AN ASSESSMENT OF PRESERVICE TEACHERS' TECHNOLOGY PERCEPTION IN RELATION TO THEIR SUBJECT AREA

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ABSTRACT

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The purpose of this study is to explore the factors affecting a preservice teacher's perception of technology in relation to subject areas. Study focused on six hundred and ninety six senior preservice teachers (405 female, 288 male, and 3 not stated) from eight different subject areas of Burdur Faculty of Education, Süleyman Demirel University in Turkey in 2003-2004 Spring semester. A none-experimental survey research design was employed by administrating a Technology Perception Scale (TPS) and a Computer Competency Scale (CCS). Study included four independent variables (gender, subject area, existence of a home computer and perceived computer competency level) and one dependent variable (perception). The study showed that preservice teachers perceive technology in education favorably, but not very favorably. The mean scores of subscales showed the positive effects of

technology in education valued more than the effects of teacher training program by preservice teachers.

The highest mean score for TPS was observed in classroom teaching preservice teachers and the lowest score was observed in science education. It was also demonstrated that preservice teachers were graduated with a less than moderate level of competency. Classroom teaching preservice teachers possessed the highest mean score, and Turkish education preservice teachers held the lowest mean score. It was also found that males had higher mean scores than females for all scales. Preservice teachers possessing a home computer with Internet access had highest mean scores for all scales.

Univariate ANOVA results showed that gender and the perceived computer competency level are the major factors affecting a preservice teacher's perception. It was also revealed that possession of a home computer correlated with perceived computer competency level. Even though there obtained differences among subject areas, subject area was not determined as a significant factor.

Under the light of the study results recommendations are suggested for both implication and further studies.

Keywords: Technology Perception, Perceived Computer Competency, Preservice Teachers, Gender

ÖZ

ÖĞRETMEN ADAYLARININ EĞİTİM GÖRDÜKLERİ ALANLARA GÖRE TEKNOLOJİ ALGILARININ İNCELENMESİ

Tınmaz, Hasan
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Bu çalışmada öğretmen adaylarının eğitim gördükleri alanlara göre teknolojiye karşı olan algılarını etkileyen etkenler ortaya çıkarılmaya çalışılmıştır. Çalışma 2003–2004 Bahar dönemi, Süleyman Demirel Üniversitesi, Burdur Eğitim Fakültesi bünyesinde bulunan sekiz farklı alanda eğitim görmekte olan altı yüz doksan altı (405 kadın, 288 erkek ve 3 belirtilmemiş) dördüncü sınıf, hizmet öncesi öğretmen adayını içermektedir. Çalışma deseni olarak deneysel olmayan, Teknoloji Algı Ölçeği (T.A.Ö.) ve Algılanan Bilgisayar Yeterlilik Ölçeği (A.B.Y.Ö.) kullanılmasına dayanan bir yöntem uygulanmıştır. Çalışmada dört adet bağımsız değişken (cinsiyet, eğitim görülen alan, bilgisayara sahip olma ve algılanan bilgisayar yeterlilik düzeyi) ve bir adet bağımlı değişken (algı) bulundurmaktadır. Çalışma sonucunda öğretmen adaylarının eğitimde teknolojiyi kullanımına yönelik yüksek düzeyde olmasa da yeterli düzeyde olumlu algıya sahip oldukları gözlenmiştir.

İncelenen alt ölçekler sonucunda öğretmen adaylarının içinde bulundukları öğretmen yetiştirme programından daha çok eğitimde teknoloji kullanımının olumlu sonuçları üzerinde durdukları ortaya çıkmıştır.
Teknoloji Algı Ölçeğinde en yüksek ortalama sınıf öğretmenliği alanında gözlenirken en düşük ortalama fen bilgisi alanında gözlenmiştir. Ayrıca Algılanan Bilgisayar Yeterlilik Ölçeği (A.B.Y.Ö.) sonuçlarına göre öğretmen adayları kendilerini orta düzeyin altında bir yeterlilikte gördükleri ortaya çıkarılmıştır. A.B.Y.Ö.'de en yüksek ortalama sınıf öğretmenliği öğretmen adaylarında gözlemlenirken en düşük ortalama Türkçe öğretmenliği öğrencilerinde gözlenmektedir. Ayrıca her iki ölçek içinde erkeklerin kadınlardan daha yüksek ortalamaya sahip oldukları bulunmuştur. Evinde Internet bağlantısı ve bilgisayarı olan öğretmen adayları teknoloji algısı ve algılanan bilgisayar yeterliliği düzeyleri yönünden en yüksek ortalamaya sahiptirler.
Univariate ANOVA sonuçları göstermektedir ki cinsiyet ve algılanan bilgisayar yeterlilik düzeyi, bir öğretmen adayının teknolojiyi algılamasında ana etkenlerdir. Ayrıca, bilgisayar sahibi olma ile algılanan bilgisayar yeterlilik düzeyi arasında bir ilişki gözlenmiştir. Her ne kadar, öğretmen adaylarının eğitim gördükleri alanlar arasında teknoloji algısı açısından farklılaşma gözlense de, eğitim görülen alanın teknoloji algısını manidar bir katkıda bulunmadığı gözlenmiştir. Çalışmanın sonuçlarından yola çıkılarak uygulamaya ve gelecek çalışmalara yönelik öneriler sunulmuştur.

