow. Therefore, during the eight week course, most planned chat sessions were interrupted or cancelled and students were asked to visit discussion boards to participate in asynchronous conversations.

Since e-mail was used in personal asynchronous interaction between the tutor and students and among students, on the one hand, and since students reported significant problems of access to others via e-mail, as mentioned above, on the other hand, analysis was conducted only of students' participations in discussion boards.

Consequently, a table representing students' usernames, the number of messages sent by every student in every lesson and the total number of messages posted was drawn up. Using this table, it was possible to calculate the number of messages in the first module (earlier lessons) and the second module (later lessons), the number of statements in each message and the total number of statements per student. Considering the nature of the learning subject, any algebraic term, operation, formula or algorithm was considered as a statement.

The average number of messages sent by students during the Wired Class

To make instruction effective and promote active learning, the tutor monitored the discussion board, motivated students to participate more positively, evaluated learners' participation and send his/her comments to learners, publicly or individually, if needed. The tutor emphasised the importance of thinking and adding personal thoughts (e.g., 'I do not want you to copy others' messages, instead I would like you to think and share your own ideas' and 'I would like to see the entire class become involved in discussions and everyone has at least one participation in every discussion board').

In Wired Class, twelve discussion topics were suggested by the tutor and students. Although participation in discussion boards was an essential activity and the tutor emphasised the importance of regular participation by sending many messages asking students to participate by responding or commenting on others' messages, and students had very high positive perception of using discussion boards, the results of quantitative analysis showed that the average number of messages sent by students was relatively low. Results from the Wired Class records showed that students responded to the Wired Class discussion boards by sending a total number of 136 messages. Assuming that every student in the Wired Class (32 students) should participate by sending at least one message to each discussion board, this number (136) represents only 35.42% of the predicted total number of messages (384) that should be sent to the discussion boards (Table 5). In other words, the average number of messages sent by each student throughout Wired Class was 4.25, compared with the ideal total of 12.

Table 5: The total number of messages posted to the discussion boards

Number of students	Total number of messages assumed to be sent	Actual total number of messages sent by students	Percent
32	384	136	35.42%

Students' participation in discussions varied from ignoring the discussion to positive and regular involvement. The minimum number of messages per student sent to the discussion boards was zero. However, three students posted between seven and nine messages during the Wired Class. Table 6 shows that the majority of students posted between two and six messages. Only one student did not participate in the discussion board.

Table 6: The number of messages per student

Number of messages per student	**Frequency**	**Percent of students**
0	1	3.13
2	7	21.88
3	4	12.50
4	5	15.63
5	6	18.75
6	6	18.75
7	1	3.13
8	1	3.13
9	1	3.13
Total	32	100

The average number of messages sent to every single discussion topic

For a more accurate picture of students' participations in discussion boards, the number of messages by students to every single discussion board was counted. The results revealed that students' level of participation in the discussions varied from one lesson to another and the number of students who participated in any given discussion board varied between 6 and 16 (Table 7). In other words, the number of students who participated in a single discussion topic was, at most, only 50% of students.

Table 7: The number of messages per student

Discussion topic		Number messages	% N=32
Module 1	Lesson 1	12	37.50%
	Lesson 2	8	25.00%
	Lesson 3	7	21.88%
	Lesson 4	6	18.75%
	Lesson 5	9	28.13%
	Lesson 6	8	25.00%
	Total	50	Mean = 26%
Module 2	Lesson 1	12	37.50%
	Lesson 2	14	43.75%
	Lesson 3	15	46.88%
	Lesson 4	14	43.75%
	Lesson 5	16	50.00%
	Lesson 6	15	46.88%
	Total	86	Mean = 44.8
Total	12	136	

The difference in the level of participation in discussion boards between earlier and later lessons

The results in the above section show that the level of participation in discussion boards varied greatly from the first module to the second module and from one lesson to another. The number of students who participated in the first lesson in the first module was relatively high (12 students out of 32, which is less than 33%). This number decreased to 6 students in lesson 4. In the second module, the number rose again to 12 students in the first lesson and increased to 16 in the fifth lesson. In general, the level of participation in discussion boards increased between earlier and later lessons. The mean number of messages per discussion topic increased from 8.33 in Module 1 to 14.33 in Module 2. Furthermore, the dispersion was reduced from 2.88 in the first module to 1.36 in the second module (Table 8). Overall, while only 26% of students participated in the first module, about 45% of students participated in later discussion boards, as shown above (Table 9-5).

Table 8: The average number of messages per lesson in the first and second module

Module	Mean	Std. Deviation
Module 1	8.33	2.8810
Module 2	14.33	1.3663

Using the number of student participations in the first and second module, a *t*-test of independent samples based on equal variances was used to test whether the difference in means between earlier and later lessons (Module 1 and Module 2) is significant. The results (Table 9) show that there is a significant difference between earlier and later lessons in the number of messages posted to discussion boards at the 95% confidence level.

Table 9: Independent-samples test for the number of messages per students in earlier and later lessons

Levene's Test for Equality of Variance		*t*-test for Equality of Means				
F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
0.488	0.501	-5.934	10	0.00	-6.00	1.0111

Time of access

Since discussion boards were designed to show the sender's name, date and time of sending, it was possible to know at what time students accessed the discussion boards. Analysis of discussion logs showed that around 65% of students who responded to discussions participated on the day of studying the lesson concerned. However, the rest of the students (35%) responded after one or two days. The majority (85%) of those students who responded on the same day accomplished this task in the last 10 minutes of the learning session. About 50% of them responded in the last 1-3 minutes. However, only 15% of students were able to manage their learning session and time well enough to respond to the discussion boards before or during other tasks (e.g., accessing external Web resources or doing self-tests).

7. The relationship between students' level of participation and tutor's participation in discussions

The number of messages sent by the tutor to discussion boards was 19 out of a total of 155 messages sent by both the tutor and students (19 by the tutor + 136 by students), which represents 12.3% of the total number of messages (Table 10). Initial analysis showed that increasing the number of messages sent by the tutor increased the level of students' participation in discussions.

Table 10: The number of messages sent by the tutor and students

Discussion topic		Number of participants	Number of tutor's responses
Module 1	Lesson 1	12	2
	Lesson 2	8	1
	Lesson 3	7	1
	Lesson 4	6	0
	Lesson 5	9	2
	Lesson 6	8	2
	Total	50	8
Module 2	Lesson 1	12	1
	Lesson 2	14	2
	Lesson 3	15	2
	Lesson 4	14	1
	Lesson 5	16	3
	Lesson 6	15	2
	Total	86	11
Total	12	136	19
Tutor contributions equal to 12.3% of the total message volume			

To investigate the significance of this relationship, the correlation coefficient (Pearson's *r*) was calculated to indicate the direction and the strength of the relationship. The results showed that Pearson's *r* for the relationship between students' level of participation in discussions and number of tutor's messages (0.635) was significant at the 0.05 level (Table 11). In other words, the lack of the tutor's presence in person, and lack of interaction with the tutor via the discussion boards might be one of the factors, though not the only one, that negatively affect the quantity of students' messages, as mentioned in the discussion below.

Table 11: The relationship between students' level of participation and tutor's participation

Correlation	Tutor's participation	N	Sig. (2-tailed)
Participation in discussions by the tutor and students	$r = 0.635$	32	0.027
Correlation is significant at the 0.05 level (2-tailed).			

RESULTS OF QUALITATIVE ANALYSIS

Since it is not enough to obtain an accurate picture of students' participation by counting only the number of messages and statements, the purpose of this analysis is to reveal patterns of responses in order to assess how well students responded to discussion topics and worked together, and whether there was any relationship between type of responses and other variables of learning in the Wired Class.

Therefore, qualitative analysis of students' messages was conducted in terms of interaction and cognition and content-related elements. First, statements which were interactive in nature were coded and categorised according to the interaction indicators, as shown below (Table 12).

Table 12: **Patterns and examples of students' interactive responses**

Patterns	Percent	Examples of responses
Self-introduction	23.81%	'My opinion is this equation […]' 'I plotted […]'
Statements that comment on another message	19.05%	'So do I […]' 'I found the same results as Mohamed Abd Elrahman […]' 'I think Walied found the correct answer […]' 'Of course Ahmed, for example […]' 'Mark, you can't use the Grapher […]'
Repeating information in another message	35.71%	'The relationship between the height of a plant and its age' 'The relationship between the age and the height of a person is a function'
Responding to the tutor's views or advice	7.14%	'I used Grapher to graph the negative values. The difference is the graph will be plotted in the quof page […]'. 'Hello Mr […], I'll do that at home because there is no time today'.
Responding to accept or reject others' views and opinions without explanation	2.38%	'[…] the relation between the two lines of the equations is changing a changes the slope of the equation as Mona said' 'I think Walied's found the correct answer. My answer is the same as his'
Responding to accept or reject others' views and opinions with more explanation	11.90%	'Yes this is correct. When a changes, the slope of the line changes. When c changes the y-intercept changes'

Content analysis revealed that responses which were interactive or socially oriented in nature made up 19.09% (42) of the total number of statements. A relatively high percentage of students (35.71%) responded by merely repeating the content of messages sent by others and about 24% of statements were related to students' own experience and showed that they had worked independently to find answers or solve problems. However, around 19% of statements were comments on messages sent by others. More than 14.28% of statements were responses that agreed or disagreed with others' views. The majority of these statements (11.90%) were accompanied by appropriate explanations reflecting the senders' own points of view. Regarding interaction with the tutor, 7.14% of the total number of statements responded to the tutor's requirements or demands.

The above analysis shows that although the tutor emphasised the importance of thinking and adding personal thoughts one of the important features noticed in students' responses was repetition. A large proportion of students (35.71% of the content) quoted or adapted what others said in their messages, instead of using their own points of view or expressions. Although this result has a negative side, it indicates that students, at least, read and interacted with what others said and communicated with them to some extent.

However, social interaction with other students by accepting, rejecting or commenting on their views was noticeable and more common than interaction with the tutor. Some students tried to emphasise or clarify classmates' solutions, although only a small percentage of students did so. At the same time, students presented themselves through self-introductions and opinions (e.g., 'my opinion is'…, 'I plotted the graph and I found' …, etc.) in the majority of their messages, allowing them to support each other and build a sense of community. In other words, students attempted to create a sense of social presence by referring to each other by name and to some elements in the learning environment (such as the Grapher and examples section) rather than interacting with the tutor. In other words, students preferred student-student interaction rather than student-tutor interaction.

To reveal patterns of cognitive and content-related responses, statements which would tell how students thought and responded to discussion questions were analysed. The statements related to understanding, reasoning, cognitive skills and problem solution were coded and categorised according to the content-related indicators (Table 13).

Table 13: **Patterns and examples of students' cognitive and content-related responses**

Patterns	Percent	Examples of responses
Solution without explanation	71.35%	'The relationship between the depth and pressure is a function'. 'My results are *x=0, y=9, x=1, y=12, x=2, y=15, x=3, y=18*'.
Solution accompanied with explanation	12.36%	'I used Grapher to graph these negative values. The difference is the graph will be plotted in the second quarter of the page'. 'The new pairing of the numbers is not a function because the record 35 has two values 1995,1996'. 'The graph does not represent a direct variation because it is not a line'.
Alternative solution	0.56%	'The length of shadow and the time. The time and temperature'
Question directly related to the discussion topic	1.12%	'[…] did you use the Grapher to graph it? If yes, how?'
Question for more clarification	1.12%	'[…] Do you need the results?' '[…] What other equations are?'
Judging the relevance of solution	5.06%	'6 notebooks are cheaper than 5. Because when 5 notebooks cost 4.5 then the book costs .9. When the 6 notebooks cost 5 pounds then the book costs .83. If we plot the table we will not get a straight line'. 'If it is positive then the gradient is positive. If it is negative then the gradient is negative'
Repeating information contained in the course materials	4.49%	'[…] the slope is positive if *a>0* and it is negative if *a<0* […]'
Repeating information contained in the discussion topic	2.81%	'1. What do you notice? I noticed that we got the same results. 2. Does the equation have the same solution in each case? Yes.' 'What do you notice about the graphs of the first group when a changes? The slope is changed'
Conclusion	1.12%	'If the value of the coefficient of x is positive then so is the slope and if it's negative then so is the slope'

The results of the content analysis showed that cognitive and content related statements accounted for more than 80% of the overall number of statements posted by students. The majority of statements (71.35%) were short answers to the main discussion topic. 12.36% of the statements were clarification statements accompanying solutions, to support or interpret participants' opinions. 2.81% of the statements came directly from the text of the discussion topic. 5.06% of statements were judgements showing the relevance of solutions provided by the same participant or other participants. Students posted only 2.24% of the total content to learn more about rules of participation in discussions or for more explanation. Only one statement gave an alternative or additional response to the discussion question.

Although the Wired Class provided students with instructions and ideas for how to participate and respond to discussion topics, as mentioned above, the above results indicate that the majority of students did not understand the actual purpose of on-line discussions, and responded to discussion questions as they would respond to conventional textbook exercises. Students did not go beyond stating the direct algebraic solution (71.35%) and did not establish a sense of argument in examining their own or others' responses. In addition, they did not clarify the evidence behind their answers in their messages, or provide alternative solutions to the problem, if applicable. Even messages that contained questions comprised only 2% of the total content and half of them were asked only to obtain assistance or more clarification. The application of higher level cognitive skills (e.g., judging the relevance of a solution) was minimal.

For example, in the first discussion topic the learning objective was understanding the definition of a function. Therefore, students were asked to suggest and examine examples of functions, as a special relationship in which each input (or *x* value) results in one and only one output (or *y* value). The purpose was to investigate students' understanding of the function concept, encouraging them to find a general expression for the function and pave the way to the next lesson. In addition, examining examples and non-examples could help students who have difficulty with the concept of a function, possibly because of its many interpretations, to understand the definition. Good examples of functions would be that each student at a school has a unique fingerprint, each

house on a street is assigned a unique address and the distance a car travels in one hour is a function of the speed of the car.

Although the Wired Class students provided good examples of function, even if many of them were repeated, and they showed understanding that a function is a correspondence that applies to each element of one set one and only one element, they neither explained the correspondence between the two sets of variables (whenever x increases y increases) nor looked at the function concept in different ways (e.g., as a relationship between sets of information, matching up one group of numbers with another group or mapping of some domain onto some range), as explained in the lesson.

In addition, it was noticed that students did not refer to on-line course materials or exploit the Web resources provided within each lesson and discussion topic, to respond and enrich discussion content. Also, students' responses indicated that they did not exploit information and tools provided by the Web sites recommended by the tutor, which explained the co-ordinate graph and provided useful and interesting tools to help them to solve plotting problems. The analysis of students' messages in this lesson indicated that students did not cite or refer to conclusions, solutions or examples presented at these sites.

The third issue considered in analysing students' messages was the relationship between the structure and objectives of discussion topics and the quantity and quality of students' responses. Since discussion topics varied from simple discussion questions to controversial problems, the requirements for discussion varied from a low level of intellectual behaviour to a high level of intellectual operations and skills. To investigate this relationship, first, the requirements for each discussion topic were analysed and coded into three levels according to Bloom's taxonomy:

1. Low-level discussion topics, which require doing simple calculations or mathematical operations and directly depended on concepts and problems mentioned in the text.
2. Moderate-level discussion topics, which required translating knowledge into new context, solving problems using available knowledge and skills, formulating, comparing and interpreting results.
3. High-level discussion topics, which required analysing, creating and verifying evidence and results.

Table 14: Requirements for discussion and level of participation

Lesson	Requirements for discussion	Cognitive demand	Level of response (number of messages)
1	Give examples that meet the requirements of the definition	Low	High (N = 12)
2	Study external Web links, draw graphs and investigate relationships, similarity and differences.	Low	Moderate (N = 8)
3	Compare and assessing values of theories, verify values, generalise from definitions and solve problem.	Moderate	Moderate (N = 7)
4	Observe, list and recall information, compare, contrast, examine, test values and solve problem.	High	Moderate (N = 6)
5	Tabulate, graph, interpret, observe pattern, explain and generalise.	Moderate	Moderate (N = 9)
6	Tabulate, graph, use old ideas to create new ones and draw conclusion.	Moderate	Moderate (N = 8)
7	Change using mathematical operations, formulate, compare and interpret facts.	Moderate	High (N = 12)
8	Tabulate, plot and construct graph, interpret the new graph and examine, identify and describe changes.	High	High (N = 14)
9	Construct graphs, compare changes, experiment, distinguish, assess and conclude.	High	High (N = 15)
10	Apply, solve problem, examine, recognition of hidden meanings, predict, draw conclusion and make choices based on discussion argument.	High	High (N = 14)
11	Construct graphs, compare graphs, describe differences and draw conclusion.	Moderate	High (N = 16)
12	Evaluate the relevance of data, modify, assess presentation	High	High

Lesson	Requirements for discussion	Cognitive demand	Level of response (number of messages)
	of equations, solve a problem and draw conclusion.		(N = 15)

Consequently, each discussion topic was analysed using the above coding system (Table 14) and the quantity and quality of students' messages for each discussion topic were coded. The results showed that the development in requirements and cognitive demands of discussion topics from low-level demands, in earlier lessons, to moderate and high-level demands, in later lessons, might be associated with growth in students' level of involvement in peer-interaction.

However, correlation analysis between cognitive demands of discussion topics and students' level of responses showed that there was no significant relationship between the students' level of participation in discussions and cognitive demands of discussion topics. In other words, the structure and objectives of discussion topics did not affect students' quantitative performance in on-line discussions. However, this performance varied significantly between earlier and later lessons and was affected by the tutor's presence and participation in discussions, as reported above, and confirmed using correlation analysis below (Table 15). At the same time, it was not surprising to find that there was a significant relationship between the cognitive demands of each lesson and its order in the course, since in the design, care was taken to choose and construct discussion topics of graduating difficulty, from simple topics making low cognitive demands, in earlier lessons, to complex topics making high cognitive demands, in later lessons.

Table 15: The inter-relationships among students' level of responses, lesson and discussion order, tutor's responses and cognitive demands of discussion topics

Variables	Variable 1	Variable 2	Variable 3
1. Lesson and discussion order			
2. Students' level of response	.774**		
3. Tutor's level of response	.429	.635*	
4. Cognitive demands of discussion topic	.686*	.340	-.114
* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).			

In order to find out if the order of the lesson or discussion topic, and any other factors, could together predict the variance of the dependent variable, multiple regression analysis was conducted using students' level of response as the dependent variable. Independent variables included in the analysis were lesson order, tutor's level of response and cognitive demands of discussions.

Table 16: Summary of multiple stepwise regression analysis for variables predicting students' involvement in discussion boards

Model		Sum of Squares	*df*	Mean Square	F	Sig.
Model 1	Regression	83.084	1	83.084	14.948	.003
	Residual	55.583	10	5.558		
Model 2	Regression	98.666	2	49.333	11.100	.004
	Residual	40.001	9	4.445		
Model 3	Regression	99.332	3	33.111	6.734	.014
	Residual	39.335	8	4.917		
$R\ Square_{Module\ 1} = .599$, $R\ Square_{Module\ 2} = .712$, $R\ Square_{Module\ 3} = .716$						

The results showed that the R Square for model 1 (in which the predictor is the lesson number) is 0.599. The R Square of 0.599 means that about 60% of the variation of students' participation in discussion (the dependent variable) could be explained by the variability in lesson number. Adding the level of tutor response as the second independent variable added 0.113 to the R Square. However, adding the cognitive demands of discussions as the third independent variables (model 3) added only .004 to the R Square to become .716. These results show that around 70% of the variation of students' participation in discussions could be significantly explained by the variability in lesson number and level of tutor response to discussions, with a significant F value at 11.1 ($p<.05$).

Second, a content analysis of randomly-selected messages (50%) in low, moderate and high level discussion topics was carried out, in the light of the analytical framework for discussion messages to investigate the relationship between the requirements for discussion topics and types of students' responses. The analysis revealed that when discussion topics presented easy and direct questions requiring low-level intellectual skills (e.g., suggest examples, study external Web links, draw graphs and investigate relationships, etc.), students responded in brief statements without showing the cause and effect of the relationship or explaining the reasons behind their arguments. In addition, they did not use statements that were social in nature or try to build a sense of community through discussions (e.g., responding to accept others' views and opinions without explanation).

However, in moderate-level discussion topics, students sent more positive responses, solved mathematical problems correctly and in detail, and interpreted the results. For example, when students were asked to discuss together which of two tables provided a function and why, what was the difference between the graphs of two equations or how an equation not in the slope-intercept format could be graphed, they provided many alternative solutions and explained how and why the answer was correct. They also responded to accept or reject others' responses with more explanation.

In high-level discussions which addressed more controversial problems requiring relatively high-level thinking and intellectual skills (such as analysing, verifying evidence, assessing information and drawing conclusions) it was noticed that students posted more alternative points of view and detailed responses, with relatively more peer interaction.

