SCIENCE, TECHNOLOGY AND SOCIAL CHANGE COURSE'S EFFECTS ON TECHNOLOGICAL LITERACY LEVELS OF SOCIAL STUDIES PRE-SERVICE TEACHERS

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ABSTRACT
Social studies curricula are required to prepared as educate children who continue to learn after their formal training and it is vital that teachers receive an education properly. In Social Studies Education Departments of Education Faculties Science, Technology and Social Change course is convenient to this aim and it contributes to technological literacies of pre-service teachers which needed in twenty-first century. In this study, it is tried to determine the effect of Science, Technology and Social Change course on pre-service social studies teachers technological literacy levels. Technological Literacy Scale which was developed by Yiğit (2011) was used in determining technological literacy levels of pre-service social studies teachers in this decriptive research. This scale is based on ITEA's teachnological literacy standards and it consists five sub-dimensions and thirty-three items and its' internal consistency is .86. In three state universities this scale was applied to pre-service social studies teachers who (100) took Science- Teachnology and Social Change Course and who (100) didn't take yet. Besides, opinions of pre-service social studies teachers (50) are picked to support quantitative data. Quantitative data were analized with SPSS 17.0 program for development level of technological literacy. T-test and ANOVA were used in analyse process. Content analyse technique was also used to analyse quantitative data depending on characteristics of research and data. In conclusion, it was found that Science, Teachnology and Social Change Course affected pre-service social studies teachers' technological literacies positively. However this result was differed dependent on the lecturer.
Keywords: Teachnological literacy, social studies education, science - technology and social change

1. INTRODUCTION

Effects of technology on human life has being going on since first human. People have developed and improved ways to communicate, travel, build structures, make products, cure disease, provide food and satisfy other needs and wants, so through technology people have changed the world (ITEA, 1996; ITEA, 2006).

Today, every human activity is dependent upon various machines and no time in history technological dominance has that been so apparent as the present. For example, the automobile has changed where and how people live, a huge infrastructure has been developed that includes road, bridges, service stations, insurance systems, and regulations. It has provided employment for thousand of people who make car and built roads. In an other example, refrigeration system change people's eatig habits and so on. In the other side environmental problems, especially in more populated areas has been a major problems, and people are forced to set out their lives without harming the environment.

People who use technology to satisfy their needs and wants, communicate with others regardless of time and location and Internet allows them to work at home and share their opinions and reactions enrolling to various groups. Besides, technology influences how we participate in democracy and, in turn, shapes what we must consider to prepare students to become active members of a democratic society (Crowe, 2006).

Technological systems have become so interrelated with todays' social systems that any new development can have far reaching effects. Thus, peoples' ability to use, manage, evaluate and understand technology, and the importance of education in this process take on a new significance (ITEA, 1996, ITEA, 2006). Besides, technology and technological change thrills some people but confuses others, because it is created, managed and used by societies, governments, industries and individuals according to their own goals and values (ITEA, 2006). So, technological literacy gained more importance in this stance.

It can be said that throughout human existence there is a relationship between technology and education. People have been transmitting information through advices and samples about how they make a fire and prepare clothes from animal hides because, by inheritence they couldn't transfer the necessary knowledge to cope with natural difficultes and to survive (Childe, 1982, p.22). Thus, it can be said that, in the history of technology which has began with first tools that human produced to make their lives easy, technology education has began primitively with teaching the usage of those tools to others. After this, technology education has began to giving in curricular framework.

Today, technology education differs according to the development levels and requirements of countries and it is branched as skill based approach, vocational approach, high-tech approach, application based approach, technological concepts approach, design approach, science-technology and society approach and subject integrated approach (Raisen, 1997). The main objective of this education which is offered in many countries' curricula is the development of technological literacy (Waetjen, 1993; de Vries and Tamir, 1997; Verner and Betzer, 2001; Zuga, 2004; Canavan and Doherty, 2007, p. 292; Solomonidou and Tassios, 2007, p. 116; Rossouw, Hacker and de Vries, 2010). Technological literacy is a necessity for all people to understand the nature of technology, appropriately use technological devices and processes, and participate in society's decisions on technological issues (ITEA, 2006). It is much more than just knowledge about computers and their application. It involves a vision where each citizen has a degree of knowledge about the nature, behavior, power and consequences of technology from a broad perspective. Because of the power of technology individuals and society need to decide what, how, and when to develop or use various technological systems and products (ITEA, 1996). Such decision making depends upon all citizens acquiring a basic level of technological literacy (ITEA, 2006). Besides, while its is logical and necessary for inventors, researchers, and implementers to have advanved technological capability, it is senseless for the general public to be technologically illeterate. Technological literacy is also vital to national economic prosperity, future generations, and even the Earths' continued ability to sustain life (ITEA, 1996).