Anahtar Kelimeler: Teknoloji Algısı, Algılanan Bilgisayar Yeterliliği, Öğretmen Adayı, Cinsiyet

This thesis is dedicated to my amazingly supportive and wonderful family & relatives
and
To my adorable sweetheart

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CHAPTER 1

INTRODUCTION

Background of the Study

In the third millennium, the widespread use of Information and Communications Technologies (ICTs) is impacting on societies and on education systems. As a parallel change with the information revolution and related economic and social changes, the society also evolves to what we call now as knowledge (Bergen, 2003) and/or information society (Light, 2001). In modernized societies, the role of education for prospective life of citizens is extensively realized as a key, hence, the charge of the teacher employing gained more importance than ever before. Even though, it is proposed that teachers share responsibility for education with administrators, families, children, legislative affairs, and the community-at-large, the teacher has always the key role. Moreover, the quality of education is also determined by the quality of instruction in the classroom at the end of a day (Bergen, 2003).

It is clear that most of current inservice teachers did not meet with ICT in their own K-12 education or even in their teacher training programs. Thus, these inservice teachers have not experienced with using the computer as a learning resource or as a model in educational situations. Unfortunately, since they were not the children of third millennium, most of the teachers are anxious about computers and related technologies and are unwillingness to integrate them into their classrooms (Hunt & Bohlin, 1993). Nanasy (2001) proclaimed that half of the preservice teachers who participated in the research expected their students would be more familiar with technology than they will when they begin teaching.

Nonetheless, this meant more than a research result that a revolution in the history of education.

Up to the advancement of new technologies in education, teacher was the only one who knew everything and passed it on to students. We are definitely beginning an era where students have the same access to an incredible amount of information the same as their teachers. This changed the role of educators from the owner of knowledge to the guide of the knowledge (Chauve, 2003). With no doubt, this role change will affect the structure of school environments. Simultaneously with the change of school structure, teacher training institutions have suffered from the difficulty that they must prepare teachers for the prospective schools of the 21st century. Since, the prospective teachers will be working in technology-based school environments, it is vital for current preservice teachers to begin the profession with the necessary background to effectively use and integrate computer-related technologies in schools.

By the same token, it is confirmed that if new ICTs are used in an appropriate way within any subject area (Lea, 1999), they could be beneficial and powerful for both teaching and learning processes (Bergen, 2003). Therefore no society can escape from the requirement of integrating technology into education in the new information era. Under the light of this necessity, computer technology has been perceived as an important issue and the argument about whether or not teachers are adequately trained to use technology into their classroom has turn out to be a major concern and research issue of most scholars (Woodrow, 1991, 1992; Hunt & Bohlin, 1993; Andrews, 1996; Fisher, 1996, 2000; Kortecamp & Croninger, 1996; Ritchie & Rodriguez, 1996; Willis & Mehlinger, 1996; Chafy, 1997; Jarvis & Rennie, 1998; Murphy & Greenwood, 1998; Lea ,1999; Crawford, 2000; Davis, 2000 , 2002, 2003; Dean, 2000; Yildirim,2000; Gurbuz, Yildirim, & Ozden, 2001; Whetstone & Carr-Chellman, 2001; Cuckle & Clarke, 2002; McDonald, 2002; Boshuizen & Wopereis, 2003; Ellis, 2003) . It is vital for our teachers to learn about modern

technology in order to effectively function in schools. Thus, teachers need to be competent in representing the various technological applications for the advantage of their students. Effectively integrating the new technology into the classroom could be the biggest challenge for the prospective educational systems (Nanasy, 2001).