DISCUSSION AND CONCLUSION

Students' feedback supported the belief that students were not far from the tutor and he/she was able to respond and answer their questions in a reasonable time, as well as providing them with useful feedback and support via e-mail and discussion boards. However, students did not find e-mail a useful and quick method of interaction with classmates. The reason is that classmates did not access and check their e-mails regularly then respond to others' messages. More interestingly, the results above showed that students found discussion boards more suitable than e-mail to access and interact with peers, and more so than individual messaging. Possibly, the reason is that students often find classmates' messages in discussion boards and read and reply to their ideas that focus on well-selected and course-related topics. However, using e-mail, it is difficult for students to contact each other and talk about the subject without guidance and support from the tutor.

However, students argued that the system is text-based and requires good spelling, vocabulary, grammar and typing skills, particularly for non-native speakers. Therefore, asynchronous rather than synchronous activities would be more appropriate and suitable for students. Discussion boards, e-mail and submission forms are good examples of asynchronous tools that give the learner the time to read, think, type and revises his/her inputs. However, chat might not be easy to use in formal learning sessions since it requires prior planning and arrangements using other medium, such as e-mail, good and appropriate Internet connection, logging-in to the chat room at a specific time, small number of participants and good typing and language skills.

These findings highlight the need to look for a more reliable means of communication for individual interaction in on-line learning environments. This means of communication should encourage and facilitate interaction among students when they are studying on-line.

In terms of quantity of interaction, students spent less time in this type of activity when compared to other types of on-line learning activities (such as self-assessment). In addition, students believed that participation in discussions was not as important as achieving other conventional tasks and the average number of messages posted to discussion boards was less than anticipated. Therefore, students should be encouraged to participate more regularly in peer discussions and tutors may need to assign grade weight to the quantity and the quality of contributions and ask students to spend more time and effort in peer interaction.

In addition, the quantitative analysis revealed that the more participation from the tutor, the more messages were posted by students. Correlation analysis revealed that the number of students' responses per discussion topic had a significant relationship with the number of tutor's responses. The non-appearance of the tutor might have been interpreted by students as non-involvement, rather than giving them the chance to think and negotiate meaning themselves. To make instruction effective and promote active learning, discussions should be carried out within a tutor's scaffolding approach at management level (tracking, encouraging, grading, etc.) and cognitive level (explaining, facilitating, suggesting, etc.), particularly for those at lower academic levels.

Although participation in discussion boards was an essential activity and students had very high positive perception of using discussion boards, the results of quantitative analysis showed that the average number of messages sent by students was relatively low. One possible explanation is that students thought that they could not post correct answers that would add meaningful value to discussion, or simply they had nothing to say. Another explanation is that students did not consider discussions to be as important as conventional tasks. This explanation is supported by the results from formative evaluation which, revealed that more than 85% of students completed conventional tasks (such as exercises and 'send to the teacher' tasks) regularly and without more pushing from the tutor, even if they were not successfully achieved.

In addition, analysis of students' logs showed that the majority of students accessed discussion boards only in the last few minutes of the lesson, which did not allow them to participate fully. This may have been because the discussion questions came at the end of each lesson. Therefore, students, particularly those who could not manage their time effectively, paid less attention and time to discussions. Although all students accessed the discussion boards and read their contents, according to their logs, a significant number of students (21.8%) 'lurked' and sent no messages or fewer than three messages for twelve discussion topics.

However, it was noticed that one of the significant factors that may have affected students' participation in on-line discussion was the structure and objectives of discussion topics. Since discussion questions varied between easy-to-answer open-ended questions and more debatable and controversial problems, it was found that in discussions that addressed more debatable questions, students were motivated enough to engage actively in critical thinking processes and pay more attention to interaction with peers. However, topics that required low cognitive demands did not help students to use higher order thinking, interact with others or learn from others' experience.

Moreover, it was found that the number of participants who got involved in the later discussions was greater than those who got involved in the earlier discussions. The correlation results showed that although there was no significant relationship between students' level of response and cognitive demands of discussion topics there was a significant difference in students' level of involvement between earlier and later discussions. Multiple regression analysis has shown that about 60% of the variation of students' participation in discussions could be explained by the variability in the lesson number. According to earlier research, students very rarely interact via discussion boards, due to lack of opportunity to develop peer relations and intimidation about using new technology (Flottemesch, 2000). Possibly, after four or five weeks of studying in Wired Class, students who could not participate in public discussions had begun to engage actively and become familiar with the new style of constructivist learning and technology.

Also, it was found that the more participation there was from the tutor, the more messages were posted by students. The non-appearance of the tutor might have been interpreted by students as non-involvement or absence, rather than giving them the chance to think and negotiate meaning. Although personal e-mail messages were sent from the tutor to students, asking them to be more active, e-mail messages did not give them the evidence or the impression of the presence of the tutor. This result indicates that, possibly, students need more encouragement and support to participate more positively, bring ideas, agree on whose ideas will be accepted and feel a sense of community.

This result was expected and is consistent with Harris (1999), who indicated that the role of the tutor in discussion is as important as the role of the 'chair of a conference'. He argued that the tutor's role is essential to open and close discussions, encourage students to participate and interact, keep discussions on track and assess learning. Also, Jonassen et al. (1996) argued that tutor-student interaction 'exemplifies the constructivist design model' of on-line education, but the instructor's contributions should be only 9-15% of the message volume, as achieved in Wired Class. Trentin (2000) called the tutor's modest participation the 'initial approach'. This approach aimed at 'breaking the ice between the students and those responsible for leading and assisting them throughout the course' (Trentin, 2000, p. 19). According to Trentin, the outcome of using this approach is that the distance learners' sense of isolation is reduced and this helps in enriching and fostering discussion.

However, the result of this study did not agree with research results on learning via discussion by Dymock and Hobson (1998), who argued that students usually participate more in discussion when the teacher is away from the discussion group. This inconsistency in findings may be attributable to two reasons. First, these earlier studies were implemented at the university/higher education level, not in earlier education. Young students, particularly those who are isolated at a distance, may not be motivated enough to use discussion boards. Second, presence/absence of the teacher is not the only factor that affects student participation. The nature of the

discussion topic and the possibility of more interesting issues being raised by students during discussion play an important role in fostering and encouraging the debate.

Therefore, on-line tutors should pay more attention and address more concern to strategies to foster participation and interaction and build the sense of community in Web-based learning environments. This can be achieved by directing comments or questions to students, suggesting materials, encouraging further exploration or opening up new avenues for development (Cox, 2000).

Stating another point of view, since discussion boards addressed more controversial issues and problems than those addressed by other tasks, students who had good experience and skills responded to discussion problems more frequently than those who lacked these abilities (Stahl, 1999).

Moreover, it was not surprising to find that also the quality of social and cognitive-related interaction was low. This low quality of participation was visible in the 'surface processing' of information, which reflected in repeating information in the discussion topic or others' messages without self explanation, supporting/rejecting others' opinions without adding personal comments or providing clear evidence, offering solutions without providing clear interpretation, providing solutions directly depicted from the text not from external Web resources or self-experience and asking questions that were not directly related to the discussion topic.

Superficial processing of information showed that much of students' learning came out as a result of interaction with the course content, rather than by negotiating and constructing meaning via peer-interaction or Web resources suggested by the tutor. Content analysis of students' messages showed that when students were challenged by discussion questions, they did not resort to Web links and this did not allow them to find information to clarify the discussion problem or respond to the discussion question.

Consistent with this finding, since interactive and co-operative learning is based on the student's interactivity and social skills (Fisher, 2000), on the one hand, and since the learning process is influenced by the level of information manipulation (Henri, 1991), on the other, little educational effectiveness can be gained from involving students in this type of activity if they are unable to carry out in-depth processing of discussion problems, are not interested in group-based learning or do not have the necessary skills and experience to participate in group and interactive activities.

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USING OF DISTANCE EDUCATION APPROACH IN TEACHER TRAINING: ANADOLU UNIVERSTY OPEN EDUCATION MODEL

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Distance education which provides important contribution to education systems is applied many fields successfully. Teacher training is another field in which distance education is used widely. Distance education is used for teacher's graduate education as much as teacher's preservice and inservice training at elementary and secondary education level. The main aim of this study is to introduce teacher training programs which have been made through distance education in Turkey between the years of 1986-2005 by Anadolu University Open Education Faculty. For this aim, five teacher education programs at undergraduate compensatory education and undergraduate level used for teacher training for elementary and secondary education were examined in terms of aim, content, teaching-learning process and evaluation. The study indicates that programmes are achived for different purposes and education is given to big masses in quantity in the beginning. It is also concluded in the research that programmes begin at pre-undergraute level then rise to undergraudate level and then are transformed into modern applications from classic distance education.

Key Words: *Distance education, Teacher training*

INTRODUCTION

Today, rapid changes and advances occurring in social, cultural, economic, and political areas affect the aspects of social life; hence, education systems need to be renewed. Scientific and technological advances lead to fundamental changes in social and economic life in the one hand, and also in the concepts and approaches acquired in the process of education on the other hand (Alkan, 1987, p.1). One of those concepts and approaches is distance education.

The increasing cost of education as a consequence of the enlarging number of students limits the opportunity to benefit from formal education; hence, distance education system has been put forward as a solution to this problem. While considering the inability to meet the education demand as the basic reason to the emergence of distance education, dimensions of lifelong education should also be taken into account.

Distance education which realizes teaching-learning activities between students and teachers in different locations through communication technologies and postal services is an education system model (İşman, 1998, p.18) implying the existence of loose communication between the organization and the students. Communication is realized in two different ways, one-way and two-way. One-way includes the interaction of the students with ready to use materials prepared by the organization in advance; and two-way means the real communication between the students and the organization (Holmberg, 1995, p.2).

Distance education is a model that brings education into reality by rescuing students from time and location limitations, by not using the facilities of schools or by using those facilities the least, and without costly investments. While this model removes the deficiencies of conventional educational institutions such as buildings, facilities and classrooms, it also lessens the cost of materials and equipment per student that is otherwise expensive and inadequate.

Distance education helps lots of adults without discriminating between countries or cities, the young or the old, and the rich or the poor, which other educational systems fail to fulfill. Through increasing access to distance education, students can meet their needs appropriately regardless of the present limitations and border lines (Verduin and Clark, 1994, p.7).

Recent advances in information and communication technologies contribute considerably to the quality of teaching and learning activities in distance education. These technologies include hardware (e.g. computers and modems), software (programs that provide communication), and communication links (telephone line). Through these learning technologies, students, teachers, and education specialists can communicate vocally or through texts and pictures with each other, or they can download all of these into their own computers. They can hold teleconferences among themselves (İşman, 1998, p.29). Therefore, many education scholars set forth that the education system of the 21st century will highly be based on interactive distance education.

DISTANCE EDUCATION IN TURKEY

Distance education in Turkey has a three-phase history. The first phase, from 1927 to 1960, includes the conceptual discussions and proposals about distance education. In the second phase, from 1960 to 1974, distance education was applied for secondary education, and finally in the third phase, from 1974 up to present, attempts have been made to use distance education in higher education system (Alkan, 1987, p.91).

Following the foundation of Republic in Turkey, the first aim was to extend literacy, and 1927 was the first year when Education via Mail—one of the ways of distance education—was proposed. Nonetheless, these proposals were not put into practice since the majority of the public was illiterate. As a way to solve the literacy problem during those years, distance education was again on the agenda in 1960s, and finally "Center for Education via Mail" was established in 1961 to carry out distance education programs with materials published by the Ministry of Education (Üstünoğlu, 1987, p.54). Center for Education via Mail provided preparatory courses about eleven occupational and technical subjects for 8 to 24 months, and at the end of the course program students took an exam and those who passed were given "certificate". This important step in terms of distance education continued its services until 1974; however, there had been no significant improvement due to the changes in the structure of the organization (Özer, 1994, p.26).

Distance education attempts in Turkey were put into practice for higher education by the Ministry of Education in 1974 with "Education Via Mail". Started as a pilot practice with limited opportunities, this application was at first restricted to just teacher training. However; this application was discontinued because of excessive number of students in the program, absence of expert staff to prepare teaching materials, and insufficiency of the program in maintaining various materials to facilitate learning.

Formal higher education institutions were inadequate to meet the great demand to study at university in early 1970's. Thus, the Ministry of Education charged the 'Center for Education via Mail' to conduct higher education through mailing. Nevertheless; there was a lack of confidence and anxiety about benefit of 'Education via Mail' among some higher education institutions and some high ranking members of the Ministry of Education; moreover, facilities and systems were not enough to make the project work. Therefore, all these reasons impeded the development of distance education system in Turkey (Özer, 1994, p.27).

After higher education programs provided by the "Center for Education via Mail" putt off, the first thing that was done was to establish "Strategy and Method Commission for Educational Technology" to run multiple-setting instruction methods, create new sources and technologies, and make necessary scientific and experimental studies. Then, "Experiential Higher School for Teacher Training" was founded as a pilot institution (Alkan, 1996, p.21). This attempt aimed to train teachers through a modern distance education system. Although all the feasibility research and preparations were ready to start the program, the Ministry of Education discarded it before putting into practice in September 1975 (Özer, 1994, p.27).

Distance education practice was conducted at higher education level by YAYKUR (Common Higher Education Institution), founded in 1975. Established just after education via mail, this institution was designed to solve the overload of students waiting to continue college or university. Its objective was to provide multi-goal instruction through television. YAYKUR was an umbrella covering residential teaching programs such as education via mail, open higher education and external graduation, and it included several programs like teacher training for secondary education, teacher training for primary education, technical and humanity departments and foreign languages at higher education level (İşman, 1998, p.44). Established to fulfill the aims such as to provide instructional opportunities of students with a high school degree in the fields to meet the needs of economy and the society by using all the means of modern educational technology, to solve the overload of students willing for further studies at colleges and universities, and to raise interface work power through two-year under programs (Özdil, 1986, p.32), YAYKUR was forced to discontinue most of its programs opened during 1978-1979 educational year, and it was not allowed to register new students afterwards (Özer, 1994, p.28). This practice was also terminated since it hadn't achieved the expected goals.

Distance education was first legally included in the university structure of Turkish education system through the "2547 Act of Higher Education (1981)" (Özer, 1994, p.28). "Central Open Education" duty was assigned to Anadolu University through decision of agreement # 41 on July 20, 1982. Open Education Faculty started its activities with 29.749 students in 1982-1983 educational year, and the instructional fields were "Economics" and "Business Management" (Baraz, 1985, p.6).

Open education system was reformed after the introduction of decision of agreement with the force of law # 496 published in the official gazette on August 18, 1993. As a result, Faculties of Economics and Management at

Anadolu University were charged to conduct central open education. Four-year undergraduate programs were designated to Faculties of Economics and Management, and two-year undergraduate programs, undergraduate compensatory education, and all of the certificate programs and common education services were assigned to Open Education Faculty.

Open Education Faculty model does not serve only the students in Turkey, but also the Turks in Turkish Republic of Northern Cyprus and in Western Europe. Aiming to spread education, to improve the quality of education and instruction in the country, and to meet the demands of students willing to study at university level, Open Education Faculty is equipped with the most recent technologies. Along with providing educational services, Open Education Faculty also serves students with its offices throughout the country. Turks living in Turkish Republic of Northern Cyprus and in Western Europe can also benefit from these opportunities (www.anadolu.edu.tr, 2002).

Faculties providing distance education on behalf of Anadolu University conduct also face-to-face education through academic counseling and practice facilities. These faculties contribute significantly to growing of higher education by creating opportunities to thousands of students who cannot enroll for a formal education program. The system including faculties creates opportunities not only to the young at the age of studying at a university, but also to the ones who could not get the chance of studying at universities before, who can not follow the residential courses because of occupational conditions, and who already have a two-year undergraduate degree and want to complete it to a BA degree. Together with extra supports to the published course materials and television broadcast, faculties try to provide the Internet, computer assisted education and teleconference services in order to adapt students to these technologies, and to creat technological interaction. Moreover, academic counseling and face to face education are supplied in appropriate places (www.anadolu.edu.tr, 2002).

Open Education High School was established on October 5, 1992 to meet the demand of secondary education in 1990s which was result of changes in structure of society (İşman, 1998, p.54). This application was needed because schooling proportion in secondary level was very low in respect of developed countries and physical substructure could not meet the demand. Besides, some people were not able to go on residential education for some excuses; some were above the age of formal education or some had to work to earn their living at early ages, some were ill or imprisoned. Open Education High School which was established in 1992-1993, is a secondary education institution using the methods of distance education. It aims providing secondary education by using advanced mass materials to people graduated from secondary schools, or to people who discontinued their education or to adults who could not use their right of high school education for any reason. Open Education High School which was presented as an alternative in the process of solving the problems has shown a rapid development.

Obtaining such an alternative in secondary education level led to lots of advantages such as continuation of students' contribution to national income, formation of an egalitarian educational system, completion of students' deficiencies due to being educated insufficiently because of the absence of location or teacher , and improvement the educational level of society (Kaya, 1995, p.12).

Distance education in Turkey has served with the names and applications of Education Via Mail, YAYKUR, Anadolu University Open Education Faculty, and Open High School since the beginning of 1950s (Demiray and Yılmaz, 1996, p.159) and it has very significant contributions to the education system.

TEACHER TRAINING PROGRAMS CARRIED OUT THROUGH DISTANCE EDUCATION IN TURKEY

In distance education, programs can be presented in different forms and other different models can be created (Verduin and Clark, 1991, p.13). Distance education approach is recently used throughout many countries with different kinds and at different levels for various purposes in teacher training area, too (Özer, 1991, p. 73). Nowadays, distance education programs are used in lots of countries for teacher's pre-service and in-service training. In Kenya, Mauritus, Indonesia, and Sri-Lanka, it is used for in-service training while in Zimbabve and Kenya it is used in preparatory teacher training programs (Sherestha, 1997). Teachers generally benefit from these pre-service and in service programs to complete the classes about their specialities and teaching methods, to be propped by inspectors and other teachers, and to communicate with them (Murphy, 1993, p.1). Distance education is a cheap and accessible way for the teachers who do not want to fall behind time (Martinez, 2002).

Distance education programs are used for training the teachers who have different histories and who are at different levels. Although they are mostly used in training of primary school teachers, they are also used for secondary levels and graduate education of teachers. While some programs are seen appropriate for the teachers'

pre-service training, some are regarded as suitable for novice teachers, and some for on-going education of the experienced and qualified ones (Perraton, 1993, p.p.3-4). Distance education is frequently used in teacher training for some reasons. First, countries can prepare great number of teachers for teaching profession, raise their professional quality and their level of education. Secondly, teachers do not have to leave their work while studying by means of distance education; thus, education in schools goes on without interruption. Thirdly, formal education benefit from teaching materials, approaches, methods and techniques used in teacher training programs through distance education are also utilized in residentail education (Özer, 1991, p. 73).

According to the analysis conducted by Perreaton, Creed and Robinson (2001, p.p. 2-3), countries use distance education for teacher training in four different types given below:

- Some countries use distance education to make crowded groups of teachers acquire some basic qualities. This application may be for the ones who have not enough experience or quality.
- When teacher training is seen insufficient in terms of duration, distance education is used in order to enhance teachers' skills, provide them a more complicated understanding, and broaden their information. Some programs are continued in the form of focusing on a special group.
- Distance education has a significant role in the reforms of the programs aimed at changing the content and activities of education such as the programs that directed to support the usage of education technologies at schools.
- Distance education is used to support teachers' career development. When teachers search the ways of professional promotion, aim to improve their qualities or want to be expert teachers or inspectors; shortly, when teachers need new skills, they benefit from distance education.

In Turkey, distance education is used for teacher training as well. Undergraduate and two-year undergraduate programs are applied by the Open Education Faculty at Anadolu University. In this sense; two-year undergraduate and undergraduate compensatory program for primary education teachers, undergraduate compensatory program for secondary education teachers, undergraduate programs for preschool and English teachers have been applied since 1986. These programs have contributed to teacher training significantly. Open Education Faculty has provided five programs since then; three of these programs are no longer in practice while two of them still operate. Basic features of these programs are given below.

Two-Year Undergraduate Education Program

This program is directed for two-year undergraduate education of primary education teachers who graduated from secondary schools.

The Rationale of the Program: Legislated in 1973, Basic Law of National Education brought the necessity of providing higher education to 130.000 primary education teachers with a secondary school degree onto the agenda by making higher education compulsory for teachers at any level of educational system (Sözer, 1991, p.24). Serving face to face education such as conventional courses or seminars to all, this teacher mass would have taken a very long time. Smilarly, forcing all these teachers leave their work and family to go to different places for face-to-face education might have brought disorders in education and caused social and economic problems (Hakan, 1991, p.4). Since face-to-face education setting such as in-service training would last many years, and this wouldn't be helpful for an immediate solution to teachers who had hard times in terms of personnel rights, distance education alternative emerged as a reasonable solution. Thus, as a result of the co-operation betwenn the Ministry of Education and the Higher Education Council, "Two-Year Undergraduate Education Program" was put into practice by Open Education Faculty of Anadolu University in 1986 (Sözer, 1991, p.24).