Indeed technological literacy is not special to 21st century. Beginnings of 1983 NCEE (National Council for Educational Exellence) has evaluated USA in danger because of citizens' inability in five basic skills. The importance of those skills has emphasized in this manner. Five areas are ranges as following: Mother tongue, mathemathics, science, social studies and computer (NCEE, 1983). According to Shohet (1996) from Montreal (Canada) Literacy Center, in new millenium the concept of literacy should be extended with different tools like Internet, electronic texts and digital environments. It has underlined that technological literacy includes both cognitive and behavioral skills and a technologically literate person has the ability to understand what technology is, how it is created, how it shapes society, and in turn is shaped by society (ITEA, 2000). In this definition, the aim "to understand how it shapes society, and in turn is shaped by society" has sourced the relationship between social studies course and technological literacy. Because, understanding societal issues and acquiring skills towards the usage of technology are among aims of social studies course (Ata, 2008). Besides, it is unsufferable to ignore the importance of technology in institutes which educate people who live and work in a technological world (Keeler, Good and Waring, 2008). In compliance with this notion social studies educators and researchers argue for the need towards using technology and especially Internet in social studies education. Because, this increases opportunities towards using primary sources and technology provides chance to see different views with removing the geographical borders (Friedman and Heafner, 2006).

Youths use Internet too often to get information and to distribute their own messages via information and communication technologies. In doing so, they may encounter with violent, racist and harmful mesagges in this process. VanFossen and Berson (2008) stated that, because efforts to control access to information and exposure to these risks are fraught with difficulties, the most effective way to safeguard students and young citizens is through education.

Young citizens of technological age need instruction on the application of skills for critical analysis and ethical decision making and social studies course distinguish in this context. According to Whithworth and Berson (2003), as both a method of instruction and a topic of instruction, the impact of computers and technology on social studies is immense. Technology-based learning has the potential to facilitate development of students' decision-making and problem solving skills, data processing skills, and communication capabilities. Through the computer, students may gain access to expansive knowledge links and broaden their exposure to diverse people and perspectives; hence, affording students the opportunity to become active participants in an increasingly global and interactive world. And, these are among the aims of social studies course.

A technologically literate person is capable problem solvers who consider technological issues from different point of view and in relation with a variety of contexts. They understand technological impacts and consequences, acknowledging that the solution to one problem may create others. They also understand that solutions often involve trade-offs, which necessitate accepting less of one quality in order to gain more of another. They appreciate the intertelationships between technology and individuals, society, and the environment. Thus, technological literacy is more of a capacity to understand the broader technological world rather than an ability to work with specific pieces of it (NAE&NRC, 2002, p.22). Most importantly, technologically literate persons understand that technology is the result of human activity (ITEA, 2006). Erich Bloch (1986), past director of the National Science Foundation said that "*technologically literate people should*

be able to read a newspaper or magazine article and react to those articles related to technology on a basis of emotion" (cited in ITEA, 1996).

Participating citizens need to consider issues and take part in decisions regarding transportation, land use, pollution control, defense and restricting or encouraging technological issues. Decisions about technological issues demands an understanding of the impacts, relationships, and costs of technological activities. As workers people also need to possess a variety of technological abilities and they need to have the tools to adapt to technological change in the workplace. Besides, as consumers people need to make decisions about the purchase, use and disposal of appliances, information systems, and comfortenhancing devices. From entertaintment to medical decision, everyday life requires a basic technological literacy.

Todays' global societies must improve their technological literacy in order to support growing populations and to provide a safe environment in a complex world. Effective democracy depends on all citizens participating in the decision-making process. The decision-making process safe-guards the country from yielding control to a small, powerful elite. Since, so many decisions involve technological issues, technological literacy is required for all citizens.

Because various technological issues can pose ecological dilemmas and create environmental problems, technological literacy is also critical to Earth's continues ability to support life. Through technology, people create new problems while they solve existings. But if people develop and use technology in the context of the country's goals and values, they can find new ways to order their lives. Each person should know how to use technology safely and effectively as means to solve problems and to extend their capabilities.

Schools should provide all students with experiences necessary to develop understanding and abilities for the constantly changing technological world. Technology education in schools must highlight the relationships between technology and other fields of study like science, mathemathics, social studies and language arts (ITEA, 2000/2002). Law-makers and administrators must also promote technology in a multu-disciplinary form of education (ITEA, 2006). All teachers must realize their own duties ans responsibilities to increase awareness towards technology. They should work with other teachers to assist them in teaching the content of technology in their classes. In example, a social studies teacher could teach a unit on the industrial revolution related with technology.

Teachers need to become familiar with the study of technology and benefits it can provide for all students so that their support can be obtained. They should also become proactive in promoting the study of technology.

1.1. Problem

Teachers have an important role in teaching individuals as active people, participatory and having the skills required by age and technological literate in 21st century. Teachers who teach individuals that can adapt the rapid changes and challenge with problems should have this qualifications primarily; and thereby, the importance of teacher training in this direction once again appeared (Abdulai, 2003). In reform intiatives about social studies the need towards difference in teaching and learning styles of social studies is especially highlighted (NCSS, 1994). The main objective of social studies is training active citizens and it is important to teach students with related skills. In this context, the role of the institutions that train teachers of social studies and the role of academic staff working in those institutions are becoming important. We may make some activities about this issue like providing opportunities for pre-service teachers to participate in both their own society and the world actively (Wade, 1995).

Scientific and technological developments, population growth and rapid increase in iformation make it impossible to suppose how the world will be and which problems they will encounter when todays' children will be adults. Thus, social studies curricula are required to prepared as educate children who continue to learn after their formal training and it is vital that teachers receive an education properly. Social studies pre-service teachers who are supposed to educate technologically literate citizens who have other knowledge, skills and attitudes. Because of this, it is required to determine their competence levels and opinions about this subject, and to develop proper curricula.