The systematic introduction of computers into classrooms began in the 1980s (Hornung, 2002). The utilization of technology for teaching and learning has evolved from Skinner's programmed instruction to highly interactive multimedia and e-learning environments. With the advancement of new learning theories, schools are beginning to comprehend the potential for technology to help students construct their own meaning based on learning activities where they are presented with opportunities to perform with and learn in technologies . Subsequent to the understanding the benefits of ICTs in schools, the term technology integration into education is debated as a re-creation or re-organization of the learning environment with computers and related technologies. A point is emphasized for the technology integration that it must be perceived as a function rather than an application, and a process rather than an approach (Mills & Tincher, 2003).

ICT integration and utilization in the schools represent a new professional role as being a sign of the changes in teaching profession. This role changing embraces various competencies related to technology and their integration into real-life school environments. These technology competencies relating with education define what a teacher has to know and has to do in order to provide successful education. These competencies are distributed into courses within a teacher training program, each course implying a huge scientific and professional effort. Yildirim, Kynigos, Potolea, Dumont and Aufenanger (2003) reported that just few systems have met with complete success in these areas.

Although there are few systems that effectively prepare preservice teachers for the future schools, it is difficult to refute the need for change in education systems with such innovations in technology. Chauve (2003)

suggested that there are two major types of problem that should be overcome for an educational reform; the first includes the management of foundations and time, the material aspects; and the second is concerned with psychological aspects. It is crucial that these two problems should be considered simultaneously for a successful educational change.

In the history of education, educators sometimes were confused about equipping the physical environment and equipping the teachers. However, while technology becomes more readily available, it is appreciated that successful technology integration is not just about purchasing and installing hardware and software in learning environments (Lippman, 1997). It is acutely identified that what the educational change makes possible, is the human factor (Tobin, 1996). It is not possible to imagine any progress in education without giving careful attention to the role of teachers. Even though most of times, teachers are uttering that they love their jobs and fun with working with children, this does not indicate that teachers have been automatically supporting all changes in schools (Bergen, 2003). Therefore, we should primarily attempt to convince them on the benefits of school changes, besides; this will only be achieved with the identification of their preoccupations.

The purpose of technology in teacher training programs should be producing teachers capable of integrating computer technologies into the curriculum and instructional activities in classrooms (Novick, 2003). On the other hand, due to the dynamic nature of technology each preservice teacher has a different set of computer technology experiences. Likewise, integrating technology into classrooms has become an increasingly important school reform issue. The researches were conducted in schools, universities, and even in nationwide structures in order to adopt, add and implement technology to meet the needs of their students (Hornung, 2002).

There is a large body of researches concerning the content of teacher training that is necessary to assist teachers integrate ICTs more effectively into their teaching. For instances; the report “Teachers as Innovators” (2000) noted

that teachers value many different forms of training. It is mostly emphasized that the content of training should meet the requirements of teachers in accordance with their ICT proficiencies and experiences, professional roles, and access to ICT resources. On the other hand, Chauve (2003) pointed that inservice teachers quite reasonably perceive any additional training as an additional work load in schools. Simultaneously, teachers should not only be persuaded on the possible advantages and drawbacks of ICT in education, but also be persuaded to spend time using this technology. However, if the needs of inservice teachers would be met by their preservice teacher training programs, the problem of extra hours of ICT integration studies would not be argued in a general sense.

Pellegrino and Altman (1997) acknowledged relative inability to effectively utilize powerful ICTs to support learning and teaching. They proposed some factors concerning the responsibilities of the current state of affairs, including the inconsistent and frequently disorganized process by which technology is acquired and implemented in schools. Even though teachers dominantly believed that technology provides advantages for both themselves and students, a major problem is still enduring; teachers' lack of adequate knowledge of how to use technology effectively to support their own teaching and their students' learning (Bruder, 1989; Willis & Mehlinger, 1996; Mendels, 1999; Russell G., Finger & Russell N., 2000; Brush et al., 2003; Ellis, 2003; Nanjappa, 2003; Novick, 2003). To overcome this trouble, teacher training programs that are currently training prospective teachers need to effectively incorporate the use of technology into their own instructional programs. One point needs careful attention that technology is assumed simply to be a tool to encourage the tasks of learning and teaching; it is not an end in itself.