Basic Features of the Program and Conditions of Acceptance: Duration of the undergraduate program is two years. Started in accordance with the protocol between the Ministry of Education and Anadolu University in 1986, the program was prepared based on primary education teacher training programs teachers had graduated and on the programs at Higher School of Education training teachers at undergraduate level at that time.

As a result of analyzing the courses and contents in the programs of Primary Education Teacher Training and Higher School of Education, it was concluded that there were deficiencies about field knowledge, there was no specialisation in professional courses in the Primary Education Teacher Training Program, and also the program could not meet the social and technological developments and the competence and features that a modern teacher ought to have (Hakan, 1991, p.4). Two-year Undergraduate Education Program was prepared by Open Education Faculty to remove those deficiencies, and was put into practice after the permission of the Higher Education Council.

Teachers in west Europe such as Germany, Belgium, England, and France participated this program as well as teachers in Turkey. Television programs in video cassettes and books were delivered to them (Demiray, Mc Isaac and Yangın, 1993, p.77).

46.770 teachers in the first year and 83.852 teachers in the second year enrolled to Two-Year Undergraduate program. 10367 other teachers who could not apply the program due to various reasons were also enrolled to the program. Totally, 141.574 teachers registered to the program from the 1986 to 1990-91 academic year. 80.348 teachers in 1986-87 completed the program, and the total number of graduates in 2001-2001 when the program came to an end was 137.950.

The Aim of the Program: As a result of the obligation "all teachers at any educational level have to be graduates of higher education" brought by # 1739 Basic Law of National Education, the main purpose of the Two-Year Undergraduate Program is to offer higher education for two years to primary education teachers with a secondary school degree, to equip them with modern knowledge and skills and hence to improve their quality (Özer, 1991, p.81). In this sense, "Two-year Undergraduate Education degree" was given to all teachers who finished the program successfully.

The Content of the Program: The content of the two-year undergraduate education program was formed according to the teachers' former education program, the education programs of two-year higher schools of education institutions training primary education teachers and the needs of teachers includes courses on *professional knowledge on teaching, field knowledge, and general culture courses*. The first year of the program includes courses on general culture and professional knowledge on teaching while the second year covers courses on general culture and field knowledge. Table 1 depicts the sourses in this program.

Teaching–Learning Processes of the Program: The program includes coursebooks, radio and television programs and academic counseling activities. Books of the program are the basic instructional sets, and they were prepared according to distance education and self-learning principles. Coursebooks were written by not only scholars at Anadolu University, but also by scholars at other universities. Television and radio broadcasts were prepared to support and reinforce course books. 179 television and 147 radio broadcasts were prepared for this program (Özer, 1993, p.83). Academic counseling activities included explanatory fascicles and television programs to clarify any blur subjects of courses. Academic counseling activities were carried out for Mathematics, Science and English language courses (Hakan, 1991, p.33; Özer, 1991, p.p. 83-84). Teachers' questions regarding the subjects of courses were replied by scholars, and were delivered to them by way of published materials or television programs (Özer, 1991, p.84). Supplementary services such as individual guidance and face-to-face education were not supplied due to the fact that there were too many teachers to be trained in a short time (Demiray, Mc Isaac and Yangın, 1993, p.78).

Table 1. The Courses in the Undergraduate Education Program

1st Grade
1. Principles of Atatürk and the History of Revolution 2. English 3. Turkish Language / Writing and Speaking 4. Behavioral Sciences (Psychology, Sociology, Anthropology, Economics) 5. Social Sciences (History, Geography) 6. Science (Physics, Chemistry, Biology) 7. Mathematics
2nd Grade
1. Principles of Atatürk and the History of Revolution 2. English 3. Turkish Language / Writing and Speaking 4. History of Philosophy and Civilizations 5. Technological Features of the Century **6. Educational Sciences** • Introduction to Science of Education • Educational Philosophy • Educational Economics • Educational Psychology • Educational Sociology • Educational Technology • Primary Education Programs and Instructional Methods

• Turkish Educational System and its Management • Guidance • Assessment and Evaluation
7. **Special Teaching Methods** • Mathematics Teaching • Social Studies Teaching • Science Teaching • Turkish Teaching • Fine Arts Teaching • Occupational Education • Instruction in Inclusion Classrooms • Physical Education and Games Teaching • Religion and Ethics Teaching

Evaluation in the Program: Academic success was determined following one midterm, one final, and one make-up exam for each course. All the exams were conducted in 30 cities where there was at least one higher education institution (Özer, 1991, p.84).

Undergraduate Compensatory Program for Primary Education Teachers
The aim of this program is to provide the opportunity for primary education teachers who have a two-year undergraduate training to complete their training up to four years of undergraduate education.

The Rationale of the Program: By the introduction of the decision # 89.22.876 by the Higher Education Council on May 23, 1989, Higher Schools Education began four-year long programs during 1989-1990 educational year, no matter for which grade the teachers were trained. All four-year Higher Schools Education were converted into Primary Education Teacher Training Department of Education Faculties during a meeting of Higher Education Council on July 7, 1992, by the law # 3837 (HEC, 1998, p.5).

There were three different types of primary education teachers graduated from two-year undergraduate programs when this law was put into practice. Those teachers had graduated from either Two Year Institutes of Education or from the Two-Year Undergraduate Education Program of Open Education Faculty, or from Higher Schools of Education. Since Higher Schools of Education expanded their two-year program up to four years, and these schools were changed into Primary Education Teacher Training Department of Education Faculties, those teachers were forced to compensate their undergraduate training (Hakan, Sözer, and Gültekin, 1996, p.16). The Ministry of Education cooperated with universities to start compensatory undergraduate programs for those teachers; however, these formal programs were insufficient to solve the problem and of course, it was not possible to train 180.000 teachers via conventional teaching methods like courses, seminars, face-to-face instructions in a short period of time. Therefore, the Ministry of Education assigned Anadolu University to launch distance education program named Undergraduate Compensatory Program for Primary Education Teachers.

Basic Features of the Program and Conditions of Acceptance: Undergraduate Compensatory Program for Primary Education Teachers was prepared under the light of the programs at Two-Year Institute of Education, Undergraduate Education Program of Open Education Faculty, two-year Higher Schools of Education, and to the four-year undergraduate primary education teacher training departments that were available at that time. The program that the teachers had been trained and the one that was being applied at that time were compared to serve this goal.

In order to analyze the program and form a basis for the program, two separate meetings were held with representative of National Education Directorship, an inspector of primary education, a head master of a primary school, and teachers who were graduates of Institute of Education, Two-year Undergraduate Education Program of Open Education Faculty, and Two-Year Higher Schools of Education. Furthermore, other meetings with the professors at Open Education Faculty and Education Faculty were also conducted, and these scholars were asked to state their opinions regarding the academic and organizational structure of the program (Hakan, Sözer, Gültekin, 1996, p.22).

Upon completion of Undergraduate Compensatory Program for Primary Education Teachers in 2003, 19748 teachers, namely; 714 teachers of mathematics, 9886 teachers of Turkish, 174 teachers of science, 8974 teachers of social sciences graduated from the program.

The Aim of the Program: The fundamental aim of the Undergraduate Compensatory Program for Primary Education Teachers is to provide the chance of graduating from a four-year faculty to teachers who are graduates of two-year Institute of Education, two-year Undergraduate Education Program of Open Education Faculty, and two-year Higher Schools of Education. Teachers completing the program successfully were given BA degrees.

The Content of the Program: The content of Undergraduate Compensatory Program for Primary Education Teachers which was developed in accordance with the programs that teachers had been trained through, the programs of four-year higher schools that train teachers, and the needs of teachers includes *common and minor field courses* that every teacher trainee has to follow. Common courses in the program are "Innovations in Educational Sciences", "Special Education", "New Technologies in Contemporary Education", "Modern Life Modern Human", "Recent History of Turkey and the World", and "Environment and Human". Other courses in the program are related with the minor fields such as Turkish, Mathematics, Social Sciences, and Science. Table 2 shows the courses in the program.

Table 2. The Courses in Undergraduate Compensatory Program for Primary Education Teachers

<table>
<tr><td colspan="2">1st Grade Common Courses
1. New technologies in Contemporary Education
2. Innovations in Educational Sciences
3. Special Education
4. Modern Life Modern Human
5. Recent History of Turkey and the World
6. Environment and Human</td></tr>
<tr><td colspan="2">2nd Grade Minor Field Courses</td></tr>
<tr><td>Science Teaching
1. Physics
2. Chemistry
3. Biology
4. Laboratory Practice and Safety in Science Teaching
5. Science Teaching
6. Basic Information Technologies</td><td>Turkish Language Teaching
1. Turkish / Speaking and Writing
2. Theories in Literature
3. Turkish Folk Literature
4. Contemporary Turkish Literature
5. Turkish Teaching
6. Basic Information Technologies</td></tr>
<tr><td>Social Sciences Teaching
1. Turkish Geography
2. Contemporary History of the World
3. Requirements of Citizenship
4. Research Methods in Social Sciences
5. Social Sciences Teaching
6. Basic Information Technologies</td><td>Mathematics Teaching
1. Analysis
2. Linear Algebra
3. Abstract Mathematics
4. Analytical Geometry
5. Mathematics Teaching
6. Basic Information Technologies</td></tr>
</table>

3. Undergraduate Compensatory Program for Branch Teachers: This
Program is designed to give BA degree to branch teachers who are graduates of two-year undergraduate programs.

Teaching-Learning Processes of the Program: *Coursebooks, television programs, and academic counseling* form the teaching-learning processes in Undergraduate Compensatory Program for Primary Education Teachers. As the main instructional setting, coursebooks are designed for distance education and self-learning. Television programs supporting the coursebooks are also an important part of the program. 70 TV episodes, including the introduction, were prepared for the program. Academic counseling activities include informing teachers about the courses and the organization of the program.

Evaluation in the Program: Results of one midterm, one final, and one make-up exam determine the academic success of students just like in Undergraduate Education Program. Teachers take the exams in the cities where they were work. All the exams are in the form of multiple-choice. Students are required to be successful for each course. Evaluation is out of 100; the midterm has a 30% weight while the final or the make-up form 70% of the passing grade.

Undergraduate Compensatory Program for Branch Teachers
This program is designed to give BA degree to branch teachers who are graduates of two-year undergraduate programs.

Basic Features of the Program and Conditions of Acceptance: Launched in 1990 after a protocol signed by the Ministry of Education and Anadolu University, this program was prepared in accordance with the program of Teacher Training Colleges where branch teachers has graduated and other higher education programs providing undergraduate training.

An analysis of the contents of the courses taught at Teacher Training Colleges and other faculties training teachers revealed that present teacher training faculty programs had more special courses in terms of field and occupational knowledge than Teacher Training Colleges. Moreover, meetings were held with teachers working at that time and with scholars working in the same field at universities in order to identify the needs of teachers (Hakan, 1990, p.556). The content analysis of the program was done along with educational needs of teachers and the needs mentioned by the scholars; and finally, the program was launched after the permission of Higher Education Council.

In the first year of education—1990-1991—, totally 53679 teachers enrolled in the Undergraduate Compensatory Program for Branch Teachers. Following is the distribution of teachers according to their fields of work; 11688 from Mathematics, 16195 from Turkish Language and Literature, 6424 from Physics, 3556 from Chemistry, 4390 from Biology, 6488 from History, and 4938 from Geography fields. For the educational year of 1993-1994, the entire number of teachers registered to the program was 7482; the distribution of teachers in terms of their fields is as follows; 3032 from English Language , 792 from German Language, 928 from French Language, 1636 from drawing and arts, and 1093 from Physical Education. Therefore, the total number of teachers benefited from the program equals to 61161. The number of teachers who graduated from the program when the program was terminated was 30351.

The Aim of the Program: Providing one-year long education to branch teachers graduated from either two or three-year programs of Teacher Training Colleges, the Undergraduate Compensatory Program for Branch Teachers basically aims to offer the chance of refreshing occupational knowledge and of promoting academic carrier with a BA degree (Demiray, Mc Isaac and Yangın, 1993, p.80). Teachers completing the program successfully were given undergraduate diplomas (BA).

The Content of the Program: Developed and designed along with educational programs that teachers graduated, with higher education programs of faculties training branch teachers, and with the needs of teachers, Undergraduate Compensatory Program for Branch Teachers covers *occupational and field courses of teaching*. Table 3 depicts the courses in the program.

The program includes only two common occupational courses such as “Recent Advances in Educational Sciences” and “Special Teaching Methods (History Teaching, Chemistry Teaching, Arts Teaching etc.)”; and other courses are related with the field knowledge.

Teaching-Learning Processes of the Program: *Coursebooks, television programs, and academic counseling activities* constitute the instructional settings of the program. As the main instructional setting, coursebooks are designed for distance education and self-learning by scholars working at Anadolu University and other universities. Radio and television programs were prepared to support the coursebooks; 296 TV programs were prepared and 144 radio programs were recorded.

Evaluation in the Program: Results of one midterm, one final, and one make-up exam determine the academic success of students just like in Undergraduate Education Program. All the exams are conducted in 30 cities where there was at least one higher education institution.

Table 3. The Courses in Undergraduate Compensatory Program for Branch Teachers

Turkish Language and Literature 1. Speaking and Writing 2. Reading and Textual Analysis 3. Morphology and Syntax 4. Basic Theories of Language and Literature 5. Text Types 6. Contemporary Turkish Literature *7. Instruction of Turkish Language and Literature* 8. *Recent Advances in Educational Sciences* 9. History of Turkish Culture 10. Principles of Atatürk and the History of Revolution 11. Geography of Countries 12. State Organization of Turkey	**History** 1. History of the Ancient Age 2. Islamic Turkish Governments of the Medieval Age 3. History of the Ottoman Empire 4. History of Turkish Culture 5. History of Europe 6. Principles of Atatürk and the History of Revolution *7. Instruction of History* 8. *Recent Advances in Educational Sciences* 9. Physical Geography of Turkey 10. Economic Geography of Turkey 11. Cartography 12. State Organization of Turkey
Geography 1. Physical Geography 2. Geography 3. Economic Geography of Turkey 4. Physical Geography of Turkey 5. Geography of Countries 6. Cartography *7. Geography Teaching* 8. *Recent Advances in Educational Sciences* 9. History of Turkish Culture 10. Principles of Atatürk and the History of Revolution 11. History of the Ottoman Empire 12. State Organization of Turkey	**Mathematics** 1. Analysis 2. Complex Analysis 3. Geometry 4. Abstract Algebra 5. Probability and Statistics 6. Computer Programming *7. Mathematics Teaching* 8. *Recent Advances in Educational Sciences* 9. Mathematical Methods in Physics 10. General Biology 11. Mathematical Methods in Chemistry 12. State Organization of Turkey
Physics 1. Mathematical Methods in Physics 2. Mechanics 3. Electric and Magnetism 4. Waves and Optics 5. Modern Physics 6. Atom and the Physics of Nucleus *7. Physics Teaching* 8. *Recent Advances in Educational Sciences* 9. Computer Programming 10. Analysis 11. Analytical Chemistry 12. General Biology	**Chemistry** 1. Mathematical Methods in Chemistry 2. Organic Chemistry 3. Inorganic Chemistry 4. Analytical Chemistry 5. Physical Chemistry 6. Bio-chemistry *7. Chemistry Teaching* 8. *Recent Advances in Educational Sciences* 9. General Biology 10. Waves and Optics 11. Computer Programming
Biology 1. General Biology 2. Plant Physiology 3. Biology and System of Animals 4. Biology and System of Plants 5. Genetics 6. Human Biology *7. Instruction of Biology* 8. *Recent Advances in Educational Sciences* 9. Computer Programming 10. Analytical Chemistry 11. Organic Chemistry 12. Waves and Optics	**English Language** 1. Writing and Teaching of Writing 2. Teaching and Learning of Grammar 3. Linguistics and Language Teaching 4. Language Learning and Teaching 5. Language and Communication 6. Reading and Teaching of Reading 7. Listening and Speaking and Teaching of Listening and Speaking *Recent Advances in Educational*
Physical Education 1. Physiology of Sports 2. Team and Individual Sports 3. Training	**French Language** 1. Language, Culture, and Communication 2. Writing and Speaking in French 3. Grammar and Language Teaching

4. Sports Injuries: Prevention Ways and Treatment Principles. 5. Bio-mechanics and Kinetics 6. Sports Psychology 7. Physical Education and Methodology *8.* Recent Advances in Educational Sciences	4. Introduction to Linguistics 5. Methods of teaching French 6. French Literature and Teaching of French Literature 7. Reading Methods 8. Recent Advances in Educational Sciences.
German Language 1. Teaching of German and Teaching Methods 2. Linguistics and Language Teaching 3. German Literature and Teaching of German Literature 4. Reading Methods 5. German Grammar and Teaching of German Grammar 6. Teaching Methods for Writing and Speaking 7. German Speaking Countries *8. Recent Advances in Educational Sciences*	**Drawing and Arts** 1. History of Turkish Plastic Arts 2. Introduction to Arts and Aesthetic 3. Training on Basic Plastic Arts 4. Examining Art Works 5. History of Arts 6. Arts and Occupational Technology 7. Art Education *8. Recent Advances in Educational Sciences*

Undergraduate Program for Preschool Teacher Training
This is a four-year undergraduate program functioning under the control of Open Education Faculty at Anadolu University.

The Rationale of the Program: In Turkey, **s**chooling ratio was 9.8% during 1999-2000 educational year, and only a 10% of 2.6 million preschool children were able to benefit from institutional education. In other words, schooling ratio in Turkey is far behind the level of developed countries. In addition, the number of preschool teachers who will enlarge the ratio of schooling is fairly limited. Our country needs 35.000 teachers to achieve its goals. However, it's not possible to train such a huge number of teachers through conventional education in a short time. Considering the realities of our country, it won't be naive to say that the most reasonable way to train preschool teachers and to keep the quality of education high is distance education (www.anadolu.edu.tr. 2002).

Undergraduate Program for Preschool Teacher Training was designed and launched following a protocol signed by the Ministry of Education and Anadolu University to meet the demand as soon as possible.

Basic Features of the Program and Conditions of Acceptance: This is a four-year graduate program operating under the control of Open Education Faculty at Anadolu University. Started after the protocol signed by the Ministry of Education and Anadolu University on January 25, 2000, this program is equivalent of all Undergraduate Preschool Teacher Training Programs run under education faculties providing conventional education in Turkey, and is completely carried out via distance education (www.anadolu.edu.tr. 2002).

Scholars working at Primary Education Department, Education Faculty of Anadolu University prepared this program on the basis of conventional Preschool Teacher Training Program designed by Higher Education Council. The principles of distance education were taken into account during planning, and the program started in 2000-2001 educational year following the approval of Higher Education Council.

Only the graduates of departments such as Child Development, Child Development and Education, and Child Development and Nurture of Girls Vocational High Schools can be candidates for Undergraduate Preschool Teacher Training Program. In addition, these candidates have to take the required score from the central college exam (OSYS). Other students graduated from different departments of different high schools are not accepted to the program (www.anadolu.edu.tr. 2002).

The numbers of students registered to the program according to educational years are as follows: 4734 students in 2000-2001, 8285 students in 2001-2002, 2976 students in 2002-2003, 2000 students in 2003-2004, and 2000 students in 2004-2005; totally reaching 20.015 students. The number of students that can study at this program was limited to 2000 in 2003-2004 educational year. First graduates finished the program in 2003-2004, and so far 940 students have completed the program. At the moment, there are 18542 official students of the program.

The Aim of the Program: The aim of this program is to train adequate number of qualified preschool teachers with least amount of cost.

Students completing their four-year undergraduate training successfully are qualified to receive "BA Degree as Preschool Teachers". These graduates are appointed by the Ministry of Education appropriately (www.anadolu.edu.tr. 2002). Students completing the first two-year of the program may drop out of the program with a "Two-Year Undergraduate Degree" at their will.

Undergraduate Preschool Teacher Training Program of Open Education Faculty at Anadolu University is based on the "Undergraduate Preschool Teacher Training Programs" applied at education faculties by the Higher Education Council. The program is suitable for a two-year undergraduate or four-year undergraduate degree, and the courses are allocated accordingly. Since the program is designed according to year-of-study, some of the courses are integrated without violating the norms set by the Higher Education Council for conventional education. Faculty-School Cooperation Protocol signed by the Ministry of Education and the Higher Education Council is regarded as the guide in the execution of "Preschool Education Practice" and "Teaching Practice" courses.

The Content of the Program: Aiming to equip students with required information, skills and attitudes for preschool teachers, the program includes courses on *professional knowledge on teaching, field knowledge, and general culture*. The courses in the first year focus on world knowledge whereas the ones in the last year are generally directed towards field knowledge. Courses about professional knowledge on teaching cover entire training period (four years) of the program. This program includes "Preschool Education Practice" and "Teaching Practice" applied courses along with other theoretical courses.