1.2. Aim

Technology is developed and applied by people. Its success or failure is usually determined by social acceptance and success in the marketplace. It has helped to satisfy some of the fundemental human needs of hunger, shelter, comfort, health, mobility, and communication while at the same time it has helped to create weapons of war and environmental degradation. Besides, in historical perpective technology is an understanding of significant

accomplishments. These subjects are studied in the context of the social studies in elementary school level. Thus, technology and social studies have a great linkage. The sociological and historical aspects of technology are very important in social studies in addition to citizenship issues. As we can see in previous part lots of the concepts, topics, skills and even problems related with technology are engaged with social studies.

Technology must be required subject for every student at every level of their education. Technology should be a part of integrated thematic units that explore the relationship of humans, societies, or the environment. Technology education activities can be used to integrate the study of technology with related concepts from other disciplines, such as social studies. Technology can and should be taught in the regular classroom. Initially, many of the teachers feel unqualified to teach technology, but experience has shown that with appropriate training these teachers perform well and excel at integrating technological concepts across the curriculum. However, all teachers need inservice and preservice opportunities about technology.

In Social Studies Education Departments of Education Faculties Science, Technology and Social Change course is convenient to this aim and it contributes to technological literacies of pre-service teachers which needed in twenty-first century.

When we looked at related literature we have seen that in the master thesis which was done by Canbaz (2010) and titled as "Determination of the technological literacy education needs of women who attended adult education courses", results showed that trainees who were over 50 ages or are housewives or were primary school graduates needed technology literacy education in the area of computer, mobile phone and ATM usage more than other age groups and higher educational groups. In this study it was also found that it was found that 56.9% of trainees were between 31-40 or 41-50 ages, 42.4% earned 501-1000 TL per month, educational status of 33.2% was primary school, 57.1% was housewives. %74.6 of trainees had computer in their homes, 94.9% had mobile phone, 64.6% had ATM card and 43.4% had an e-mail address.

Şimşek and Şimşek (2010) found in their study titled as "History of science teaching in Turkey and social studies teacher candidates' efficiency" that teacher candidates have inadequate and false knowledge about the contributions of civilizations to humanity, contributions of Turk-Islam scientist to civilization, contributions of geographic discoveries to modern science. Especially, they are in adequate at telling anecdotes about history of science in social studies lessons.

Olson (2003) has aimed to determine the graduating Alberta grade 12 students perceptions about their skills and needs in technology. Results of the study were also reviewed in the context of the technological literacy in ICT. Student interviews showed that students have evaluated themselves as they were at intermediate level. Besides, they discussed their opinions regarding the skills that thet gained through their own effort and family support rather than attending the school. It was also interesting that participants evaluated their teachers (Mathemathics, Science, English and Social Studies) as insufficient for using technology.

Donan (2003)'s study showed us the illiteracy especially on medical and agricultural technologies. Taylor (2004) aimed to determine perceptions of TSA members about selected TSA activities in regard to their effects on skill development and the development of technological literacy. In conclusion, it was seen that the majority agreed that being involved in their selected activity did increase their understanding of what technology is and how technology works, as defined by these questions. Results also showed that the participants perceived their involvement in the activity increased their understanding of the effects of technology on society and how to solve technology-related problems. Participants perceived that they increased their understanding of how to use the design process and how to solve technologyrelated problems as a result of being involved in these selected TSA activities.

Castillo (2007) was focused on the design and testing of an assessment instrument to measure eighth-grade student achievement in the study of technology. The study was designed to assess the level of technological literacy achieved by eighth-grade students as measured by a self-designed/developed technology literacy instrument correlated with the Standards of Technology Literacy. The results of this study indicated that there was promise in demonstrating that instruction in technology education could influence a student's level of knowledge/literacy in the subject.

The literature presented limited data and results about technological literacy and especially the connection between interdisciplinary areas like social studies. Thus, this study is an attempt to determine the effect of Science, Technology and Social Change course on pre-service social studies teachers technological literacy levels. The purpose of this two phase study was to obtain statistical, quantitative results from a sample and then

follow up with a few individuals to explore those results in more dept. Quantitative phase of this research, hypothesis are addressed the effect of Science, Technology and Social Change course with participants. In the second phase, qualitative interviews are used to probe significant results by exploring aspects of the technological literacy with selected participants.

1.3. Importance

Our world will be very different 10 or 20 years from now. We have no choice about that. However, have a choice whether we march into that world consciously, deciding for ourselves how we want it to be, or whether we let it push us along, ignorant and helpless to understand where we're going or why. Technological literacy will make a difference (ITEA, 1996).

Technological literacy is important for all people. Because technology is such an important force in our world. The most vital issue in this context is that our world becomes a global village and we have a global culture in consequence of technological developments.

Teachers who teach individuals that can adapt the rapid changes and challenge with problems should have knowledge and skills about technology primarily; and thereby, the importance of teacher training in this direction once again appeared. The main objective of social studies is training active citizens and it is important to teach students with related skills. In this context, the role of the institutions that train teachers of social studies and the role of academic staff working in those institutions are becoming important.

Technological literacy vary from person to person and depend upon ones' background, education, interests, attitudes, and abilities. Understanding of and capability in technology have been ignored, but technological literacy don't have to be left for individuals to gain through their daily routines. A massive effort is needed in order to achieve technological literacy. Educational system is the only means by which each child can be participated in technological issues and because of this, schools must guide to this issue (ITEA, 2002).