Yildirim et al. (2003) established a connection between the new technologies and teacher training; that these are placed at two levels: area specialization or tool of training. Training preservice teachers to use various media in school is an obvious requirement for a teacher education program. For

this reason, it is impractical for a teacher training institution that is not provided with multimedia labs and computer networks. They also uttered that it would still be blocked and unprofitable, if the infrastructure was to be used mainly for teacher literacy in the field of computers.

Scholars illustrated more remarkable points for the teacher training for developing and under-developed countries. The problems relating system of education as well as teacher training will be overcome more straightforwardly than developed countries. Every year approximately 30,000 preservice teachers are graduated from Turkish universities and become teachers. Having completed requirements of teacher training programs and tests, they are prepared to teach. Current preservice teachers are different than the preservice teachers graduated a decade ago that today's preservice teachers have been taught to integrate technology into their teaching (Hornung, 2002). The re-designing project of the teacher education programs at the faculties of education in Turkish universities in 1998 established two major compulsory courses for addressing the technological needs of teaching profession. The computer course designed for providing preservice teachers with the necessary background knowledge about ICT, especially for computers. Second course, educational technology and material preparation, was planned for the equipping the preservice teachers with the required information on effective technology integration in education. The necessary technology infrastructure of both schools and teacher training institutions were attempted to be supplied. New teacher educators were employed under the light of the fact that the views and the applications of the teacher may determine the ultimate success or failure of any program, whether school-based or inservice training (Woodrow, 1991). But most studies demonstrated that the problems of teacher training system of Turkey are still permanent (Altun, 1996; Arat & Guclu, 1999; İmer, 2000; Odabasi, 2000; Çakıroğlu E. & Çakıroğlu J. 2003).

Sometimes, in spite of training and encouragement from preservice teachers' training courses and from their teacher-mentors, preservice teachers

are yet not using their potential in ICT during their teaching training or experience (Cuckle & Clarke, 2002). For these times, educators should focus on a second aspect what Chauve (2003) named as psychological aspect. Hadley, Eisenwine, Hakes, and Hines (2002) declared that empowerment of students in learning technology is an attitudinal situation that is more important than possessing specific competencies. Thus, through empowerment, the students should initially develop the confidence to deal with the computers. It could be concluded that the more the student experiences success related to technology, the more the student is motivated to learn technology. The report of “Teachers as Innovators” (2000) illustrated that teachers who use ICT in their teaching on a regular basis observed ICT relatively easy to use and found ICT to be useful to them, their teaching, and their students. Therefore, report asserted that for enhancing the motivation of novice ICT users, preservice teachers, teacher training programs should attempt to address teachers' perceptions concerning ease of use and usefulness. It is even more essential that teachers' perceptions concerning the benefits of ICT are improved. The ideas of Krech, Crutchfield and Ballachey, (1962) will help educators to understand the importance of attitudinal studies on preservice teachers such that:

> To know the characteristics of attitudes is to know a great deal. But it is not enough. If we are to predict the behavior of people over extended periods of time, and if we are to control their actions, we must also know how attitudes develop and how they change. These are matters of concern not only for the social scientist as "pure" scientist, but also for all those who would seek to influence social action. Educators, leaders of causes, reformers, politicians, minority-group leaders, businessmen -all are interested in knowing, how to develop, new attitudes and how to strengthen or to weaken existing ones. p. 180

Our past experiences are recapped into perceptions which play an important role in leading and expecting our prospective acts. The perceptions of preservice teachers of technology, whether received through parents, peers (Ellis, 2003), schooling, or one's daily life experience, play an important role in their ability to participate actively in their current and future technological world

(Volk, 1999). A significant body of research exists in the area of technology perception and teacher training. In general, studies attempt to find out the variables that correlate with technology perception. With a more focus on the factors affecting technology perception and its utilization were identified as age, gender, area of specialization, existence of a home computer and perceived computer competency level. With no doubt, our perceptions turn into practices; thus, teacher training programs are strongly recommended to focus on the factors that affect preservice teachers' technology perception for better educational outcomes. Even if studies revealed different data and provided different conclusions, it is still possible to draw some generalization from the existing body of literature. Across a range of studies, a strong conclusion has emerged that most significant factor in influencing whether teachers used ICT in classroom teaching was their subject areas (Barton, 1996; Grant, 1996; Cuckle, Clarke, & Jenkins, 2000; Lang, 2000; McRobbie, Ginns, & Stein, 2000; Whetstone & Carr-Chellman, 2001; Cuckle & Clarke, 2002; Davis, 2003).