Teaching-Learning Processes of the Program: This program consists of *coursebooks, television programs, and academic counseling activities*. Printed materials (books and guidebooks) are written by experts working under the supervision of an editor. All the printed materials are prepared in a way that provides opportunities of self-learning and complies with the principles of distance education. Each unit in the books include goals, content, instructions, text, summary, comprehension questions, and bibliography. Furthermore, three or five TV programs are filmed to support the printed material. TV programs are expected to foster students' learning. Academic counseling activities are also carried out to reinforce learning through printed materials and television programs. Academic counseling service covers questions and problems posted by students on the Internet.

Table 4. Courses in Undergraduate Preschool Teacher Training Program

1st Grade	**2nd Grade**
1. Introduction to Teaching Profession 2. Basic Information Technologies 3. Principles and Methods of Preschool Teaching 4. Human Anatomy and Physiology 5. Child Development and Psychology 6. Nutrition and Health of Mother-Child 7. Foreign Language (English, German, French)	1. Music Teaching 2. Language and Concept Development in Childhood 3. Movement in Children, Development and Teaching of Games 4. Training on Speaking and Writing 5. Principles of Atatürk and The History of Revolution 6. Speaking and Writing in Turkish 7. Planning and Evaluation in Teaching 8. Development and Learning
3rd Grade	**4th Grade**
1. Art Teaching 2. Child Literature 3. Computer Teaching for Preschoolers 4. Science and Maths Teaching for Preschoolers 5. Parental Education 6. Classroom Management 7. Guidance *8. Preschool Education Practice* 9. Techniques of Getting to Know an Individual	1. Special Teaching Methods 2. Creativity and Drama in Children 3. Special Education 4. Child Psychology, Adaptation Disorders and Guidance 5. Developing Instruments and Tools for Preschoolers 6. Instructional Technologies and Developing Instruments *7. Teaching Practice* 8. Elective Courses • Education of Children with Behavioral and Learning Disorders • Education of Children with Hearing, Speech, and Visual Disorders Development Individualized Educuation Programs in Preschool

Evaluation in the Program: Academic success of students is determined via central exams conducted according to regulations of Anadolu University on distance education. Students take exams three times a year (midterm, final, make-up) in the cities where their responsible offices are located. Exams are administered in 81 cities including Lefkosa (North Cyprus).

All the exams are in the form of multiple-choice and evaluated by computers. Students are required to be successful for each course. Evaluation system is out of 100. Passing grade for each course is calculated by 30% of the midterm and 70% of the final or the make-up.

Undergraduate English Language Teaching Program
This is a four-year undergraduate program run under the control of Open Education Faculty at Anadolu University.

The Rationale of the Program: In our country, although education faculties that have been training teachers since 1982 have contributed significantly to raising of teachers, they have both quantitative and qualitative difficulties in meeting the need for teachers. As a result, some fields have got teachers more than enough whereas some other fields like English language teaching have a severe vacancy problem that cannot be solved in a short time. Especially, since the introduction of eight-year compulsory education required teaching of English at the 4th and 5th levels of primary schools, the need for English teachers has become even more serious. It was not possible to meet this huge need although people did whatever they could. Considering the realities of our country, distance education was regarded as the most reasonable solution to meet the urgent need of English teachers without ignoring quality (www.anadolu.edu.tr.2004).

So, "Project to Train English Language Teachers" was prepared through co-operation between the Ministry of Education and Anadolu University. After signing the related protocol, Undergraduate English Language Teaching Program started.

Basic Features of the Program and Conditions of Acceptance: This is a four-year graduate program operating under the control of Open Education Faculty at Anadolu University. Launched in accordance with the protocol signed by the Ministry of Education and Anadolu University on February 2, 2000, is the equivalent of conventional English Language Teaching programs provided by education faculties.

This program is a "mixed education model" that is run both with a conventional and distance education design. Thus, the first two-year period of the program is completed conventionally while the last two-year period is completely conducted via distance education. Reading, Writing, Speaking and Grammar courses are carried out face-to-face for an interactive instruction during the first two-years. When students are equipped with an adequate command of English at the end of the first two-years, courses on professional knowledge and skills are conducted interactively on the Internet, and other courses are taught through printed materials (AUAOF, 2004, p.13).

Started in 16 cities, face-to-face education was limited to 10 cities in 2004-2005 educational year. Students can go on their training wherever they like for the last two-years of the program. Nevertheless, students have to pick up one of the cities where face-to-face education is held for their exams (www.anadolu.edu.tr. 2004). By 2005-2006 educational year, all other interactive education centers in other cities were closed, and Anadolu University Campus in Eskisehir became the only center for face-to-face education.

This program is planned and prepared according to conventional Undergraduate English Language Teaching Programs designed by the Higher Education Council. The principles of distance education were taken into account during planning and preparation. There are 30 courses some of which are integrated on an annual basis. 2000-2001 was the year when the program was launched after the approval of the Higher Education Council.

Students graduated from high schools and scored 185 or over in central Foreign Language Test (English) are accepted to the program (AU.AOF, 2004, p.13). There are 8896 students in the program and the following is the distribution of students according to educational years: 1733 students in 2000-2001, 3873 students in 2001-2002, 3091 students in 2002-2003, and 199 students in 2003-2004.

The Aim of the Program: This program aims to contribute to training of English Language Teachers needed in our country without ignoring the quality of education and with the least amount of cost. Students completing Undergraduate English Language Teaching Program successfully are given "BA Degree in English Language Teaching". These students are also appointed as English teachers by the Ministry of Education. Students can

discontinue their education at the end of the first two-year, and graduate with a "*Two-Year Undergraduate Degree*". Students with a two-year undergraduate degree and 3rd grade students who do not have any FF course from the previous years can work as substitute English teachers at schools or institutions where there is a need (www.anadolu.edu.tr. 2004).

The Content of the Program: Aiming to train qualified English Language Teachers, this program includes courses such as *professional knowledge on teaching, field knowledge, and general culture*. The first two years of the program cover face-to-face courses on field knowledge and world knowledge courses conducted via distance education. Courses in the last two years focus on field knowledge. Besides, courses about teaching profession are also administered during the last two years of the program. Courses of this program are depicted on Table 5.

Table 5. Courses in Undergraduate English Language Teaching Program

1st Grade	**2nd Grade**
1. Grammar I (face-to-face) 2. Reading Skills (face-to-face) 3. Speaking Skills (face-to-face) 4. Writing Skills (face-to-face) 5. Introduction to Teaching Profession (distance) 6. Basic Information Technologies (distance)	1. Grammar II (face-to-face) 2. Advanced Reading Skills (face-to-face) 3. Advanced Writing Skills (face-to-face) 4. Translation (Tur-Eng/Eng-Tur) (face-to-face) 5. *School Experience I (observation)* 6. Speaking and Writing in Turkish (distance) 7. Principles of Atatürk and The History of Revolution (distance) 8. Planning and Evaluation in Teaching (distance) 9. Development and Learning (distance)
3rd Grade	**4th Grade**
1. Introduction to Linguistics (distance) 2. Introduction to English Literature (distance) 3. Methods of Teaching English (distance) 4. Approaches in English Language Teaching (distance) 5. Teaching Foreign Language to Children (distance) 6. Classroom Management (distance) 7. Guidance (distance)	1. Instructional Technologies and Developing and Assessing Materials (distance) 2. Language Acquisition (distance) 3. Foreign Language Teaching Skills (distance) 4. Testing English (distance) 5. English / American Literature and Teaching (distance) 6. Turkish Phonology, Morphology, Syntax and Semantics (distance) 7. Pedagogical Grammar (distance) 8. *School Experience II and Teaching Practice* (distance)

In addition to theoretical courses, the program also offers two practical courses such as "School Experience I" and "School Experience II and Teaching Practice". School Experience I is administered in the second year, and requires students to observe the schools that they are assigned. School Experience II and Teaching Practice course is offered in the 4th year, and requires teaching internship from students.

Teaching-Learning Processes of the Program: The first two years of the four-year long Undergraduate English Language Teaching Program is conducted face-to-face. Face-to-face instruction is carried out in high schools that are approved to have appropriate conditions by the Ministry of Education in seven cities and in universities in three other cities. The courses are administered by formative English Language teachers of the Ministry of Education, and by instructors working at foreign languages departments of universities. Face-to-face instruction takes place after 04:00 pm during week days, and between 09:00 am and 04:20 pm at weekends (AU AOF, 2004, p.13).

The coursebooks of the residential part of the program are chosen among Longman's, Oxford's , Heinle's and Cambridge University Press' published books. Supplementary materials to be used during face-to-face education are prepared to reinforce and facilitate learning in the classroom. Coursebooks regarding the distance education part of the program are prepared by the scholars in a way that enables autonomous learning and according to the principles of distance education (AU.AOF, 2004, p.15). The books about professional knowledge of teaching and world knowledge are the same as the ones used in Undergraduate Preschool Education Teacher Training

Program. Each unit in these coursebooks include goals, content, instruction, text, summary, comprehension questions and bibliography.

In addition to these, instruction of 3rd and 4th year courses covering professional knowledge and skills are carried out online. The following is a short list of 3rd and 4th year courses administered on the net. 3rd year: Introduction to Linguistics, Introduction to English Literature, Methods of Teaching English, Approaches in ELT, and Teaching English to Children. 4th year: Language Acquisition, Foreign Language Teaching Skills, Testing English, English/American Literature and Teaching, Pedagogical Grammar. These courses are conducted unsynchronized, and each unit is covered in one week. Students can raise questions or share ideas with their friends online.

In terms of academic counseling services, Open Education Faculty offices in cities where face-to-face education is held offer solutions to students, or formative teachers can contact with the university through telephone or the Internet to help their students (AUAOF, 2004, p.27). Under academic counseling, students can find answers to their questions, their problems are solved, or they are referred to other sources of solution.

Evaluation in the Program: Academic success of students at Undergraduate English Language Teaching Program is determined according to the regulations of the university. 8th item of the related regulation sets that "one midterm, one final and one make-up exam are compulsory for each course. Besides, homework assignments and quizzes are also allowed. Exams may be both written and oral. It is the Faculty Committee that defines the number and the type of the exams that will be conducted (www.anadolu.edu.tr. 2004). Therefore, the committee has decided to administer five exams (three midterms, one final and one make-up) for the residential courses in the first two years (AU.AOF, 2004, p.17). Evaluation of students for the speaking course in the 1st grade is held orally by a jury consisting of a scholar from Anadolu University and a teacher who works where the exam takes place.

Exams are graded out of 100. Passing grade is calculated by midterm grades, quiz or homework assignment grades, and final or make-up grade. It is the Faculty Committee that decides how to calculate the passing grade for the courses in English. The weight of the final or make-up exam is 50%. Students have to score at least 70 out of 100 to be successful for the courses in English. Passing grade for the courses in Turkish is calculated by 30% of the midterm grade and 70% of the final or make-up exam grade. Students have to get at least 50 out of 100 to pass the courses in Turkish (www.anadolu.edu.tr. 2004).

RESULTS AND SUGGESTIONS

Being a modern and student centered approach distance education is carried out successfully in Turkey and in other countries, and contributes significantly to educational systems. Teacher training is one of the fields that distance education affects positively. Teacher training programs conducted via distance education serve various goals. These programs are used not only for pre-service and in-service training of preschool, primary and secondary education teachers, but also for their graduate studies.

In Turkey, Anadolu University Open Education Faculty has contributed tremendously to teacher training through two-year undergraduate and undergraduate compensatory programs for primary education teachers, undergraduate compensatory program for secondary education teachers, and undergraduate programs for preschool education teachers and English language teachers since 1986. Open Education Faculty has offered five programs during the last two decades, and these programs have both unique and common basic features shared by other applications in the world.

- Distance education programs were first used to train a great number of teachers. Almost 190.000 teachers were trained in a very short time through Two-Year Undergraduate Education Program, Undergraduate Compensatory Program for Primary Education Teachers, and Undergraduate Compensatory Program for Branch Teachers.
- These programs were administered to increase the quality of teachers. Two-Year Undergraduate Education Program, Undergraduate Compensatory Program for Primary Education Teachers, and Undergraduate Compensatory Program for Branch Teachers were open to remove the differences among educational levels of teachers, to increase the quality of teaching-learning, and to improve the qualities of teachers. These programs were open because training periods of teachers were thought to be insufficient.
- Programs started as two-year undergraduate degrees were converted into either undergraduate compensatory programs or undergraduate programs in time. Distance education is used to support

teachers' carrier studies. Teachers thinking to promote in their profession or intending to improve their qualities can easily benefit from distance education.

- Coursebooks, television programs, and academic counseling activities constitute the teaching-learning setting of these programs. Radio broadcasts were only used for Two-Year Undergraduate Education Program. Coursebooks are the basic learning environment for each program. Television programs function as supplementary source for the coursebooks. Computer assisted learning and the use of the Internet has become prevalent by Undergraduate English Language Teaching Program and Undergraduate Program for Preschool Teacher Training. Interactive learning environments have been introduced by Undergraduate English Language Teaching Program.
- Academic counseling services were held through guidebooks and brochures at first, but today these activities are provided via the Internet. Students can find immediate solutions to their questions and problems by this way.
- Conducted through distance education, these programs have shouldered a major role in finding solutions to problems in teacher training, and provided opportunities to train thousands of teachers quickly with the least cost possible. Unfortunately, the number of studies regarding these programs is fairly limited. There is a desperate need for studies that will be conducted on the characteristics of these programs.

Under the light of above evaluation, the following list of suggestions can be set forth for future teacher training programs.

- Distance education should be regarded as a vital option in continuous in-service training of teachers. Distance education should be effectively used to inform teachers about contemporary knowledge and skills, make them follow innovations in their fields, and give them the chance for their further carrier studies. Especially after current carrier requirements for teachers, people should make the most out of distance education to meet the educational needs of teachers.
- Teacher training programs should also include graduate education. Since the use of computer and the Internet have grown significantly, it is now easier both to open and to maintain graduate programs.
- Multi-faceted research studies about teacher training programs conducted through distance education should be carried out. These studies should assess and evaluate the programs. By this way, the characteristics of those programs and new ways to improve them may be figured out, and the results may be shared and compared with other studies in other countries, which might introduce those programs abroad.

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VIRTUAL MANIPULATIVES IN MATHEMATICS EDUCATION: A THEORETICAL FRAMEWORK*

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Abstract: *Meaningful educational activities and cognitive tools might improve students' active involvements in the teaching-learning process and encourage their reflections on the concepts and relations to be investigated. It is claimed that usage of manipulatives not only increase students' conceptual understanding and problem solving skills but also promotes their positive attitudes towards mathematics since they supposedly provide "concrete experiences" that focus attention and increase motivation. A concrete experience in mathematics context is defined not by its physical or real-world characteristics but rather by how meaningful connections it could make with other mathematical ideas and situations. For instance, a student might create the meaning of the concept "four" by building a representation of the number and connecting it with either real or pictured blocks. Computer manipulatives, also called virtual manipulatives, may provide interactive environments where students could pose and solve their own problems to form connections between mathematical concepts and operations, and get immediate feedback about their actions. Hence, it is necessary to design specific math manipulatives focussing at different mathematical concepts. Virtual manipulatives might also provide further advantages over physical manipulatives by eliminating some of the constraints they impose on the task. In this paper, virtual manipulatives in mathematics education will be introduced, their main characteristics will be explained and the implications of the usage of virtual manipulatives in mathematics classrooms will be thoroughly discussed.*
Keywrords*: virtual manipulative, mathematical abstraction, modeling*

INTRODUCTION

Mathematicians have used several tools, such as sliding rules, compass, calculators and recently computers, to simplify doing mathematics throughout history. However, employing tools in an education requires paying special attention to certain pedagogical concerns. Hence, the provision of tools is not just sufficient without clarifying adequately its place and the usage policy in the teaching-learning process. For instance, the computer, from the very beginning of its invention, has taken its place in education. Computers made life easier for mathematics educators and people doing mathematics with the help of several software packages capable of word-processing and making difficult mathematical calculations and drawings. Employment of computers in math classrooms became synonymous with learning how to use those software packages to simplify mathematical calculations such as Mathematica, Derive and MathCad. After computers became ubiquitous and affordable, attention soon shifted from "learning to use computers to do math" to "using computers as an aid in a math lesson". Earlier applications considered the computer as another medium to display and test the content material in the form of programmed instruction (Skinner, 1954) and intelligent tutoring systems (Koedinger et al. 1997). These systems mainly adopted drill and practice approach, advocated strict control over instructional method employed and the content material presented and generally hold the intrinsic view that the computer could become someday a good replacement for books and teachers to some extent. However, skeptical educators especially holding constructivist views opposed this approach and redefined the computer's role as a tool enabling free explorations of the concepts and relations in open ended tasks void of any instructional method and content. Several software packages, called microworlds, were implemented to enable explorations in math. Logo and dynamic geometry software applications such as Cabri and Sketchpad, are the most widely used and prominent of this kind. Incorporation of these packages into mathematics lesson required specific teaching activities and a large collection of activities accumulated over the years. Hence, computers' place and functionality in an educational context nowadays could best be described with a "cognitive tool" metaphor that supports cognitive apprenticeship by scaffolding the important processes of articulation and reflection that are the foundations of knowledge construction (Collins et al., 1989). Salomon et al. (1991) describes learning with computers as the mindful engagement of learners in the tasks afforded by the computer, i.e., an intellectual partnership with the computer. Norman (1993) also argues that computers support reflective thinking which is defined as the careful, deliberate kind of thinking that helps us not only make sense out of what we have experienced and what we know but also to compose new knowledge by adding new representations, modifying old ones, and comparing the two. Educators holding socio-cultural constructivist views may still be cautious about these applications since they are not designed in a way to support collaborative and cooperative learning strategies. However, computers role as a thought-provoking tool seems to be firm among educators whatever view they may hold. In fact, mathematics itself could be considered as a tool for problem solving and organizing one's thinking through mathematical modeling.

MATHEMATICAL MODELING

Mathematics is often seen as an isolated experience area performed just in schools alienated from real life. In fact, mathematics is a systematic way of thinking that produce solutions to problems by modeling real-world situations. *Modeling* could be defined as translating a problem at hand into mathematical notations, i.e., describing it in a mathematical language, by seeing mathematics as a tool for problem solving. In fact, all mathematical concepts have roots in the real world. A situation could be translated into the mathematical symbols in order to enable mathematical calculations. For example, the problem of bringing together two sets of sheeps having three and four sheeps respectively could be translated into mathematical symbols as 3+4 and the result is found as 7 seven sheeps. The process of mathematical modeling consists of three main stages; formulation of a real world situation as a mathematical problem (creation of a mathematical model), the mathematical solution of the problem and finally translating back the solution into the original context in order to interpret the results produced by the model to help solve the real problem (Berry & Houston, 1995). If the model acts in a way that truly parallels the original, then it becomes feasible to manipulate and employ the model to make predictions and conclusions about its counterpart in the real world (Post, 1981). Modeling is a way of simplifying the real world problems by making abstractions. Abstraction in turn is to reach a much more simple depiction of a system by deciding on the most significant elements and the salient features of the system and omitting other elements and features of minor importance. The aim of mathematical modeling, then, becomes to understand, to explain, to describe and to predict the different aspects of the real world. By the help of the mathematical models, we could enrich our understanding of the concepts and relations and learn how to control some aspects of the systems by predicting how their objects will behave under certain circumstances. For instance, the ancient Egyptians used geometry to model land problems and improve irrigation and astronomers used mathematical model in order to be able to accurately predict the motion of the planets.

Modeling might be used both as a teaching and assessment tool since mathematical models might be viewed as external indicators of student cognitive structures that are built and amplified through the tutor's interventions and the most important goal of teaching mathematics is to instill a value of the possibilities of using mathematical methods to handle incoming problems from all different parts of life (Duncan et al., 1996). The initial steps of mathematical modeling require identification of adequate and appropriate representations of the objects in the problem situation. Representations are interpretations of the reality. Mathematical concepts and relationships could be exemplified through these representations. Mathematical representations could help students recognize connections among related concepts and improve their communication skills in mathematics. Multiple representations, such as diagrams, graphical displays, and symbolic expressions, are also important to convey the various aspects of the same mathematical concept. However, representations, no matter how concrete they are, often does not serve the purpose of clarifying concepts if they are perceived as an end-product rather than as a tool to interpret the reality.

There are two different approaches in using models in learning environments; “Learning to model“ and “learning with models”. Learning to model approach advocates teaching how to model the reality. Learners are expected to construct their own models and models are used as a communication medium to express learner’s knowledge. Although microworlds such as Logo and Cabri could be regarded as adopting this approach to some extent, using computer as a tool to create novel models is not easy. For instance, Cabri geometry enables learners to make their own constructions and models. However, there is no way to check or to verify the consequences of the model. Likewise, one could solve certain mathematical problems with the help of Mathematica or other computer algebra systems but there is no mechanism to enter a model to be evaluated by these systems. This approach requires learners to have a significant understanding of the underlying objects of the model and could be regarded as the end product of an educational process rather than being used certain while concepts are trying to be conveyed.

Learning with models approach, on the contrary, encourage learners to solve problems by the help of ready-made models.