Technological literacy must become a central concern of the educational system. This will require significant effort involving the schools, individuals, parents, concerned citizens, business and industry learders, government agencies, and those in the technological professions. Study of technology in broad sense msut become a liberating force as a new basic and multi-disciplinary form of education.

Technology must be required subject at every level of education and incorporating technology into school systems requires curriculum development, teacher training and some innovations in other areas of education. Thus, in teacher training pre-service teachers gain more importance.

Pre-service teachers who are engaged in activities that promote technological literacy become able to make informed decisions regarding the use and management of technology. Interdisciplinary nature of the social studies provides adaption of technology and this course, even more than other courses. Besides, social side of technology has availed of social studies. Thus, this research gains impotrance in means of measuring the technological literacy levels of pre-service social studies teachers and taking their opinions about these issues.

1.5.Definitions

Technological Literacy: One's ability to use, manage, assess and understand technology.

2. METHOD

The methods used in this descriptive study included Technological Literacy Scale and interview questions. Hypothesis of the research were as following:

> Hypothesis 1: Pre-service social studies teachers who took the Science, Technology and Social Change course will have higher technological literacy points than who haven't take this course yet.
> Hypothesis 2: Studying in different universities will not be effective on technological litecay points of social studies pre-service teachers.
> Hypothesis 3: Gender will not be effective on technological litecay points of social studies pre-service teachers.

2.1. Sample/Research Group

1st and 2nd graders in the social studies department of three universities in Turkey received information about the study and were asked to participate. The social studies departments of those universities has more than 100 students each year and offers a baccalaureate program for the purpose of training pre-service teachers about

society and world, past and present. These departments are dedicated to producing a new generation of middle school teachers who are equipped to generate student interest in social sceinces and the challanges of active citizenship.

The available population included three education faculty were about 300 students. Approval to conduct the study was obtained from pre-service teachers who could fill the scale in full. Thus, in three state universities, pre-service social studies teachers who (100) took Science- Teachnology and Social Change Course and who (100) didn't take yet were selected to research group. Besides, opinions of pre-service social studies teachers (50) are picked to support quantitative data. They were selected according to their points in the scale. Higher and lower points were considered in this process.

2.2. Data Collection Tools

Technological Literacy Scale which was developed by Yiğit (2011) was used in determining technological literacy levels of pre-service social studies teachers in this descriptive research.

2.2.1. Technological Literacy Scale: This scale is based on ITEA's teachnological literacy standards and it consists five sub-dimensions and thirty-three items, and its' internal consistency is .86.

The more difficult problem in determining technological literacy is how to develop this and the other is what experiences, abilities and knowledge are needed to call someone as technologically literate. ITEA's technological literacy standards help people those concerned with this issue. Standards for technological literacy was created under the ages of International Technology Education Association (ITEA), and hundreds of educators and professionals have participated in its' developments and revision.

A dimension of both Technological Literacy Standards (STL) and the scale of this research was "*The Nature of Technology*". People need knowledge and understanding of the nature and a historical perspective of technology to understand and analyse current situations and issues about technology (ITEA, 2007). This dimension address what technology is, its general core concepts, and the relationships among various technologies and between technology and the other areas of human endeavor.

"*Technology and Society*" dimension deals with how the use of technology affects society and environment, as well as how society influences the development of technology, and how technology has changed and evolved over the course of human history.

"*Design*" dimension is the core problem solving process of technological development. Technological design involves practical, real world problem solving methods and it teaches valuable abilities that can be applied to everyday life and provides tools essential for living in a technological environment.

"*Abilities for a Technological World*" dimension involve the development of important abilities for a technological world, which include applying the design process, using and maintaining technological products and systems, assessing products and systems, and others.

"*The Designed World*" dimension is the product of a design process that provides ways to turn resources to into products and systems.

2.2.2. Interview Questions: The objective of those questions was to determine the pre-service social studies teachers' perceptions about technology, the technological world, and the relationship between science, technology and the society. The content established in ITEA's Standards for Technological Literacy provides the foundational basis for the questions. Those questions were as following:

- Just your opinion, what technology is?
- Please, give examples to technologies what comes to mind.
- Based on your understanding, how does technology effect peoples' life?
- Could you tell something about the relationship between technology and society?
- Please, give examples to effects of technology on society.
- According to you, what are the differences between natural world and the technological world?
- Please, tell me the relationship between science and technology.

2.3. Data Collection

During April 2012, 230 social studies pre-service teachers in 1th and 2nd grades of selected universities answered the questions in the Technological Literacy Scale. It is because there were 230 students in 1th and 2nd grades of

those universities. However, only 200 of them answered all questions in the scale. Missing papers were not included in this research.

Data were collected by means of Technological Literacy Scale containing 33 items. Besides, opinions of 50 pre-service social studies teachers are picked to support quantitative data. They were selected as their points in the scale. Higher and lower points were considered in this process. Quantitative data were collected by interview questions and these questions were given participants in written because universities were on different cities.

2.4. Data Analyse

The statistical package for Social Sciences (SPSS 16 Windows) was used for data analysis. Data were analysed using descriptive statistics to summarize the data.

Independent samples t-test was used to analyse Technological Literacy Scale points according to both class level and gender, because we compared the difference between sample means that we collected. At first, assumptions of the t-test (data were from normally distributed populations and measured at least at the interval level) have checked. The independent t-test, because it is used to test different group of people, also assumes that variances in these populations are roughly equal and scores are independent. One-way ANOVA was used to analyse data collected from the scale according university variable. Assumptions of ANOVA (data should be from a normally distributed population, the variances in each condition are fairly similar) were checked. .05 was used as criteration for significance. For post-hoc procedure Bonferroni has used, because when the number of comparions is small Bonferroni has more power (Field, 2005).