In fact, Simon (1981) argues that solving a problem simply means representing it so as the solution is transparent.

Learners are given ready models specially created for certain problems or situations and are required to change certain parameters in the model to be able to solve related problems. Learners are expected to see the relationships between objects in the model and expected to construct mathematical concepts through “mathematical abstraction”. This approach advocates creating specific models, activities and manipulatives, which is the main focus of this presentation, for every area of mathematics. Although there is a risk of rote-learning ready models without giving much thought, they might help learners gain problem solving skills which

constitutes substantial part of mathematics curriculum. Before delving into manipulative models, mathematical abstraction process needs to be further explained because of its vital role in gaining conceptual understanding using those manipulatives.

MATHEMATICAL ABSTRACTION

Mathematical abstraction has long been on the agenda of educators (e.g., Dienes, 1963; Piaget, 1970) and this in turn amounted to a large literature on this issue. Ozmantar (2005), in his extensive literature review, investigates the issue of abstraction in mathematics education under two broad categories: cognitivist and socio-cultural views. Ozmantar (ibid.) extracts three main features associated with mathematical abstraction within the cognitivist tradition: (1) generalisation arising from the recognition of commonalities isolated in a large number of specific instances; (2) an ascent from lower concrete levels to higher levels of abstract thinking; and (3) a process of decontextualisation.

Piaget (1970), within this tradition, talks about three different types of abstraction depending on where one directs his/her focus of attention; empirical abstraction on objects, pseudo-empirical abstraction on properties and reflective abstraction on interrelationship among actions. Mathematical ideas are classified by deep structure rather than by visible appearance or known functions like everyday objects (Dienes, 1963). Dienes describes abstraction as "the extraction of what is common to a number of different situations" (ibid., p.57). In his view, abstraction is a process of discovering 'the same type of patterns' among different situations which embody the same concept, i.e., formation of an isomorphism, for example, by constructing rectangles from a given set of unit squares. Hence, a concrete experience in mathematics context is defined not by its physical or real-world characteristics but rather by how meaningful connections it could make with other mathematical ideas and situations. For instance, a student might create the meaning of the concept "four" by building a representation of the number and connecting it with either real or pictured blocks. Sfard (1991) argues that abstract mathematical notions can be conceived in two different ways; operationally as processes and structurally as objects. Learners firstly get familiar with mathematical concepts by using the processes or operations, manipulatives in our case, and their conception later is detached from the process and seen as a new object belonging to a particular category of concepts through reflection on these actions. Hence, it is very important to encourage learners to reflect on actions they make in order to be able to perceive mathematical processes as objects.

Regarding the socio-cultural view, Ozmantar (2005) suggests that accounts of abstraction in this tradition are greatly influenced by such authors as Lave (1988), Leont'ev (1978) and Vygotsky (1978) all of whom are concerned with the connection of learning and knowledge to, for example, the context of the learning, social interaction, personal histories, and to tools and artefacts available in a learning situation. In this respect, Lave (1988), for instance, analyses the performance of shoppers who perform the presented calculations virtually always correctly; nonetheless, these shoppers' success rate falls dramatically when they are presented with the same calculations in paper-and-pencil format. On the basis of this observation, Lave argues that the setting itself creates problems and structures its own solutions. In a similar vein, Brown et al. (1989) states that all knowledge is inextricably a product of the activity and situations in which they are produced and action is grounded in the concrete situations in which it occurs. Similarly, Resnick (1991, p.2) argues that "every cognitive act must be viewed as a specific response to a specific set of circumstances".

An important figure in the studies of abstraction in this tradition is Van Oers (2001) who describes abstract thinking as a process of contextualising an experience through the manipulation of physical materials and cycles of perceiving to discover new features and conceptual reframing. Noss and Hoyles (1996) asserts that context could affect one's cognition in many ways at varying degrees, for instance, depending on the tools and resources available at hand. Central to their argument is the presence of a structure of a particular situation, called webbing, that enables learners to make use of the previous constructions they have made and coining the term 'situated abstraction' when referring to how the webbing of a particular setting shapes the way in which the ideas are expressed.

Recent educational theories promote developing conceptual understanding rather than teaching procedures and memorizing facts and formula. Hiebert et al. (1986) states that conceptual knowledge can be regarded as a connected web of knowledge, a network in which the linking relationships between the individual facts and propositions are as prominent as the discrete pieces of information. The conceptual knowledge takes meaning with the explicit relationships in a context and cannot be explicitly represented as an isolated piece of information. Hence, conceptual knowledge grows by the construction of new knowledge, and the relationships between constructed concepts are strengthened when one practices with tasks involving those concepts. Therefore, it is very important to devise appropriate tasks to relay certain concepts and accomplish effective teaching. Meaningful educational activities and cognitive tools might improve students' active involvements in

the teaching-learning process and encourage their reflections on the concepts and relations to be investigated. When students perform tasks that they perceive as purposeful and authentic, they show greater interest in and accept more responsibility for their own learning and set their own personal meaningful goals (Jones et al., 1997; Savery & Duffy, 1995). Students also obtain significant gains in the educational contexts where they are challenged (Vygostky, 1978), and the construction of new mathematical concepts only occurs when a need arises (Dreyfus et al., 2001).

MANIPULATIVES AS A MODELING TOOL

Manipulative materials are concrete models that involve mathematical concepts, appealing to several senses including the socio-cultural needs that can be touched and moved around by the learners (Heddens, 2005). Manipulatives are physical objects, such as base-ten blocks, algebra tiles, Unifix Cubes, Cuisienaire rods, fraction pieces, pattern blocks and geometric solids that can make abstract ideas and symbols more meaningful and understandable to students. They are widely used in mathematics education. Furthermore, the usage of manipulatives in classrooms have long been recommended by educators (NCTM 1989, p. 17) and even mentioned in state legislations in Texas, Chapter 75, as "new concepts should be introduced with appropriate manipulatives at the elementary and secondary levels"(Peavler et al. 1987). While it is virtually impossible to demonstrate a mathematical concept directly by the help of manipulatives, it is likely for a learner to construct a concept or discover a mathematical relationship through appropriate use of manipulatives with an adequate task. It is suggested that manipulative materials can be used as an intermediary between the real world and the mathematical world (Lesh, 1979). Moreover, the usage of manipulative materials as concrete models thought to be more abstract than the actual situation but less abstract than the formal symbols (Post, 1981). Dienes (1961) emphasizes using manipulatives in order to provide a concrete referent for a concept, often at more than one level, instead of a referent for a given abstract idea or procedure. Concrete materials such as geometry rods, geoboard, isometric papers, symmetry mirrors etc. are supposed to help students construct geometric ideas. Using manipulatives benefits students across grade level, ability level, and topics which using manipulative makes sense for that topic (Driscoll, 1983; Sowell, 1989; Suydam, 1986). A simplistic design that enables easy manipulation should be chosen while creating manipulatives and motivational concerns should be addressed. Every student should be given an opportunity to play with manipulatives. Just a demonstration by a teacher is not sufficient to realize their full potential and not in line with the theoretical rationale of their usage since they are meaningful to the extent they involve interactive activities. Furthermore, manipulatives should be carefully chosen with the levels of intended audience and the realistic models, such as 1 stick for the digit 1 and 10 stick together as digit 10 for base blocks, should be used in order not to mislead learners by causing misconceptions.

Suydam and Higgins (1976) believe that lessons involving manipulative materials, if employed properly, will produce greater mathematical achievement than will lessons in which manipulative materials are not used. In fact, their meta-analysis of the studies using manipulatives verified them. They gave the following suggestions, in the same report, on good use of manipulatives:

1. Manipulative materials should be used frequently in a total mathematics program in a way consistent with the goals of the program.
2. Manipulative materials should be used in conjunction with other aids, including pictures, diagrams, textbooks, films, and similar materials.
3. Manipulative materials should be used in ways appropriate to mathematics content, and mathematics content should be adjusted to capitalize on manipulative approaches.
4. Manipulative materials should be used in conjunction with exploratory and inductive approaches.
5. The simplest possible materials should be employed.
6. Manipulative materials should be used with programs that encourage results to be recorded symbolically.

Heddens (2005) argue that using manipulative materials in teaching mathematics will help students learn:

- to relate real world situations to mathematics symbolism.
- to work together cooperatively in solving problems.
- to discuss mathematical ideas and concepts.
- to verbalize their mathematics thinking.
- to make presentations in front of a large group.
- that there are many different ways to solve problems.
- that mathematics problems can be symbolized in many different ways.
- that they can solve mathematics problems without just following teachers' directions.

Clements and McMillen (1996) proposed that using manipulatives does not always guarantee conceptual understanding: In one study, students not using manipulatives outperformed students using manipulatives on a test of transfer (Fennema, 1972). Furthermore, students sometimes used manipulatives in a rote manner (Hiebert

and Wearne, 1992). Clements and McMillen (1996) claims that student often fail to link their action with manipulatives to describe the actions. Jackson (1979) identifies several common mistaken beliefs about manipulative materials including the facts that manipulatives do not necessarily simplify the learning of mathematical concepts, the more manipulatives used for a single concept-the better the concept is learned, and the manipulatives are more useful in the primary grades than in the intermediate and secondary grades, more useful with low-ability students than with high-ability students. In short, employing manipulatives in a class is not straightforward and good employment requires carefully defining the role of the teacher and the aims and the potentials of the tasks involved.

VIRTUAL MANIPULATIVES

A virtual manipulative is defined as "an interactive, web-based visual representation of a dynamic object that presents opportunities for constructing mathematical knowledge" (Moyer et al., 2002, p. 373). Visual representations of concepts and relations help learners to gain insight in mathematics. Virtual manipulatives enable as much engagement as physical manipulatives do since they are actual models of physical manipulatives mentioned above including Tangram and Geoboard (Dorwand & Heal, 1999). They may provide interactive environments where students could pose and solve their own problems to form connections between mathematical concepts and operations, and get immediate feedback about their actions that might lead them to reflect on their conceptualization. Although virtual manipulatives might simulate manipulatives in flesh, they are much more abstract since they do not allow hands-on activities. However, it is suggested that virtual manipulatives could be employed interchangeably with physical manipulatives in mathematics since manipulatives are not expected to make mathematical concepts “touchable” but to highlight the salient features of the concept to be covered. Hence, it is necessary to design specific math manipulatives focusing at different mathematical concepts. Virtual manipulatives might also provide further advantages over physical manipulatives by eliminating some of the constraints they impose on the task. Some computer manipulatives may be more beneficial than any physical manipulative. Artigue (2002) argues that mathematics education primarily does not aim to promote efficient mathematical practices with the help of available computational tools but rather concerned with the transmission of the bases of “mathematical culture”. Hence, efficient and successful use of virtual manipulatives is not self-evident and might require certain computational skills to be developed by a process of instrumentation. Furthermore, virtual manipulatives must be designed in a way to put focus on the mathematical concepts to be conveyed making their functionality as transparent as possible. Ozmantar (2005) argues that newly formed constructions are fragile entities and in need of consolidation. Hence, computer manipulatives could be used to reinforce the conceptual understanding. They could also be used to design extra-curricular activities since they are easily accessible both at home and the schools.

Any program having the following features can be thought as beneficial computer manipulative (Clements and McMillen, 1996, p.76). They

- ✓ have uncomplicated changing, repeating, and undoing actions;
- ✓ allow students to save configurations and sequences of actions;
- ✓ dynamically link different representations and maintain a tight connection between pictured objects and symbols;
- ✓ allow students and teachers to pose and solve their own problems; and
- ✓ allow students to develop increasing control of a flexible, extensible, mathematical tool. Such programs also serve many purposes and help form connections between mathematical ideas.

Selecting and using proper computer manipulative in learning environment should consider the following recommendations (Clements and McMillen, 1996, p.77):

- ✓ Use computer manipulatives for assessment as mirrors of students' thinking.
- ✓ Guide students to alter and reflect on their actions, always predicting and explaining.
- ✓ Create tasks that cause students to see conflicts or gaps in their thinking.
- ✓ Have students work cooperatively in pairs.
- ✓ If possible, use one computer and a large-screen display to focus and extend follow-up discussions with the class.
- ✓ Recognize that much information may have to be introduced before moving to work on computers, including the purpose of the software, ways to operate the hardware and software, mathematics content and problem solving strategies, and so on.
- ✓ Use extensible programs for long periods across topics when possible.

There are many funded projects in USA aiming to produce virtual manipulatives such as the national library of virtual manipulatives (NLVM) carried out by Utah State University (NLVM, 2005). Several java-based interactive mathematical manipulatives covering all areas of mathematics education at elementary and middle

school levels have been designed by NLVM team. NLVM is designed in a way that manipulatives are presented both across the grade levels and mathematical strands (number sense and operations, measurement, geometry, algebra, and data analysis and probability). However, it might be argued some of the developed manipulatives lack the desired level of interactivity, usability and motivation since they employ predefined problem sets and provide limited interactivity. There are also special sites aiming specific subject areas of mathematics. Some examples are as follows: "The geometry applet" offers users a dynamic experience in three dimensional geometry (Joyce, 2005);"Algebra tiles" gives opportunities to users for investigating concepts and relations in algebra (Texas A,2005); "Base ten blocks activities" helps users gain insights about place value and arithmetic operations (Mankus,2005).There are many web sites hosting virtual manipulatives in mathematics in the form of applets or mathlets. The readers may visit those sites and may get insights about their functionality and reasoning (CTME, 2005).

CONCLUSION

The integration of technology into mathematics instruction requires students to be comfortable with new mathematical representations. Virtual manipulatives have been introduced in this article as viable computer applications both to get learners familiar with mathematical representations and to help them appreciate the meaningful applications of mathematics to solve real-world problems. Most manipulatives in mathematics simply implements the "learning with model" approach. However, educators also need to consider the possibility of designing manipulatives employing "learning to model" approach since full potential of any technological device could be achieved through its usage as a communication tool to model the concepts and relations at hand. The potential of virtual manipulatives for improving the quality of mathematics education is very promising since everyday new projects and web sites are developed for designing virtual manipulatives for some area of mathematics. Unfortunately, there seems to be no ongoing project in Turkey aiming to create computer-based mathematical manipulatives or learning tools. Hence, Turkish educational technologists should immediately start developing such projects in cooperation with mathematics educators. Although it is a good start to instigate campaigns to provide computer equipments and internet connections to every school in the country, policy makers should also focus on how these equipments will be employed to create learning environments providing thought-provoking activities. Direct translation of available virtual manipulatives into Turkish is not desirable and some cultural and contextual alterations to the design of the manipulatives might be required to meet the needs of Turkish audience since manipulatives could be regarded as a social medium.

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ÇEVRİMİÇİ EĞİTİMDE AKADEMİK BAŞARIYI ETKİLEYEN GÜDÜLENME YAPILARI

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ÖZET
Son yıllarda hızlı bir gelişme gösteren çevrimiçi eğitim, geleneksel eğitim ortamlarındaki zaman ve yer sınırlılıklarını ortadan kaldırmakta, yeni öğrenme çeşitlilikleri yaratmaktadır. Bu makalenin amacı, öğrencilerin başarılı olması için gerekli güdülenme yapılarından; öz- yeterlik (self-efficacy), kendi kendini düzenleme (self-regulation) ve başarı amaçlarını (achievement goals), literatür bulgularına dayalı olarak çevrimiçi eğitim ortamı için detaylı şekilde tartışmaktır.

Anahtar Sözcükler: Çevrimiçi eğitim (online eğitim), güdülenme, öz-yeterlik, akademik başarı.

ABSTRACT
Online education which has been in a rapid growth in the recent years, removes the time and place restrictions in the traditional education environment and create the new modality of learning. The purpose of this article is to discuss in detail self-efficacy, self-regulation and achievement goals which are the motivational constructs for success of the online students. The discussion is based on the findings of the literature review for the online education environment.

Keywords: Online education, motivation, self-efficacy, academic achievement.

GİRİŞ

Uzaktan eğitimin bir alt kategorisi olarak "çevrimiçi (online)" eğitim son yıllarda büyük gelişme göstermiştir. Geleneksel eğitim ortamlarındaki zaman ve yer sınırlılıklarını ortadan kaldırabilen, her yerde ve her zamanda gerçekleştirilebilen çevrimiçi eğitim, çekici eğitim seçenekleri sunmakta ve yaşam boyu öğrenme olanakları sağlamaktadır.

İster ilköğretim, ister ortaöğretim, isterse de yüksek öğretim seviyelerinde olsun, dünyanın pek çok ülkesindeki eğitim kurumu, çok çeşitli disiplinlerde çevrimiçi dersler vermektedir. Ancak çevrimiçi ortamda öğrenmenin geleneksel yüz yüze öğrenme kadar kaliteli olabileceği savları, ister istemez bazı soruları da düşündürmektedir: Acaba herkes her yerde ve her zamanda öğrenebilir mi? Yoksa böyle bir öğrenme ortamında öğrenen bireylerin daha başarılı olmasını sağlayacak birtakım beceri ve stratejiler var mıdır?

Bu makalenin amacı, çevrimiçi ortamda öğrenen öğrencilerin başarılı olması için sahip olması gereken güdülenme yapılarını detaylı bir şekilde inceleyerek yeni bir öğrenme paradigması ortaya koymaktır.

ÇEVRİMİÇİ (ONLİNE) EĞİTİM

Çevrimiçi eğitim, günümüzdeki mevcut öğrenme biçimlerinin en dinamik ve zenginleştirilmiş biçimlerinden birisidir. Çevrimiçi eğitim, öğretici ve öğrencilerin zaman ve coğrafik konum olarak birbirlerinden ayrı şekilde gerçekleşen formal bir öğretim olarak tanımlanan (Holmberg, 1989:6) uzaktan eğitimin bir alt kategorisidir.

Geleneksel uzaktan eğitim modelleri, öğrencinin bağımsızlığını ve öğrenmenin özelleşmesini vurgulamakla birlikte, çevrimiçi eğitim bir grup etkinliğidir ve örgün eğitimde mevcut olan sosyal etkileşim sürecini de içinde barındırmaktadır. Harasim, (1990:42)'e göre, tarihsel olarak öğrenciler arasındaki etkileşim ve işbirliğinin sosyal, duyuşsal ve bilişsel yararları, yalnızca yüz yüze yani örgün öğrenmede mümkün olmaktadır. Oysa çevrimiçi eğitim, eğitim ortamındaki etkileşim açısından büyük olanaklar yaratmaktadır. Çevrimiçi eğitimin beş özelliği şöyle belirtilmektedir:

- Çok fazla kişiyle iletişim kurma,
- Bağımsız yer,
- Bağımsız zaman (esnek zaman),
- Metine dayalı iletişim,
- Bilgisayar ortamlı etkileşim (Harasim, 1990:43).

Çevrimiçi eğitim ortamları, öğretimi yaymak için "Bilgisayar Ortamlı İletişim" i (Computer-Mediated Communication-CMC) kullanırlar. CMC, çevrimiçi eğitimde önemli bir rol üstlenmekte olup, çevrimiçi ortamda öğrenciler ve öğreticiler arasındaki bir etkileşim aracıdır. Etkileşim, CMC'nin ayırt edici bir özelliğidir. CMC, yüksek derecede etkileşimli, eşzamanlı ya da eşzamansız çok çeşitli iletişim yoluyla gerçekleştirilmektedir. Son on yıl içerisinde, bilgisayar ağlarının hızlı bir şekilde gelişmesi ve internetin yaygınlaşması, çevrimiçi eğitimin verilmesinde temel bir rol üstlenen CMC'nin kullanımını daha da artırmıştır.

CMC, üç tip çevrimiçi hizmetin desteğini almaktadır: elektronik posta (e-mail), bilgisayarlı konferans ve çevrimiçi veritabanları. Bu hizmetler, ders içeriği konusunda "öğrenme ortaklıkları (learning communities)" oluşturmada eğitimcilere oldukça yararlı olmaktadır. Elektronik posta, öğrenciler arasında ve öğrenci ile öğretici arasındaki, temel çevrimiçi iletişim biçimini oluşturmaktadır. Çevrimiçi veritabanları ise, öğrencilerin, bilgiye ulaşma, kendi bilgi alt yapılarını oluşturma ve öğrenme ortaklığına katkıda bulunma becerilerini geliştirmektedir. Bilgisayar ağlarının (network) kullanımıyla gerçekleşen bilgisayarlı konferans da, fikir alışverişlerinin ve tartışmaların yapıldığı ortaklaşa bir öğrenme ortamıdır (Gunawardena ve McIsaac, 2004: 370).

GÜDÜLENME

Güdülenme, hangi çeşit eğitim ortamı olursa olsun öğrenmenin en önemli bileşenlerinden birisidir. Eğitim alanında güdülenme konusuna oldukça yer verilmiş, güdülenmeye karşı geliştirilen kuramsal yaklaşımlarca pek çok güdülenme tanımı ortaya atılmıştır. Genel olarak güdülenme, kişileri belli faaliyetleri yapmaya yönelten, enerji veren ve insanların içinde oluşan fizyolojik, bilişsel ve duyuşsal boyutları olan bir güçlenme durumu olarak tanımlanmaktadır (Fidan, 1997: 130). Bununla birlikte güdülenme, bireyleri bazı amaçlara yönlendirmektedir. Çünkü güdülenme, doğrudan işe hız kazandıran amaçları içermektedir. Sonuç olarak bireyler kafalarına koydukları şeyi elde etmek (veya ondan kaçınmak) için çaba harcamak veya sabretmek gibi fiziksel faaliyetler; planlamak, tekrarlamak, düzenlemek, izlemek, karar almak, problem çözmek ve süreci değerlendirmek gibi bilişsel faaliyetler içerisine gireceklerdir (Pintrich ve Schunk, 1996:5).

Öğretme-öğrenme süreci içerisinde, öğrenmeye karşı ilgisini ve dikkatini sürekli tutan, çaba gösterme konusunda gerekli gayreti sarf eden, konuya odaklaşan ve güçlüklerle karşılaştığında hemen vazgeçmeyip ısrarcı olan kişi yüksek derecede güdülenmiş demektir.

Uzaktan eğitim gören öğrenciler, bazı yönleriyle geleneksel sistemdeki öğrencilerden ayrılmaktadır. Çünkü uzaktan eğitimde öğrenme daha bireysel ve bağımsız bir etkinlik olduğu için, etkili öğrenmenin gerçekleşebilmesi için gerçek güdülenme şarttır (Kaya, 2002: 20). Uzaktan eğitim veren çevrimiçi bir sınıftaki öğrencilerle, eşdeğer geleneksel bir sınıftaki öğrencilerin öğrenme biçimlerini karşılaştıran Diaz ve Cartnal'ın (1999:11) araştırması, uzaktan öğrenen öğrencilerin, geleneksel sistemdeki öğrencilerin sahip olduğu sınıftaki ödül yapısı olmaksızın içten güdülenerek daha iyi çalıştıklarını göstermektedir.

Eğitim alanında geliştirilen güdülenme kuramlarından Sosyal Bilişsel Öğrenme Kuramı'nda, bireylerin yeterlik algılarını, bilişsel strateji kullanma becerilerini ve başarıya yönelik davranışlar belirlemelerini inceleyen güdülenme yapıları öğrencilerin akademik başarılarını etkileyebilmektedir. Bu güdülenme yapılarından bu araştırmada ele alınacak olan; öz-yeterlik (self-efficacy), kendi kendini düzenleme becerisi (self-regulation) ve başarı amaçlarıdır (achievement goals).

ÖZ YETERLİK (SELF-EFFICACY)

Sosyal öğrenme kuramının kurucusu Bandura, öz-yeterliği, kişilerin belirtilen performans tiplerine ulaşmak için gerekli faaliyetleri düzenleme ve gerçekleştirme yeteneklerine ilişkin yargıları olarak tanımlamaktadır (Bandura, 1986:391'den aktaran: Schunk 1991:207). Öz- yeterlik beklentileri ya da inançları, kişilerin ne kadar çaba harcayacaklarını ve güçlükler karşısında ne kadar uzun süre gayret göstereceklerini ve zor durumlarla karşılaştıklarında nasıl kendilerini toparlayabileceklerini belirlemelerine yardımcı olmaktadır (Bandura, 1977:194; Pajares, 2002:10).

Bandura (1977:195)'ya göre herhangi bir durumdaki yeterlik beklentisi dört kaynaktan ortaya çıkmaktadır: (a) Bireyin daha önceki başarı ve/veya başarısızlık deneyimlerini içeren performans başarıları; (b) diğer kişilerin yaptığı etkinliklerin sonuçlarından elde edilen başkasının deneyimleri; (c) bireylerin yapabileceği etkinlikler konusunda sözel olarak ikna olması; (d) endişe, stres, yorgunluk, ruhsal durum gibi duygusal uyarılma durumları. Öz-yeterlik beklentisinin ortaya çıkmasına neden olan bu kaynaklar incelendiğinde, performans başarılarının, yeterlik bilgisinin en etkili kaynağı olduğu ve kişisel öğrenme deneyimlerine dayalı olduğu görülmektedir. Bireylerin elde ettiği başarılar öğrenme beklentilerini arttırmakta, tekrarlanan başarısızlıklar ise öğrenmeyi azaltmaktadır. Sonuçta bu deneyimlerin, öğrencilerin okuldaki başarılarını arttırmaya ilişkin önemli

bilgiler verdiği görülmektedir. Bunun yanı sıra, başka kişilerin deneyimleri, kişilerin kendi performans başarıları kadar güçlü olmasa bile, özellikle yeni bir becerinin öğreniminde başarılı bir modeli gözlemek yararlı olmaktadır (Alderman, 1999:62). Olumlu ve olumsuz sözel mesajlar da yeterlik beklentisini etkilemekte, örneğin birisinin verilen durumun gerektirdiği becerilere sahip olduğu ikna edici bir biçimde savunulduğunda öz-yeterlik beklentileri artabilmektedir (Eysenck, 2000: 463). Aynı şekilde yapılacak göreve ilişkin kuvvetli duygusal tepkiler (stres, endişe), sonuçların başarı ve başarısızlığını sezme konusunda ipuçları vermektedir (Bandura, 1977:199).

Öz-yeterlik beklentisi yüksek öğrenciler, öğrenme etkinliklerine daha isteyerek yaklaşmakta, büyük çaba harcamakta, güçlükler karşısında uzun süre gayret ederek daha etkili stratejiler kullanmakta ve düşük beklentisi olan öğrencilerden daha yüksek performans göstermektedir (Eggen ve Kauchak, 1999:403). Sonuç olarak, öz-yeterlik beklentisi inançları, bireylerin ulaştıkları başarı seviyesinin kuvvetli belirleyicileri olduğu ve insan davranışında bir anahtar rolü üstlendiği söylenebilmektedir.

Bazı araştırmacılar, öz-yeterlik beklentisini çevrimiçi uzaktan eğitim gören öğrenciler üzerinde incelemişlerdir. Lim (2001:41), öğrencilerin bilgisayar konusundaki öz-yeterlik beklentileri, akademik benlik kavramları, yaşları, cinsiyetleri, akademik konumları, bilgisayar kullanım yılları, bilgisayar kullanım sıklıkları, bilgisayar eğitimleri, internet deneyimlerini araştırmıştır. Bu araştırmada, bilgisayar konusundaki öz-yeterlik beklentisinin, istatistiksel açıdan anlamlı tek önceden kestirim sağlayacak değişken olduğu ortaya koyulmuştur. Wang ve Newlin (2002:160)'in kolej öğrencilerinin, web tabanlı çevrimiçi dersleri seçme nedenlerini araştırdıkları çalışmada ise, öğrencilerin öz-yeterlik beklentileri, final sınav sonuçlarıyla ilişkili bulunmuştur. Sözü edilen çalışmada, öz-yeterlik beklentisi puanlarının, final sınavı puanlarını önceden belirleyebileceği ortaya konmuştur.

KENDİ KENDİNİ DÜZENLEME (SELF-REGULATION)

Kendi kendini düzenleme, kişinin, düşüncelerini, duygularını ve eylemlerini amaçlarına ulaşacak şekilde yönlendirmesi için gösterdiği sistematik çabalar olarak tanımlanabilmektedir (Schunk, 2001:1).

Kendi kendini düzenleyen öğrenciler, akademik amaçlarını belirleyerek bu amaçlara ulaşmak için gerekli öğrenme stratejilerini seçer ve amaç sürecini devamlı olarak izlerler. Amaçlarını ortaya koyan, etkili biçimde planlama yapan ve amaç sürecini sürekli izleyen öğrenciler, akademik açıdan, bu etkinlikleri yapmayan diğer öğrencilerden daha yüksek başarı göstermektedir (Kovach, 2000:1). Bu alanda yapılan araştırmalara bakıldığında, kendi kendini düzenleme stratejilerinin etkili bir şekilde kullanıldığında öğrencilerin akademik başarısını etkilediğini ve kendi kendini düzenleyerek öğrenme stratejilerini kullanma ile derslerin final notları arasında olumlu ilişki olduğu ortaya koyulmuştur (Volters, 1998:231).

Howland ve Moore (2002:188)' un araştırmasında, öğrenciler, çevrimiçi şekilde internet üzerinden alınan derslerdeki bilgiyi organize etmenin, yapılacak çalışmaları ve zamanı düzenlemenin önemini belirtmişlerdir. Kendi kendini yönetme, kendini gözleme ve güdüleme, yüz yüze verilen derslerde olduğu kadar çevrimiçi derslerde de başarılı olmak için gereklilik olarak görünmektedir. Sözü geçen bu çalışmada, öğrenciler, yüz yüze öğrenme ortamındaki yapı olmaksızın belli bir çalışma takvimine uymanın güçlüğünü ve kendi kendini düzenlemenin önemli bir gereksinim olduğunu belirtmişlerdir.

Çevrimiçi derslere katılan bir öğrencinin başarılı olması için, öz-disiplin, inisiyatif, kendi kendini güdüleme, karar verme, zamanını iyi kullanma yani zaman yönetimi gibi becerilere sahip olması bir gereksinim olarak ortaya çıkmaktadır.

BAŞARI AMAÇLARI (ACHIEVEMENT GOALS)

Bir kişinin yapacağı işe ilişkin amaç belirlemesi, o kişinin yaptığı işi nasıl daha iyi yapabileceği hakkında bilgi edinerek öğrenme ve güdülenmesini etkilemektedir (Alderman, 1999:88). Herhangi bir işi ya da görevi yerine getirme durumunda amaçlarını ortaya koyan kişi, dikkatini ve eylemini amaçlarına doğru yönelterek, görevi başarmak için çaba ve gayret ederek, başarıya ulaştıracak plan ve stratejileri seçip uygulayarak güdülenme ve öğrenmesini artırmaktadır.

Bir önceki bölümde anlatılan kendi kendini düzenleme kuramları zaten amaçlar üzerinde yoğunlaşmaktadır. Amaçlar, kendi kendini düzenlemenin farklı evrelerini içermektedir. Bunlar; bir amaç saptama ve amaç stratejilerine karar verme, performans kontrolü ve kendini yansıtmadır. Amaçlar, insanları istenen görevleri yerine getirmek için gerekli çabayı harcama ve daha fazla gayret gösterme konusunda güdülemektedir. İnsanlar herhangi bir görev ya da iş üzerinde çalıştıklarında, kendi performanslarını amaçlarıyla karşılaştırmaktadır. İnsanların bu şekilde kendilerini değerlendirmeleri, kendi yeterliklerine olan inancı güçlendirmekte ve

dolayısıyla güdülenmeyi artırmaktadır. Amaçlara ulaşma, öz-yeterlik beklentisini yaratmakta ve insanların yeni amaçları seçerek onlarla mücadele etmelerinde yol göstermektedir (Schunk, 2001:2).

Başarı amaçları, bir bireyin başarı meşguliyetinin maksadını ifade etmektedir. Başarı amaçlarının; öğrenme amaçları (learning goals) ve performans amaçları (performance goals) olmak üzere iki genel tipi vardır. Eğitim araştırmacıları, öğrenme amaçları ile performans amaçları arasında bazı farklılıklar olduğunu ortaya koymuşlardır. Öğrenme amaçları ile akademik öz-yeterlik algıları ve etkili öğrenme stratejilerini kullanma arasında olumlu ilişkiler olduğu belirtilmektedir (Middleton ve Midgley, 1997:711). Performans amaçlarının da güçlü güdüleyici etkileri vardır, ancak özellikle öğrenme amaçları kendi kendini düzenleme ve öz-yeterlik beklentisini artırma konusunda etkilidir (Schunk, 2001:3).

Özet olarak güdülenme yapılarından biri olarak başarı amaçları alanı, öğrencilerin başarmak için meşgul oldukları işe ya da göreve ilişkin nedenlerini, amaçlarını incelemektedir. Araştırmacılar, bu konunun geleneksel yüz yüze eğitim ortamlarındaki akademik başarıyı önceden belirleyebilecek önemli bir güdülenme yapısı olduğunu belirtmişlerdir. Ancak bu konunun çevrimiçi eğitim ortamlarında daha fazla araştırılması bir gereksinim olarak görünmektedir.

SONUÇ

Özellikle 20. yüzyılın sonlarında bilgisayar ve iletişim teknolojilerinin çok hızlı gelişme göstermesi ve 21. yüzyılın başında da bu gelişmelerin artık gündelik yaşamın sıradan olaylarından biri haline gelmesi, çevrimiçi teknolojileri kullanan geleneksel derslerin sayısını da artırmaktadır. Artık geleneksel eğitim ortamlarında bile, öğreticiler, derslerini gerçekleştirirken yüz yüze eğitime yakın bir şekilde, kendileri ile öğrencileri ve öğrencilerin birbirleriyle etkileşim ve bilgi alışverişine olanak veren çevrimiçi ortamları kullanabilmektedir. Bu da hem geleneksel, hem de çevrimiçi öğrencilerin, uzaktan öğretim metotları ile karşı karşıya kalmasına neden olmaktadır. Bu nedenle, uzaktan öğrenme ortamlarına başarılı uyum sağlanabilmesi açısından, güdülenme ve öğrenme stratejileri hakkında bilgiler verilmesi yararlı olacaktır.

Daha önceki bölümlerde incelendiği üzere, çevrimiçi eğitim ortamlarındaki akademik başarıyı hangi güdülenme yapılarının nasıl etkilediğine yönelik daha fazla araştırmaya gereksinim vardır. Eğitim kurumları, eğitimciler ve öğretim tasarımcılarının, bir ders yapılmaya başlamadan önce, öğrencilerin algılaması, güdülenmeleri, öğrenme stratejileri hakkında daha fazla bilgi elde etmesi, çevrimiçi eğitim çeşitliliğini anlamalarına, elde ettikleri bilgileri öğretimde kullanmalarına ve sonuç olarak öğrencilerin eğitim amaçlarını gerçekleştirmesine hizmet edecektir.

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GENETİK KONUSUNDA BİLGİSAYAR DESTEKLİ MATERYAL GELİŞTİRİLMESİ VE 5E MODELİNE GÖRE UYGULANMASI[5]

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ÖZET
Bu araştırmanın amacı; fen bilgisi öğretmenliği son sınıfta yer alan Biyoloji V (Genetik) dersi kapsamında; öğretmen adaylarının anlamakta zorluk çektikleri, kromozom-DNA-gen kavramları, genetik çaprazlama ve klonlama konuları ile ilgili animasyon ve simülasyonlardan oluşan Flash programında hazırlanmış bilgisayar destekli öğretim materyalleri geliştirmek ve bu materyalleri 5E modeline dayalı planlanan etkinlikler içerisinde kullanarak öğrenme üzerine olan etkilerini tespit etmektir. Araştırma 2004-2005 bahar yarıyılında KTÜ Fatih Eğitim Fakültesi Fen Bilgisi Öğretmenliği programı son sınıfta öğrenim gören 25 öğretmen adayı ile yürütülmüştür. Etkinliklerin uygulanmasından önce ve sonra öğretmen adaylarına uygulanan testlerden elde edilen bulgular değerlendirilirken, "cevapları kodlama sistemi" kullanılmış ve adayların seviyelerindeki değişimler grafikler yardımıyla gösterilmiştir. Testlerden elde edilen bulgular 10 öğretmen adayı ile yapılan mülakatlarla da desteklenmiştir. Örneklem ile yürütülen etkinliklerden elde edilen bulgulara dayalı olarak, adayların seviyelerinde tespit edilen olumlu yöndeki değişimler, bütünleştirici öğrenme ortamında bilgisayar destekli öğretimin kullanılmasının genetik kavramlarının öğretiminde başarıyı yükselten bir etkiye sahip olduğu sonucuna varılmıştır. Araştırma, biyoloji eğitimcilerinin öğretmen adaylarında biyolojinin farklı konularında var olan kavram yanılgılarını tespit ederek, bunlara uygun bilgisayar destekli materyalleri kendilerinin tasarlamaları veya geliştirmelerinin önemine yönelik önerilerle tamamlanmıştır.
Anahtar Kelimeler: Bilgisayar Destekli Biyoloji Eğitimi, Materyal Geliştirme, 5E Modeli

THE DEVELOPMENT OF COMPUTER BASED MATERIAL ABOUT GENETIC AND APPLICATION ACCORDING TO 5E MODEL

ABSTRACT
The aim of this study is to develop instructional materials including simulations and animations produced by using the Flash computer program for the chromosome-DNA-gene concepts and genetics, crossing and gene cloning topics, in which students teachers have problems to learn, taught in Biology 5 at the fourth year of primary science teacher education program and then, to determine the effects of these materials on learning by using them with the teaching activities designed according the 5E teaching model. The study was carried out with 25 primary science student teachers attending primary science teacher education program in Karadeniz Technical University Fatih Faculty of Education, in the spring term of the 2004-2005 academic year. An "answer coding system" was used in analyzing the findings from the tests applied before and after the activities and graphics were used to indicate changes in the student teachers' achievement levels. The findings from the tests were supported by the data obtained from the interviews conducted with ten student teachers who showed constant conceptual change. It was concluded that, based on the findings obtained from the activities run with the student teachers, positive changes in the student teachers' achievement levels indicated that the use of computer based instructional materials in an constructivist learning environment had an effect that increased student teachers' achievement in genetics. The paper ended with suggestions emphasizing the importance of science teacher educators determining their student teachers' misconceptions in different biology topics and then, developing appropriate computer-based instructional materials.
Key words: Computer Aided Biology Teaching, Material Development, 5E Model

GİRİŞ

Ülkemizdeki eğitim sistemi incelendiğinde çoğunlukla içe dönük, kapalı bir sınıf ortamı; bir öğretmen ile bir grup öğrenci, ders kitabı, sıra ve yazı tahtasından oluşan geleneksel bir yapıyla karşılaşılmaktadır (Başaran, 1993). Genellikle fizik, kimya ve biyoloji alanlarında bir çok konuda soyut kavramların olduğu ve öğrencilerin bu alanlarda kavram yanılgılarının bulunduğu, öğrendikleri bilgileri günlük hayatla ilişkilendiremedikleri bilinmektedir (Ayas ve Özmen, 1998; Kadıoğlu, 1996; Özmen, İbrahimoğlu ve Ayas, 2000). Genetik konusu biyoloji eğitim-öğretiminde en çok sorunla karşılaşılan konular arasında yer almaktadır (Johnstone and Mahmoud, 1980; Kindfield, 1991; Ramorago ve Wood- Robinson, 1995; Bahar, Johnstone Hensell, 1999; Bahar, Johnstone ve Sutcliffe, 1999; Özcan, 2000; Tsui ve Treagust, 2003). Bununla birlikte, bu konudaki problemlerin

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çözümünde eğitim-öğretim sürecinde kullanılan materyallerin ve geleneksel öğretim yöntemlerinin mevcut şartlarda önemli ölçüde yetersiz kaldığı, kavramsal öğrenmeyi desteklemediği ifade edilmektedir (Şahin ve Parim, 2002; Saka ve Cerrah, 2004). Kavramsal öğrenmenin gerçekleşmemesi bütün öğretim kademeleri için bir sorun olarak görülmektedir. Özellikle öğretmen adayları söz konusu olduğunda, bu durum çözülmesinde öncelik verilmesi gereken bir problem haline gelmektedir. Bunun nedeni ise, geleceğin fen bilgisi öğretmenlerinin sahip oldukları kavram yanılgılarının, onlar aracılığı ile yüzlerce öğrenciyi etkileyecek olmasıdır.

Eğitim sürecinin en önemli öğelerinden biri olan öğretmenler, sınıftaki öğrenme-öğretme etkinliklerinden birinci derecede sorumlu olan kişilerdir. Bu nedenle öğretmenlerin çağdaş öğretim yöntemleri ve teknolojiyi kullanmaları, eğitim kalitesinin artması açısından önem arz etmektedir (Reis, 2004). Teknolojideki hızlı gelişmeler ve eğitim-öğretim yöntemlerindeki yeni arayışlar, geleneksel yöntemlerle sürdürülen biyoloji öğretimi yerine animasyon ve simülasyonların kullanıldığı etkileşimli, bilgisayar destekli öğretimi alternatif bir seçenek olarak ortaya çıkarmıştır. Bilgisayarla ilgili teknolojiye sınıflarda ulaşabilme imkânının artması kavramsal gelişim ve değişim üzerine etkilerinin araştırılmasını teşvik etmiştir. Simülasyon yeteneği, olayları tasvir etme ve kullanıcılara etkileşim halinde olma imkânı sunmaktadır. Bununla birlikte, öğrenenlere kavramsallaştırmada yardımcı olduğu bilinmektedir. Fen eğitiminde kullanılan geleneksel objektivist yaklaşımlar nedeniyle, sınıfta bilgisayar kullanılarak ders yürütme uygulamalarına genelde rastlanmamaktadır. Windschitl ve Andre (1998) yaptıkları bir çalışmada, geleneksel simülasyon kullanımının bütünleştirici yaklaşımda simülasyon kullanımı kadar etkili olmadığını ortaya çıkarmışlardır. Bütünleştirici simülasyon yaklaşımı zengin şartlar ve çevrede öğrencilere kendi hipotezlerini değerlendirme fırsatı sağlamaktadır. Bütünleştirici yaklaşımın bilgisayar simülasyonlarında kullanımı, kavramsal değişim stratejilerinin nitelikleriyle bağdaşmaktadır. İyi tasarlanmış simülasyonlar öğrenenlere bilişsel temsil etme biçimini, bilgisayar ekranından seçme olanağı sunmaktadır. Bu da onlara olaylar hakkında hipotez geliştirme olanağı sunmada ve kendi problem çözme yollarını sağlamada yardımcı olmaktadır (Windschitl ve Andre, 1998). Üniversitelerde bütünleştirici öğrenme uygulamalarına yer verilmesi gerektiği düşünülmektedir. Bu sayede öğrencilerin üst düzeyde bilişsel, duyuşsal ve devinişsel davranışları kazanmalarının daha kolay sağlanacağı belirtilmektedir (Aytunga, 2003). Bununla birlikte Aytunga (2003), yaptığı bir çalışmasında, yükseköğretimde bütünleştirici öğrenme yaklaşımı uygulamalarının ve değerlendirilmesini içeren araştırmaların yapılmasını önermektedir.