Quantitative data were analysed through content analyse technique. The written data obtained from interview questions were read to obtain a general sense of the information and to reflect on its overall meaning. Notes and general thoughts about data were written in margins at this stage. Similar topics were clustered together. These topics were formed into columns as major topics, unique topics and leftovers.

Detailed analysis were began with coding process. Topics were abbreviated as codes and codes were written next to appropriate segments of the text. Most descriptive words were found for the topics and they were turned into categories. Categories were reduced by grouping topics that relate to each other. Lines were drawn between categories to show interrelationships. Member-checking was used to determine the accuracy of the findings. Figures were used to convey the findings of analysis.

3. FINDINGS

Tablo. 3.1. Technological Literacy Scale Points' T-Test Results According to the Class Level

Class Level	N	$\bar{x}$	S	Sd	T	P
1	100	19,58	4,13	198	9,64	.000
2	100	24,79	3,49			

As we have seen in Table 3.1, t-test results showed that value of t was t(198)=9,64 and that it was statistically significant at $p<.05$. It is interpreted as pre-service social studies teachers' who took the Science, Technology and Social Change course scored high technological literacy points than others. Levene's test was significant at $p<.05$ then we could conclude that our first hypothesis was correct. We have also seen it when we looked at their means. The group who took the course had 24,79 means, with a standard deviation of 3.49. However, the average technological literacy level of the group who haven't take the course was 19.38, with a standard deviation of 4.13.

This result coincided with the research of Taylor (2004) and Castillo (2007). In Taylor's study effects of some activities on technological literacy were examined and it showed that those activites have an effect on students' conceptions about technology, society and technology, solutions of the technological problems, design process and subsystems. Castillo (2007) concluded that students who had technology course were more literate than others in the context of technology. The research of Earnest B.S (2001) also reached to similar results.

Table 3.2. Technological Literacy Scale Points' T-Test Results in Abilities for a Technological World Dimension According to the Class Level

Abilities for a Technological World	N	$\bar{x}$	S	Sd	t	P
1	100	5,81	2,37	198	2,72	.007
2	100	6,65	1,99			

When we looked at Table 3.2, t-test results showed that value of t was t(198)=2,72 and that it was statistically significant at p<.05. It is interpreted as pre-service social studies teachers' who took the Science, Technology and Social Change course scored high technological literacy points in Abilities for a Technological World dimension than others. We have also seen it when we looked at their means. The group who took the course had 6.65 means, with a standard deviation of 1.99. However, the average level of the group who haven't take the course was 5.81, with a standard deviation of 2.37.

This result concided with research of Foster and Wright (2001), Derfler (2002), Taylor (2004) and Topper (2004). In those studies the effect of technology related education on technology education was examined and it was found that such education had positive effects on Abilities for a Technological World dimension of technological literacy.

Tablo 3.3. Technological Literacy Scale Points' T-Test Results in The Nature of Technology Dimension According to Class Level

The Nature of Technology	N	$\bar{x}$	S	Sd	T	P
1	100	5,59	1,45	198	3,75	.000
2	100	6,30	1,22			

As we have seen in Table 3.3, t-test results showed that value of t was t(198)=3,75 and that it was statistically significant at p<.05. It is interpreted as pre-service social studies teachers' who took the Science, Technology and Social Change course scored high technological literacy points in The Nature of Technology dimension than others. We have also seen it when we looked at their means. The group who took the course had 6,30 means, with a standard deviation of 1.22. However, the average level of the group who haven't take the course was 5.59, with a standard deviation of 1.45.

Table 3.4 Social Studies Pre-Service Teachers Views About The Nature of Technology

Code	Category	Direct Quotation
Technology	Product	All kinds of inventions that make life easier (P2). Human made tools that make life easier and speed it up (P11). Transform of the idea to tool (P34).
	Process	Scientific developments which make life easier (P43).
	System	All opportunities that make life easier and provide access to information (P18). A system which helps people (P29).
	Design	Designs which effect human life in positive or negative ways (P27). Technogy means multi functional designs which are produced through processing of natural objects (P29).