Saka ve Akdeniz (2004a) tarafından yapılan bir araştırmada fen bilgisi öğretmen adaylarının genetiğin farklı konularında yaygın kavram yanılgıları olduğu tespit edilmişti. Belirlenen bu yanılgılardan bazıları aşağıda sıralanmıştır: 1.Çaprazlama; erkek ve dişi hücrelerden gelen genlerin harflerle sembolik olarak birbirleriyle yazılmasıdır. Çaprazlama, aşılama yapmaktır. 2. Kromozom-gen-DNA kavramları ile ilgili yanılgılar: DNA kromozomun bir parçasıdır; kromozom DNA'nın bir parçasıdır; kromozom ve DNA aynı şeydir; gen ve DNA aynı şeydir; DNA, kromozom ve gen birbirlerinden ayrı parçalardır; DNA, gen ve kromozomlar stoplazmada yer alır. 3. Klonlama bir canlı ile aynı yaşta, aynı kişilikte olan yeni bir canlı üretmedir. Yapılan bu çalışmada söz konusu yanılgıları gidermeye yönelik geliştirilen materyallerin uygulanma süreci ve sonuçları üzerinde durulmuştur.

AMAÇ

Bu araştırmanın amacı; fen bilgisi öğretmenliği son sınıfta yer alan Biyoloji V (Genetik) dersi kapsamında; öğretmen adaylarının anlamakta zorluk çektikleri, kromozom-DNA-gen kavramları, genetik çaprazlama ve klonlama konuları ile ilgili animasyon ve simülasyonlardan oluşan Flash programında hazırlanmış bilgisayar destekli öğretim materyalleri geliştirmek ve bu materyalleri 5E modeline dayalı planlanan etkinlikler içerisinde kullanarak öğrenme üzerine olan etkilerini tespit etmektir.

YÖNTEM

Araştırma 2004-2005 bahar yarıyılında KTÜ Fatih Eğitim Fakültesi Fen Bilgisi Öğretmenliği programı son sınıfta öğrenim gören 25 öğretmen adayı ile yürütülmüştür. Araştırmada kullanılan materyallerin geliştirilmesi ve 5E modelinin uygulama aşamaları aşağıda maddeler halinde sunulmuştur.

1. Örnek olay yönteminin kullanıldığı çalışmada daha önce Saka ve Akdeniz (2004a) tarafından yapılan bir araştırmada tespit edilen kavram yanılgıları dikkate alınarak materyal geliştirilmiştir. Söz konusu çalışmada fen bilgisi öğretmen adaylarının bu yanılgılarını gidermeye yönelik materyallere ihtiyaçları olduğu tespit edilmişti.

2. Bu materyaller DNA-gen-kromozom kavramları, genetik çaprazlama ve klonlama konuları ile ilgili animasyon ve simülasyonlardan oluşan Flash programında hazırlanmış bilgisayar yazılım programlarını içermektedir.

3. Bu çalışmada; örnek olay yaklaşımı kullanılmıştır. 25 kişiden oluşan fen bilgisi öğretmen adayları ile 2 ders saati süren, 5E modeline uygun bir etkinlik gerçekleştirilmiş, etkinlik sırasında adaylara konu ile ilgili

soruları içeren testten oluşan bir anket uygulanmış ve içlerinden kalıcı kavramsal değişim gösteren 10 öğretmen adayının yer aldığı grupla yapılan mülakatlarla çalışmanın bulguları elde edilmiştir.

4. Yürütülen uygulamada; bilgisayar donanımı olan sınıflardan birinde bütünleştirici öğrenme ortamı tasarımı yapılmaya çalışılmıştır. Buna göre; öğretmen adaylarının beşer kişiden oluşan gruplar halinde oturmaları sağlanmış ve sınıfın bir bölümünde daha önceden tespit edilen kavram yanılgıları ile ilgili kaynak kitaplara ulaşmalarına, diğer bölümünde ise bilgisayar kullanmalarına imkân sağlayacak düzenleme yapılmıştır.

5. Uygulamada; kendi aralarında seçecekleri bir başkan önderliğinde iş bölümü yapmaları ve farklı kaynaklardan araştırma yapmak üzere grup elemanlarından bazılarını görevlendirmeleri istenmiştir. Yürütülen uygulamanın içeriği bütünleştirici öğrenme kuramının 5E modeline yönelik Keser (2003) tarafından geliştirilen etkinlik planlama kılavuzuna göre düzenlenmiştir.

6. Etkinliklerin girme aşaması için, öğrencilere konuyla ilgili bildiklerini hatırlamalarına yardımcı olacak ve yeni konuya yönelik ilgi uyandıracak sorular hazırlanmıştır. Bu sorulardan bazıları aşağıda verilmiştir:

* Genetik biliminin ortaya çıkmasında başlangıç sayılabilecek çalışmalar hangileridir, kimler tarafından yapılmışlardır?
* Genetik çalışmalarda neden bezelye bitkisi tercih edilmiştir?
* Klonlama ne demektir?
* Genleriniz vücudunuzda nerelerde bulunur?

7. Etkinliklerin keşfetme aşamasına yönelik öğrencilerin bütünleştirici bir ortamda çalışmalarına imkân sağlayacak kaynak kitapların seçilmesi ve hazırlanan yazılımın kullanılabileceği bilgisayar ortamının çalışır duruma getirilmesi için gerekli düzenlemeler yapılmıştır.

8. 5E modelinin açıklama aşamasında öğretmenin, bir video, film, bir gösteri veya simülasyon ya da öğrencilerin yaptıklarını tanımlamaları ve sonuçlarını açıklamalarını teşvik edici bir etkinliğin yürütülmesi gibi ilginç yollara başvurabileceği bilinmektedir (Keser, 2003). Bu nedenle geliştirilen materyallerin, 5E modeli dikkate alınarak etkinlik içerisinde açıklama aşamasına yerleştirilmesine karar verilmiştir. Flash programı kullanılarak geliştirilen materyallerin bulunduğu, klonlama konusuna ait animasyonun aşama aşama ekran görüntüleri Ek 1'de (Ek 1a, b, c, d, e, f, g, h, i, j, k) verilmektedir.

9. Derinleşme süreci, önceki aşamalarda farkına varılan bilgilerin ve kazanılan deneyimlerin doğru bir şekilde kullanılmasını, eğer mümkünse günlük yaşamla ilişkilendirilmesini ve farklı durumlarda test edilmesini gerektirdiğinden, modelin derinleşme aşamasına yönelik, kavram yanılgılarını belirlemede araştırmacı tarafından hazırlanıp kullanılan sorulardan derlenen bir test uygulanmıştır. Aynı test etkinlikten önce, etkinlik sırasında ve etkinlikten üç ay sonra geciktirilmiş son test olarak üç aşamada uygulanmıştır. Test soruları ekte verilmiştir (Ek 2). Soruların hazırlanmasında ilgili literatürden ve konu alanında uzman öğretim elemanlarından faydalanılmıştır. 5E modelinin aşamalarının örnek bir etkinlik üzerinde uygulanışını gösteren başka çalışmalardan faydalanılarak, modelin uygulama aşamaları ve verilerin nasıl toplandığı hakkında daha detaylı bilgiler elde edinilebilir (Çepni, Akdeniz ve Keser, 1999; Saka ve Akdeniz 2004b; Çepni, Küçük ve Bacanak, 2004).

Etkinliklerin uygulanmasından önce ve sonra öğretmen adaylarına uygulanan testlerden elde edilen bulgular değerlendirilirken, "cevapları kodlama sistemi" kullanılmıştır (Küçüközer, 2004). Kategori belirleme işlemleri her üç test için de ayrı ayrı yapılmıştır. Her bir soru için belirlenen kategoriler, Tablo 1'da verilen düzeylere göre gruplandırılmıştır.

Tablo 1. Öğretmen adaylarının cevaplarını kodlamada kullanılan düzeyler.

Düzeyler
A- Tam Doğru
B- Kısmen Doğru
C- Yanlış (1)
D- Yanlış (2)
E- Yanlış (3)
F- Kodlanamayan
G- Yanıtsız

Tablo 1'de yer alan düzeylere ait açıklayıcı tanımlar aşağıda verilmektedir:

Tam Doğru-(A): Bilimsel olarak doğru ve tam olarak kabul edilebilecek açıklamalar bu grup içerisinde bulunmaktadır.

Kısmen Doğru-(B): Açıklamalar doğru fakat tam doğru cevaba göre eksik ise bu grup içerisinde yer almaktadır.

Yanlış-1 (C): Hem kısmen doğru kabul edilebilecek hem de yanlış ifadelerin beraber bulunduğu açıklamalar bu düzeyde yer almaktadır.

Yanlış-2 (D): Tamamıyla yanlış olan açıklamaları içeren ifadelerin yer aldığı düzeydir.

Yanlış-3 (E): Konuyla ilgisi olmayan açıklamaların yer aldığı düzeydir.

Kodlanamayan- (F): Anlaşılamayan ve soru ile tam olarak ilişkisi kurulamayan açıklamalar bu grup içerisinde yer almaktadır.

Yanıtsız- (G): Açıklama yapmayanlar bu grup içerisinde yer almaktadır.

10. Değerlendirme sürecinin en önemli yardımcı veri kaynaklarından biri öğrenci mülakatları olduğundan (Keser, 2003); testlerden elde edilen bulgular örneklemden kalıcı kavramsal değişim gösteren 10 öğretmen adayı ile yapılan mülakatlarla desteklenmiştir.

BULGULAR

Bu bölümde yer alan veriler iki başlık altında düzenlenmiştir: 1.kısımda, öğretmen adaylarının öğretim sırasında dikkate alınan alternatif fikirler açısından kavramsal değişimi incelenmiştir. 2. kısımda ise, örneklem arasından kalıcı kavramsal değişim gösteren 10 aday ile yapılan mülakatlar değerlendirilmiştir.

Örneklemin Testlere Verdikleri Cevapların Kodlanmasından Elde Edilen Bulgular

Bu kısımda yer alan veriler; yukarıda açıklanan cevapları kodlama sistemine göre adayların ön test, son test ve geciktirilmiş son testte verdikleri cevaplar bilimsel verilerle karşılaştırılmak suretiyle kodlanmış ve adayların her üç testten aldıkları kodlar değerlendirilerek, öğretim sırasında dikkate alınan alternatif fikirler açısından kavramsal değişimi Tablo 2'de sunulmaktadır.

Tablo 2. Öğretmen adaylarının öğretim sırasında dikkate alınan alternatif fikirler açısından kavramsal değişimi

	Alternatif fikirler		
Öğrenci numarası	Çaprazlama, ebeveyn genlerinin harflerle sembolik olarak birbirleriyle eşleşmesidir veya aşılama yapmaktır.	Kromozom-gen-DNA kavramları ile ilgili alternatif fikirler.	Klonlama bir canlı ile aynı yaşta, aynı kişilikte olan yeni bir canlı üretmedir.
1	=>	←	←
2	=>	↓	←
3	☺	↓	↔
4	=>	☺	☺
5	←	↑	←
6	↔	☺	☺
7	☺	=>	☺
8	☺	↔	↔
9	☺	☺	←
10	=>	☺	=>
11	↓	☺	=>
12	=>	☺	☺
13	☺	☺	☺
14	↓	☺	☺
15	☺	☺	☺
16	=>	=>	☺
17	=>	☺	←
18	☺	=>	☺
19	☺	☺	☺
20	☺	☺	☺
21	↔	=>	↔
22	☺	☺	☺
23	=>	=>	=>
24	☺	↓	☺
25	☺	=>	☺

=> Her üç testte de A ve B düzeyinde kalan öğretmen adayları.

☺ Ön testte C,D,E,F,G düzeylerinden birindeyken, son test ve geciktirilmiş son test sonuçlarına göre A veya B düzeyinde kalıp kalıcı kavramsal değişimi gerçekleştiren adaylar.

← Ön testte C,D,E,F,G düzeylerinden birindeyken, son testte A veya B de olup geciktirilmiş son testte C, D, E, F, G düzeylerinden birine inerek kalıcı olmayan kavramsal değişimi gerçekleştiren adaylar.

↑ Ön test ve son testte C,D,E,F,G düzeyindeyken geciktirilmiş son testte A veya B düzeyine yükselen adaylar.
↔ Ön test, son test ve geciktirilmiş son testte C,D,E,F,G düzeylerinden birinde olan adaylar.
↓ Ön ve son testte A ve B düzeylerinde olup geciktirilmiş son testte C,D,E,F,G düzeylerine inen adaylar.

Tablo 2'den de anlaşılacağı gibi, örneklem grubunda üç kavram yanılgısında, her üç testte de A ve B düzeylerinde kalan öğretmen adayları hariç tutulduğunda, belirgin oranlarda (çaprazlama ile ilgili kavram yanılgısında % 71, DNA-gen-kromozom kavramları ile ilgili yanılgılarda % 68 ve klonlama ile ilgili yanılgıda % 64) kalıcı kavramsal değişimin gerçekleştiği görülmektedir.

Mülakatlardan Elde Edilen Bulgular

Öğretmen adayları arasından, kalıcı kavramsal değişimin gerçekleştiği gruptan seçilen 10 kişi ile yapılan mülakatlarda, iki konu hakkında görüş bildirmeleri istenmiştir: Bunlardan birincisi; "bütünleştirici öğrenme ortamını nasıl buldunuz, size sağladığı yararları ve eleştirdiğiniz yönlerini söyler misiniz?", ikincisi ise; " yürütülen etkinlik kapsamında, bilgisayar destekli biyoloji öğretimi size ne kazandırdı? Konu ile ilgili daha önceden bilmediğiniz hangi kavramları veya bilgileri öğrendiniz, sıralayabilir misiniz?"

*Adayların sorulara verdikleri cevaplar genel olarak aşağıdaki gibi özetlenebilir, cümlelerin sonundaki numaralar öğretmen adaylarına aittir (**a1:**aday 1);*

"Kendimizi daha esnek bir ortamda hissettik" (a1, a4, a6, a8, a9,a10).

"Bilgi bize klasik bir yöntemle sözlü olarak veya yazdırmak suretiyle hazır verilmediği için kendimizi bilgiye ulaşmada sorumlu hissettik" (a1, a3, a5, a7, a8, a9, a10).

"İlk aşamada (girme aşaması) karşılaştığımız sorular bizi kısmen çelişkiye düşürdü, bildiklerimizi sorgulama gereği hissettik" (a2, a3, a6, a7, a9).

"Aynı ders saati içerisinde yanlış bilgilerimizin farkına varmak ve bunları doğru olanlarla karşılaştırmak öğrenmemize olumlu katkı sağladı" (a3, a4, a6, a7, a10).

"Bilgisayar ortamında simülasyonlar izlememiz ve bazı soruları görsel olarak inceleyerek cevaplamamız hem kafamızda konu ile ilgili belirgin bir şekil oluşmasına yardımcı oldu hem de dersi eğlenceli bulmamızı sağladı" (a1, a2, a4, a6, a7, a8, a9, a10).

"Örnek verecek olursak, kromozom-DNA-gen kavramlarını biraz biliyordum ama şekillerini şimdi tam olarak çizebiliyorum" (a2, a5, a8, a10).

"Klonlanan canlının karakter özelliklerinin de aynı olacağını zannediyordum, ama şimdi bunun böyle olmadığını öğrendim"(a3, a6, a7, a9).

"Klonlama denilince aynı yaşta bir ben daha düşünüyordum, tek farkı hani bilim kurgu filmlerinde hep görürüz ya her tarafı sıvı içinde, tam olarak derisi oluşmamış, gelişme aşamasında ama normal bir insan boyutlarında bir şey olarak kafamda tasarlamıştım" (a4).

"Çaprazlama yapmanın ağaçları aşılamak gibi bir şey olduğunu zannediyordum, şimdi bir tür tozlaştırma olduğunu öğrendim" (a1, a5, a7, a8, a10).

"Çaprazlamak terimini hep duyuyoruz ama kafamda tam olarak net bir açıklaması yoktu, çaprazlandı derken 'kâğıt üzerinde karakterleri bilinen iki canlının özelliklerini çaprazlayarak yeni oluşabilecek canlının özelliklerini tahmin edebilme' diye düşünüyordum. Gerçekte nasıl yapıldığı hakkında hiç bilgim yoktu" (a2, a3, a4, a6).

"Bilgisayardaki programları izledikten ve uygulamayı bitirdikten sonra soruları doğru cevaplayabilmemiz (derinleşme aşaması) kendimizi daha iyi hissetmemize neden oldu" (a2, a5, a8, a9, a10).

"Arkadaşlarla iş bölümü yapmak her zaman iyi olmuyor bazen istemediğimiz bir işle görevlendirilebiliyoruz, mesela iş bölümü yaparken herkes bilgisayarda araştırma yapmak görevini istiyor" (a6, a9).

"Her zaman değil fakat zaman zaman biyoloji dersinin bu şekilde yürütülmesini isteriz, çünkü ders saati olarak uzun sürüyor" (a3, a6,a9).

SONUÇ VE ÖNERİLER

Araştırma kapsamında yürütülen etkinliklerden elde edilen bulgulara dayalı olarak, adayların seviyelerinde tespit edilen olumlu değişimler, bütünleştirici öğrenme ortamında bilgisayar destekli öğretimin kullanılmasının genetik kavramlarının öğretiminde başarıyı yükselten bir etkiye sahip olduğunu ortaya çıkarmıştır. Bu durumun nedenleri incelendiğinde; bütünleştirici ortamda adayların bilgiyi kendileri yapılandırdıkları için, öğrenmeye karşı istek ve sorumluluklarının artmış olabileceği düşünülmektedir. Bilgiyi kendilerinin yapılandırmasında ilk aşamada 5E modelinin girme basamağında yer alan soruların, onlarda merak uyandırmış olmasının ve bildiklerini sorgulamalarını sağlamasının, ikinci aşamada ise; zihinlerinde oluşan kavram kargaşasını karşılaştıkları materyalleri kullanarak gidermeye çalışmalarının etkili olmuş olabileceği düşünülmektedir. Bununla birlikte, yanlış bilgilerinin doğrularla yer değiştirmesi ve bu olayı aynı ders saati içerisinde yaşamaları kendilerini daha iyi hissetmelerine, bu nedenle de öğrenmeye karşı motivasyonlarının artmasına neden olmuş

olabilir. Bütünleştirici öğrenme ortamında teknolojinin kullanılmasının da öğrenmelerine olumlu katkı sağladığı mülakat bulgularından anlaşılmaktadır. Yürütülen etkinliğin olumlu taraflarının yanı sıra, zaman alıcı olması ve grup içerisinde iş bölümünden kaynaklanan eleştirilerle karşılaşılmıştır. Uygulamaların yürütüleceği dersliklerin mümkünse bilgisayar donanımı ve hatta internet bağlantısı sağlanabilen ortamlar olması ve iş bölümü sırasında ilgili öğretim elemanının yardımıyla, grup üyeleri arasında dönüşümlü bir sıranın takip edilmesi uygulama süresinin kısaltılmasına yardımcı olabilir. Özellikle yükseköğretimde, kavram yanılgıları tespit edilen konularda 5E modeline uygun ders etkinlikleri hazırlanması hem öğrencileri tekdüze bir ders ortamından kurtaracak hem de yakın bir zamanda öğretmen olması beklenen adaylara 5E modeline uygun ders yürütülmesi hakkında iyi bir deneyim kazandıracaktır. Biyoloji eğitimcilerinin, öğretmen adaylarında biyolojinin farklı konularında var olan kavram yanılgılarını tespit ederek, bunlara uygun bilgisayar destekli materyalleri kendilerinin tasarlamaları veya geliştirmeleri önerilmektedir. Bununla birlikte, bütünleştirici yaklaşım uygulamalarında yeni teknolojilerin kullanımı teşvik edilmeli, öğretim elemanları bütünleştirici öğrenme ve buna uygun ortam hazırlama konusunda yetiştirilmelidir. Üniversitelerde grup çalışmasına olanak sağlayan oturma düzeni esnekliği sağlanmalıdır. Biyolojinin farklı konularında, bütünleştirici öğrenme yaklaşımı uygulamalarının ve değerlendirilmesini içeren araştırmaların yapılması önerilmektedir.