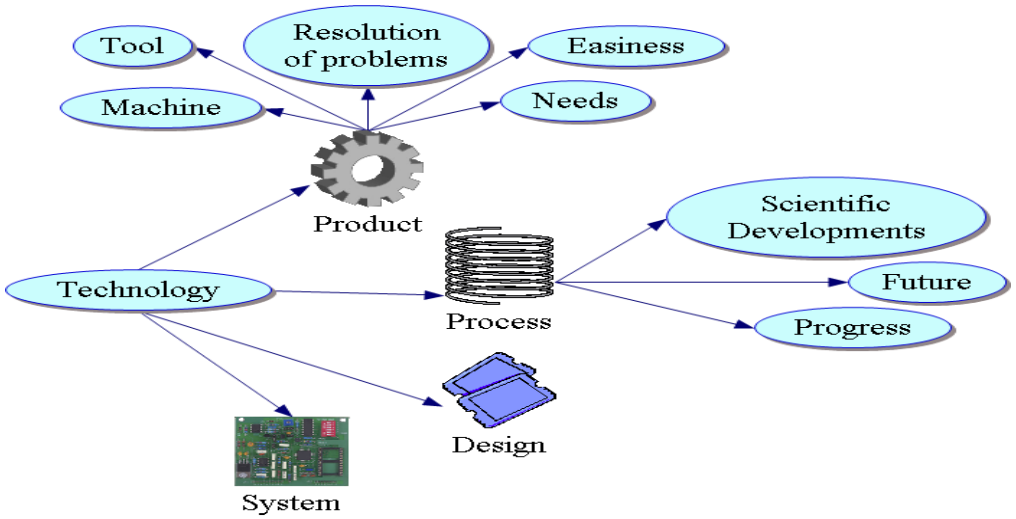

Figure 3.1. Codes and Categories about Views of Pre-Service Teachers towards Technology

As shown in Figure 3.1. majority of pre-service teachers view technology narrowly as mostly being computer and Internet. Only one thirds of the the respondents embrace the broader concept of technology as the means of "*changing the natural world to satisfy our needs and wants*". It is not surprising that computer and Internet come immediately to mind when the word technology is mentioned. This tendency can be interpreted in the context of age factor and participants earlier linkage of the word technology with computers. This result is similar with Gallup's pool (2002,2004) about technology. Besides, in other studies (Rennie and Jarvis, 1995; Cunnigham and et.al, 2005; Solomondiou and Tassios (2007) similar results were also obtained.

Pre-service social studies teachers' responses about technology are provided in Table 3.5.

Table 3.5. Technologies Given as Sample by Pre-Service Social Studies Teachers

Technology			
Product	Process	Design	System
Computer	-	-	GPS
Internet	-	-	-
Car	-	-	-
Phone	-	-	-
Domestic appliances	-	-	-
Watch	-	-	-
Pen	-	-	-
Newpaper	-	-	-
Camera	-	-	-

They tend to see science and technology as related but somewhat different. Majority of the participants have ignored the interaction between science and technology and they thougt that scientific developments affect the technology in single way. We have seen it from the expressions like "*Science is the building stone of the technology and it underlies the technology* (P3).", *Technology developes as long as science exist* (P15).", "*Science serves for technology* (P35).", "*Science is created before technology. Technology is produced based on science. Technology is the result of science* (P47)." that pre-service social studies teachers have not understand the interrelation between science and technology. This results could be interpreted as pre-service social studies teachers hadn't got enough knowledge about the history of science and technology. Bouras and Albe (2008) and Rubba and Harkness (1993) had similar results from their studies.

Table 3.6. Technological Literacy Scale Points' T-Test Results in The Designed World Dimension According to the Class Level

The Designed World	N	$\bar{x}$	S	Sd	T	P
1	100	2,77	1,50	198	7,67	.000
2	100	4,31	1,33			

When we looked at Table 3.6, t-test results showed that value of t was t(198)=7,67 and that it was statistically significant at p<.05. It is interpreted as pre-service social studies teachers' who took the Science, Technology and Social Change course scored high technological literacy points in The Designed World dimension than others. We have also seen it when we looked at their means. The group who took the course had 4.31 means, with a standard deviation of 1.33. However, the average level of the group who haven't take the course was 2.77, with a standard deviation of 1.50.

Although above results, answers given to the interview questions showed that pre-service social studies teachers couldn't differentiate the natural life and the human made technological world accurately. Data obtained from interview questions proved that pre-service social studies teachers saw natural world as "*slow, simple and primitive*" when they summed up technological world as "*fast, complex and mechanic*". Answer given by participant with code P7 supported this as following: "*Relationships in natural world progress slowly but people are more healthier and happier. Technologic world is stresful*". This result showed that pre-service social studies teachers were confused in defining rural and town lives to natural and technological lives. Another participant (P37) affirmed this result with following statement: "*Natural life is primitive life. In example, people in African clans are living in natural life*". However, the view like "*Natural life is a life sytle without human intervenes*." showed that there was few pre-service social studies teachers who described the natural life and the technological life accurately.

Table 3.7. Technological Literacy Scale Points' T-Test Results in Design Dimension According to the Class Level

Design	N	$\bar{x}$	S	Sd	t	P
1	100	2,67	1,75	198	7,10	.000
2	100	4,07	,91			

Design is a term that, as presented in Standards for Technological Literacy, is associated with a creative process for solving problems. As we have seen in Table 3.7, t-test results showed that value of t was t(198)=7,10 and that it was statistically significant at p<.05. It is interpreted as pre-service social studies teachers' who took the Science, Technology and Social Change course scored high technological literacy points in Design dimension than others. We have also seen it when we looked at their means. The group who took the course had 4,07 means, with a standard deviation of .91. However, the average level of the group who haven't take the course was 2.67, with a standard deviation of 1.75.

Compton and Harwood (2003), Kelly and Brown (2003), Mawson (2003) and Wicklein (2006) found similar results. Those studies showed the importance of design process and students' active participation.

Table 3.8. Technological Literacy Scale Points' T-Test Results in Technology and Society Dimension According to the Class Level

Technology and Society	N	$\bar{x}$	S	Sd	t	P
1	100	2,74	1,21	198	5,04	.000
2	100	3,46	,74			

When we looked at Table 3.6, t-test results showed that value of t was t(198)=5,04 and that it was statistically significant at p<.05. It is interpreted as pre-service social studies teachers' who took the Science, Technology and Social Change course scored high technological literacy points in Technology and Society dimension than others. We have also seen it when we looked at their means. The group who took the course had 3.46 means, with a standard deviation of .74. However, the average level of the group who haven't take the course was 2.74, with a standard deviation of 1.21.

Bijker (2001), Kahyaoğlu (2004) and Özaydın (2010) also reached to similar findings. However it is interesting that our participants didn't mention the relationship between technology and environment and technologies' effects on environment.

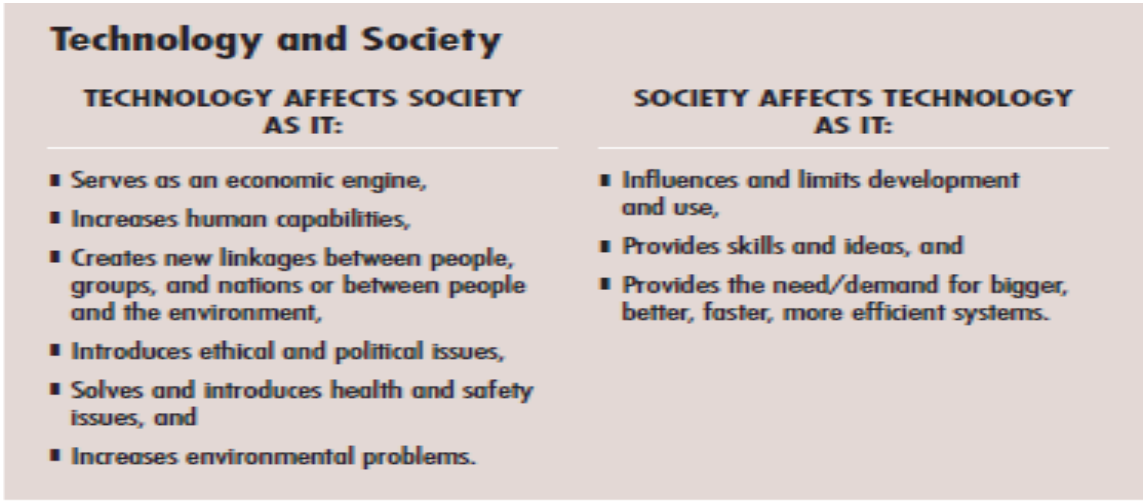

Table 3.9 Social Studies Pre-Service Teachers Views About Technology and Society

Code	Category	Direct Quotation
Technology and Society	Positive Effects	There is a parallelism between technology and society. Technology is shaped by societal needs (P1). Technology makes the society developed (P6). Technology effects society exceedingly. The needs of the society create technology. So, there is mutual interaction (P10). Technology shapes the society in a way. It steps up the change process (P15). Developed societies continue to their existence through technology (P20). Technology makes the societal life easier (P32). It forms an interaction between different societies (P42).
	Negative Effects	Some countries establish superiority on others by technology (P 13). It has changed the economic, social and cultural structures of the society (P22). It causes to the socital corruption and decreases the interaction among people (P35). It causes to globalisation and makes all societies uniform (P40).

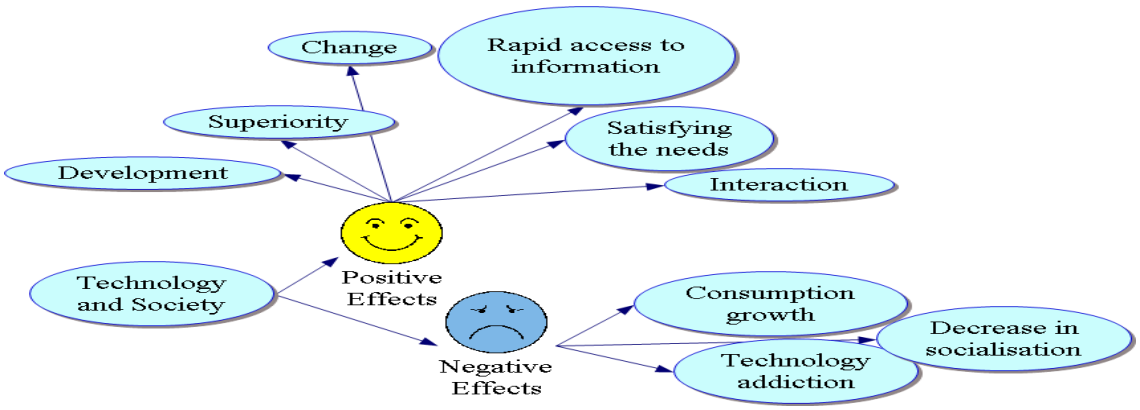

Figure 3.3. Codes and Categories about Views of Pre-Service Teachers towards Technology and Society

There is near consensus on the part of the social studies pre-service teachers that technology is a major factor in the innovations developed within a country and, they believe that the results of the use of technology can be good or bad for the society.

Table. 3.7. ANOVA Results of Technological Literacy Points According to the University

	Sum of Squares	Sd	Mean Square	F	p	Significance
Between Groups	172.280	2	86,380	4,176	,017	2-3
Within Groups	4075,375	197	20,687			
Total	4248,155	199				

Analyses showed that there was a statistically meaningful difference among pre-service social studies teachers with regard to their universities [F(2,197)=4,18, p<.05]. Scheffe test was done to see which groups have differences and the results of this test posed that pre-service social studies teachers who were studying in 3th university had higher technological literacy points ($\bar{x}$=23,32, S=4,68) than 1st ($\bar{x}$=22,20, S=4,19) and 2nd ($\bar{x}$=22,20, S=4,75) universities. Levene's test was significant at p<.05 then we could conclude that our second hypothesis was not correct.