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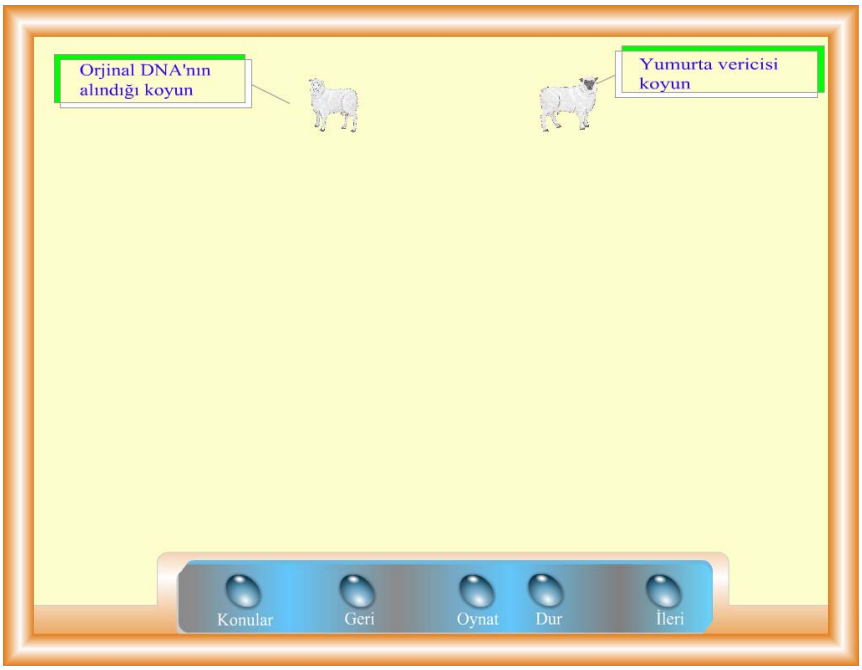
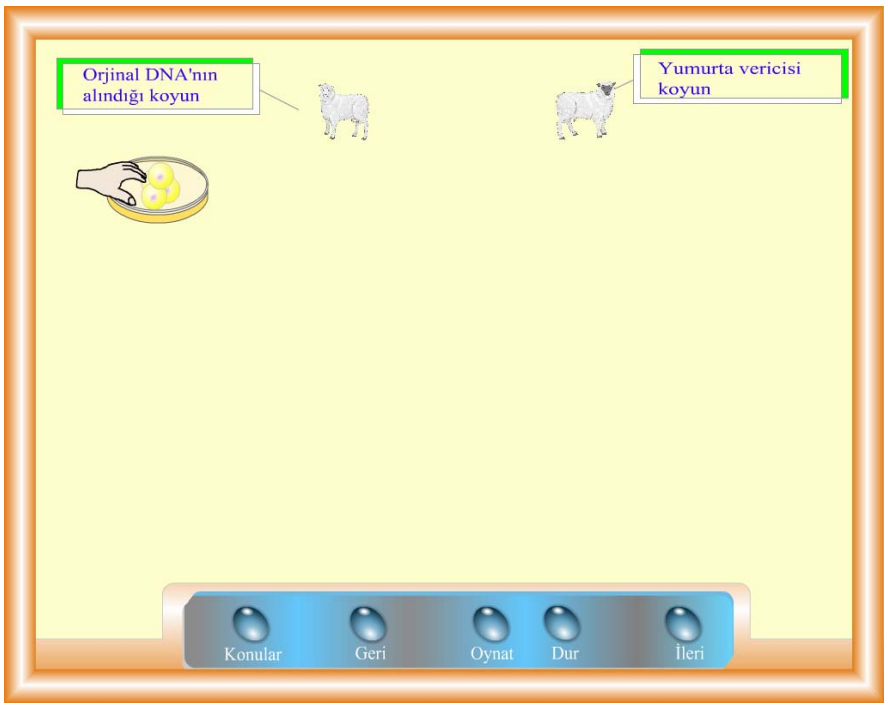
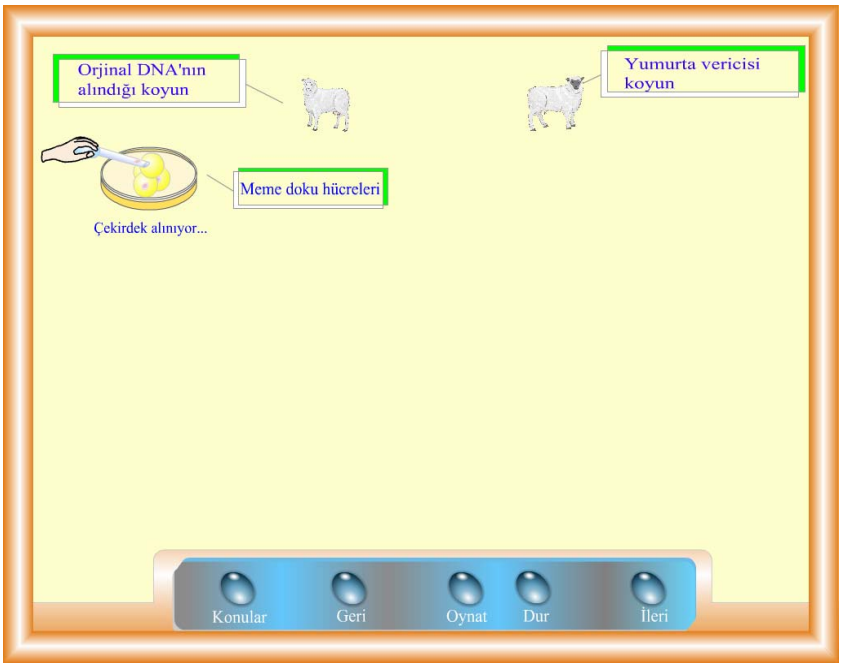
Ek 1a. Klonlama konusunda, orijinal ve verici koyunu gösteren ekran görüntüsü.



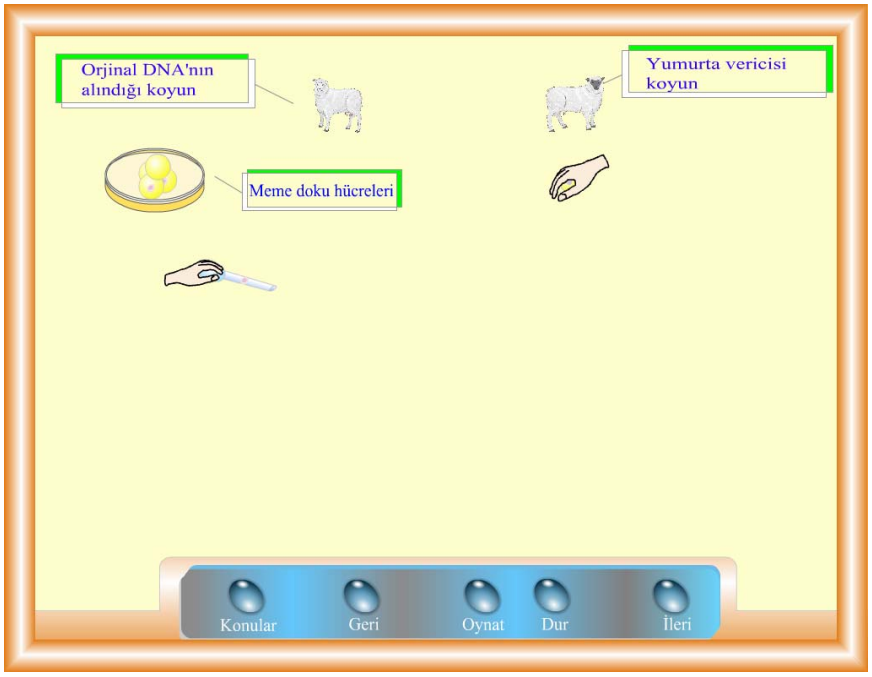
Ek 1b. Önceki görüntüde oynat butonuna basıldığında, orijinal DNA'nın alındığı koyundan meme doku hücrelerinin alınarak petri kabına koyulmasına ilişkin ekran görüntüsü.



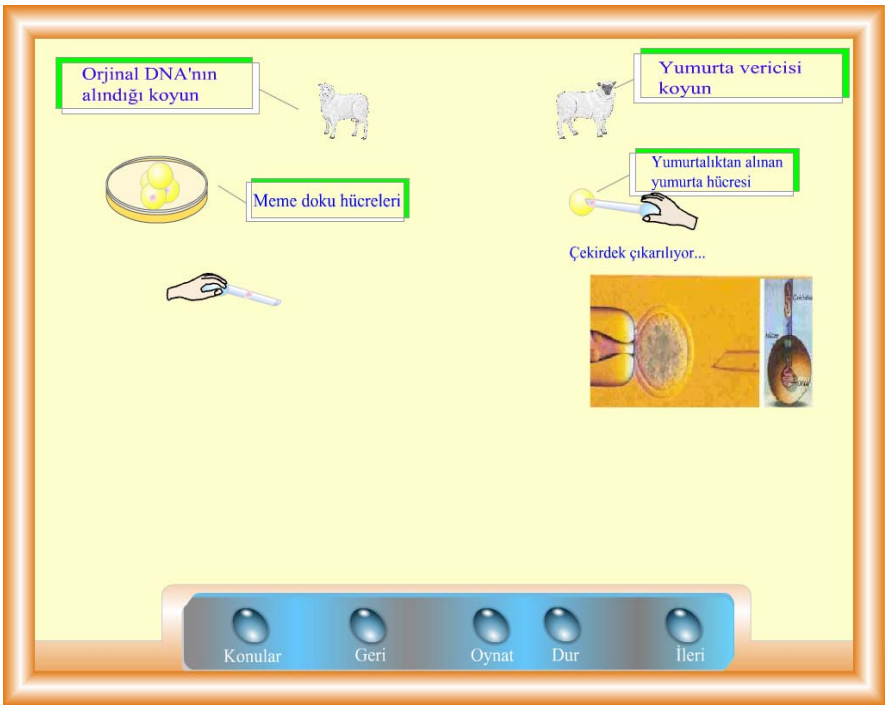
Ek 1c. Önceki görüntüde oynat butonuna basıldığında, meme doku hücrelerinden çekirdeğin alınışına ilişkin ekran görüntüsü.



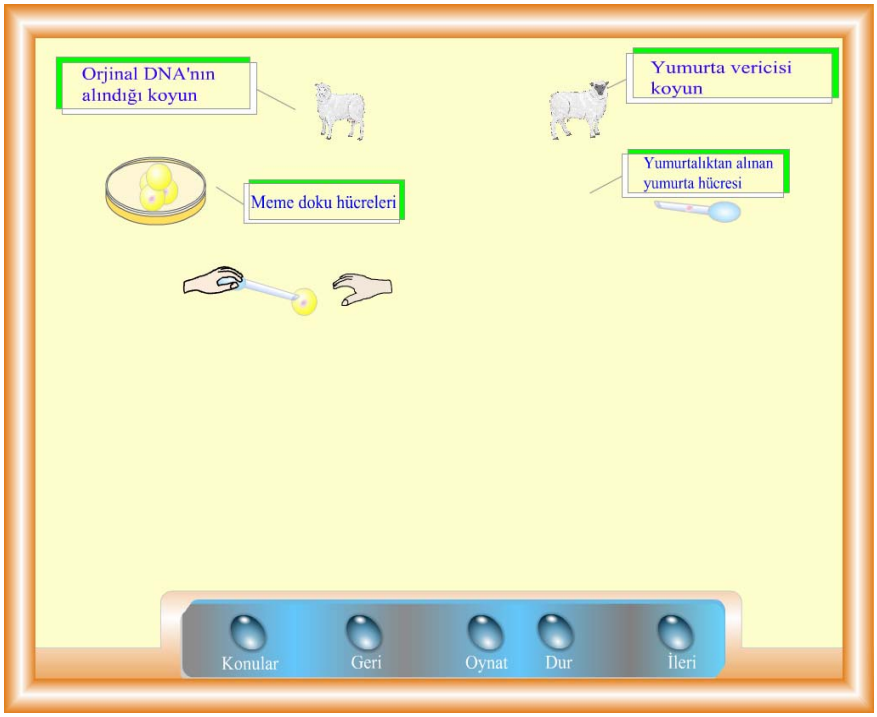
Ek 1d. Önceki görüntüde oynat butonuna basıldığında, yumurta vericisi koyundan yumurtanın alınışına ilişkin ekran görüntüsü.



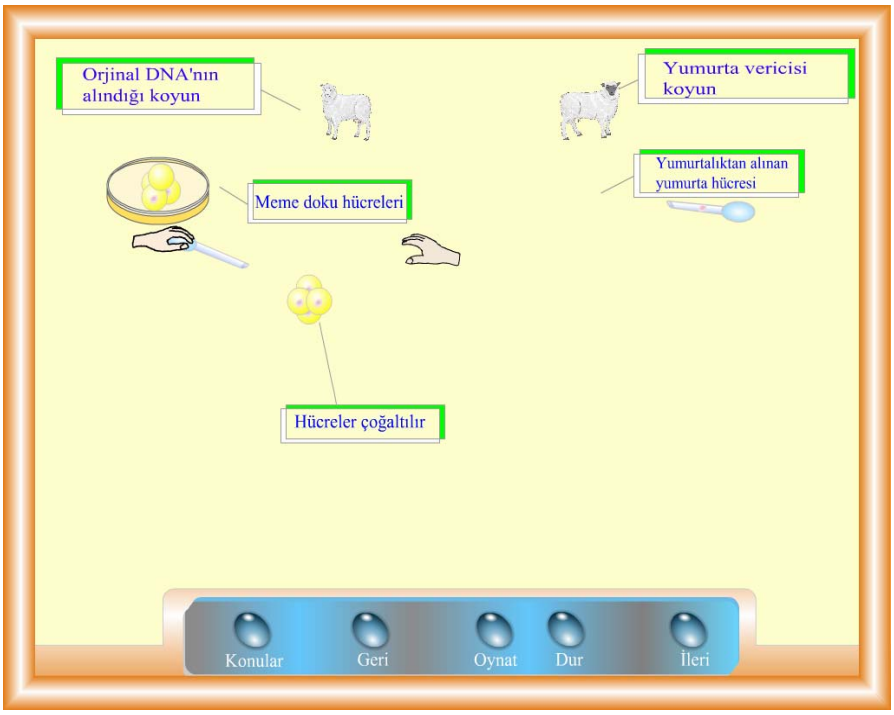
Ek 1e. Önceki görüntüde oynat butonuna basıldığında, verici koyundan alınan yumurta hücresinden çekirdeğin çıkarılışına ilişkin ekran görüntüsü.



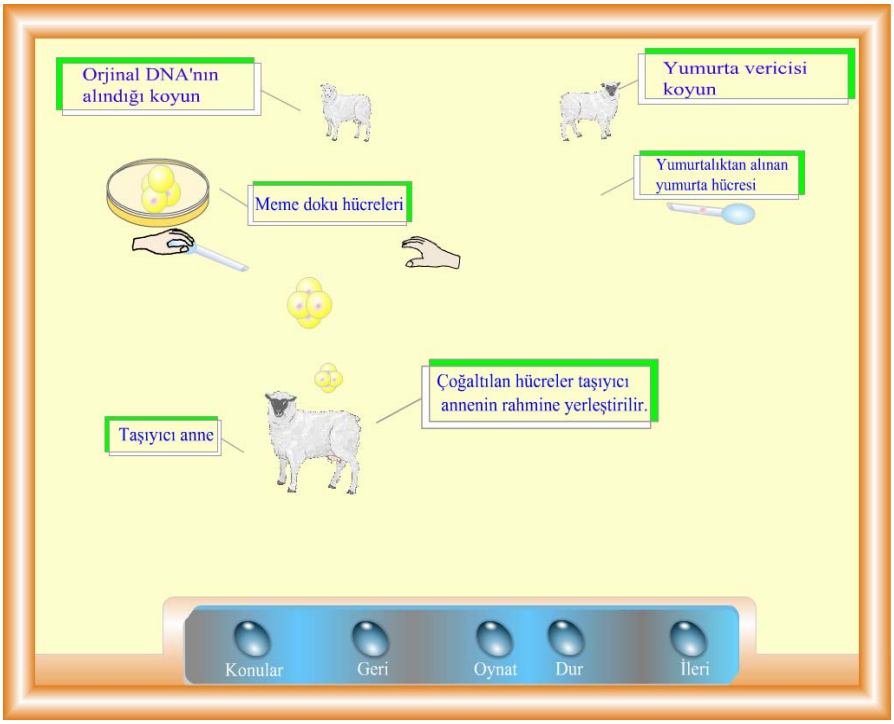
Ek 1f. Önceki görüntüde oynat butonuna basıldığında, orijinal koyunun meme doku hücrelerinden alınan çekirdeğin, verici koyunun yumurta hücresine yerleştirilmesine ve kaynaştırılmasına ilişkin ekran görüntüsü.



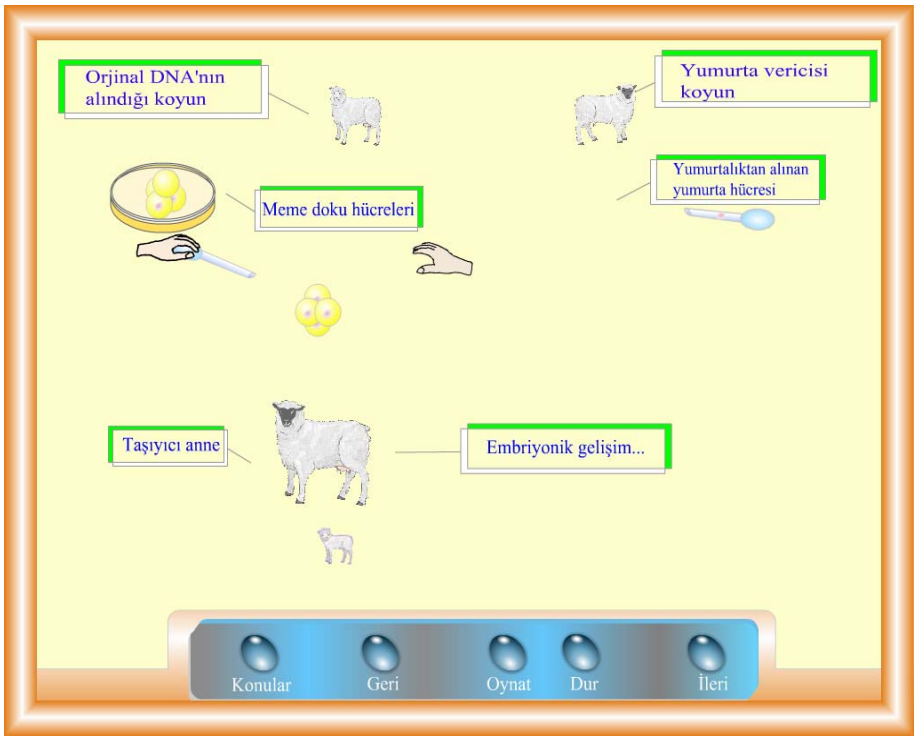
Ek 1g. Önceki görüntüde oynat butonuna basıldığında, elde edilen yeni hücrenin çoğaltılmasına ilişkin ekran görüntüsü.



Ek 1h. Önceki görüntüde oynat butonuna basıldığında, çoğaltılan hücrelerin taşıyıcı annenin rahmine yerleştirilmesini gösteren ekran görüntüsü.



Ek 1i. Önceki görüntüde oynat butonuna basıldığında, embriyonik gelişime ilişkin ekran görüntüsü.



Ek 1j. Önceki görüntüde oynat butonuna basıldığında klonlanmış kuzuya ve konu ile ilgili sorulara geçilmesi gerektiğine ilişkin ekran görüntüsü.

Ek 1k. Önceki görüntüde, sorularla ilgili bölüme tıklandığı konumdaki birinci soruya ilişkin ekran görüntüsü.

Ek 2. Ankette yer alan sorular

Soru 1. Aşağıda yer alan boşluk kısmına içerisinde hücre, kromozom, gen ve DNA'nın bulunduğu temsili bir şekil çiziniz. Her bir terimi uygun yerlere koyarak işaretle üzerinde belirtiniz.

Soru 2. Çaprazlama ne demektir? "Mendel bezelyeleri çaprazladı" cümlesinden ne anlıyorsunuz, açıklayınız?

Soru 3. Klonlama yapıldığında oluşan yeni birey ana bireyin % 100 aynısı olur mu? Yaş, cinsiyet, karakter, fiziksel görünüş bakımından değerlendiriniz.