Table. 3.8. T-Test Results of Technological Literacy Points According to the Gender

Gender	N	$\bar{x}$	S	Sd	T	P
1	87	22,78	4,39	198	1,61	.109
2	113	21,72	4,76			

As we have seen in Table 3.4, the difference of pre-service social studies teachers' technological literacy points was not istatistically significant in respect to gender [t(198)=1,61, p>.05]. Levene's test was significant at p<.05 then we could conclude that our third hypothesis was correct.

4. DISCUSSION

The importance of technological literacy was stated in ITEA (2007)'s Standards for technological Literacy like this: "*Students who studying technology learn about the technological world. They study how energy is generated from coal, natural gas, nuclear power, solar power and wind, and how it is transmitted and distributed. They examine communication systems and delve into the various manifacturing and material-processing industries. They investigate transportation, information processing, and medical technology. They even look into new technologies such as genetic engineering* (ITEA, 2007, p.4). To this end, this study emphazises the importance of technological literacy and the relationship between the social studies course and technological literacy.

The major purpose of this research to determine if there was an affect of "Science, Technology and Social Change" course on pre-service social studies teachers technological literacy levels and their views about technology and its' importance in life.

The findings support three major conclusion. The first is that the "Science, Technology and Social Change" course has an affect on technological literacy levels of pre-service social studies teachers. The second is that participant's definition of technology is a narrow one that is likely encompass mostly computer and Internet. The third major conclusion is gender is not important in the context of technological literacy.

Interdisciplinary subjects like social studies are important for teaching technology because in this way, students learn to make connections among fields of study and begin to understand how all knowledge is interconnected. Social studies teachers learn technology and the relationships among science, technology and the society during their pre-service education through Science, Technology and Social Change course. Science and technology concepts and their historical developments are taught within this course. Pre-service social studies teachers in our research group tend to see science and technology as related but somewhat different. Besides they view technology narrowly as mostly being computer and Internet. This is similar to the tendency of people who are unfamiliar with technology. They think it purely in terms of its artifacts. But, people who taught about technology should able to think that technology is also knowledge and the processes that create these products.

The promise of the future lies not in technology alone, but in people's ability to use, manage and understand it. However, as voiced in ITEA's report (1996), many people embraced technological change, believing that through technology their lives will be made easier. They see the growing ability to solve problems. Others afraid of the possible problems that technology will cause. Besides, some people find that through technology they can more easiliy maintain their personal relationships and others discover that same technologies can strain the relationships. Some people believe that techological advances come with alot of privileges in means of new jobs and new industries but others see automation replacing skilled labor. So, it can be said that people have different views and fears about technology and all of these are true in some ways. For example; biotechnological

developments can eradicate a plague or can cause one. Nuclear energy can be used for the human weal or to destroy millions of lives.

In this study pre-service social studies teachers mentioned both positive and negative effects of technology on individuals and society. A technologicaly literate person should be able to evaluate their effects on other technologies, on the environment and on society itself. However, participants of this research have seen technology as having a great effect on society, greater even than its' effect on the individual or the environment. It showed us that they couldn't understand the relationships among technology, society and environment in depth.

In technological literacy learning about technology is also learning to do technology. In this context, abilities for a technological world and design dimensions distinguish. For this reason, students are taught practical skills in regular classrooms are asked to put them to work on real-life. Many teachers have reported that, real world problem solving helps students with their own courses by making the subject matter meaningful to them (ITEA, 2007). In our case, pre-service social studies teachers hadn't got any opportunity to work on real conditions. However, it was interesting to saw that participants who received a technology education in Science, Technology and Society course had greater points in Abilities for a technological World and Design dimensions than others.

In our case the difference of pre-service social studies teachers' technological literacy points was not istatistically significant in respect to gender. Male-female differences were examined in other research in terms of online game-playing behavior, because online games may also be useful for technological literacy (NAE and NRC, 2002). Research suggest that assessments that rely on computer technology may also be skewed by gender (Prensky, 2001). Considerable research has been done about this topic and in absolute numbers, at least as many women as men play games, including online games, but women prefer different types of games and different types of interactions (Crusoe, 2005; Robar and Steele, 2004). Women prefer quizzes, trivia games, and board and contest games, whereas men prefer action games. Women tend to enjoy the social aspects of online gaming and relationship-building in games. In contrast, men prefer strategy games, military games, and games that involve fighting or shooting.

In conclusion, Science, Technology and Social Change course has an effect on technological literacy but it should be redesigned in accordance with technological literacy and pre-service social studies teachers must taught the nature of technology and its' importance in societal life.

5. SUGGESTIONS

1. Technological literacy standards should be developed for Turkey to describe the content and they should be implemented in Grades K-12.
2. To educate teachers who will develop technological literacy, education faculties must give technology education more importance and new attempts muts be done to improve teachers' technological literacies.
3. In education faculties the contents of the courses like Computer I, Computer II, Instructional Technologies and Material Design must be enriched and they must be related with technological literacy.
4. Science, Technology and Social Change course should be redesigned in accordance with technological literacy.

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