Anymore, it is a fact that ICTs are getting a part of the education. Preservice teachers must be aware of the advantages and disadvantages of ICTs in education, be competent users of ICTs and their integration into education. Otherwise, our prospective teachers as well as our education system will not struggle with the challenges of modern information era. Therefore, exploring the factors affecting a preservice teacher's perception of technology regarding different subject areas becomes a critical issue in the field of teacher education and technology.

The Purpose of the Study

Because of the changing and advancing nature of technology, the variety of innovations will probably continue to expand with the availability of new technologies (Kjetsaa, 2002). The uncontrollable development in computer technologies over last decades has also influenced the teaching profession. So,

it is expected that professional organizations, university academics, and community policy makers have recognized an imperative and pressing need to integrate technology in all levels of educational efforts. While the efforts on effective use of technology in instruction increase, educators are dealing more with offering adequate preservice teacher education to prepare new teachers to teach in the information age (Irving, 2003).

Without hesitation, today's contemporary teachers are expected to be competent users of technology and be the experts of technology integration. As being a necessity, teachers must primarily master ICTs in order to be able to integrate them into their teaching. As Yasin (1998) stated only the persons having technologically literate and capable citizens can contribute to a country's development. This concentrates the teacher training programs as being a matter of concern and interest internationally as well as in Turkey development policy. The high expectations and demands associated with education, at all levels, in the context of ICTs must be handled by adequate efforts in the development of teachers' competence and perception. The need to train preservice teachers about technology is an enduring issue. Over the past decades, teacher training institutions have begun to deal with the task of teaching teachers about technology (Doering, Hughes, & Huffman, 2003).

Professional development of teachers is a dynamic framework and it will only be updated in accordance with new research, educational theories, and responses from preservice and inservice teachers and teacher educators (Teachers as Innovators, 2000). Similarly, the success of any new educational program depends strongly upon the support and position of the teachers involved in the system (Woodrow, 1992). Accepting our preservice teachers as our prospective teachers, the ideas of them will make a great contribution to understand the current teacher training programs and more generally our present educational system.

Technology training and integration in preservice teacher education is a current research concern. It is believed that by exploring the perceptions of

preservice teachers regarding technology integration experiences toward their professional development can provide essential knowledge for preservice teacher education curriculum designers (Elwood-Salinas, 2001). Kjetsaa (2002) also claimed that considering the increase in the number of research concerning technology education, the pace of innovative diffusion into teacher training has increased. As further research is performed in the area of teacher training and technology, better utilization and investment could be planned which will lead to increased teacher computer competencies and favorable teacher perception towards computer and related technologies.

Teachers with favorable perception of technology will believe that ICTs make their teaching more pleasant and interesting for both the teacher and their students. They will be more willing to overcome barriers relating to deficiencies of resources, technical problems and a lack of technical support. They will be eager to spend personal time for developing their competencies and their integration into classrooms. Moreover, they will be interested in helping their colleagues to develop their competencies as well.

The purpose of this study was to explore the factors affecting a preservice teacher's perception of technology relating with their subject areas.

Research Questions

The general question this study sought to explore was the factors that affect a preservice teacher's perception of technology in selected subject areas. This study looked at the subsequent five sub-questions:

Sub-question 1: What are the descriptive characteristics associated with the following scales: (a) Technology Perception Scale (TPS) and sub-scales, and (b) Computer Competency Scale (CCS)?

Sub-question 2: Is there a relationship between preservice teachers' technology perception scores, and the following demographics: (a) gender, (b) subject area, (c) possession of home computer, and (d) perceived computer competency level?

Sub-question 3: How accurately can a technology perception score be predicted from a linear combination of the following demographics: (a) gender, (b) possession of home computer with or without Internet access, (c) perceived computer competency level (novice, intermediate and competent) and (d) different subject areas?

Sub-question 4: Is there any significant difference between the technology perception of preservice teachers from different subject matters, gender, possession of home computer and perceived computer competency level?

Sub-question 5: Is there any difference between the subject matter areas and preservice teachers' perceptions of technology?

Significance of the Study

This study is expected to:

a) explore the factors affecting a preservice teacher's perception of technology,

b) describe the differentiation of technology perception in selected subject areas,

c) guide future studies since preliminary research and review of literature reveals few studies focused on technology perception in different area of specializations,

d) describe the effects of the re-designing the teacher education programs at the faculties of education in Turkish universities in 1998 with respect to technology training.

Definitions of Terms

Following are the terms that will be used extensively in the study. A working definition for each is set forth. Neglecting the importance of each term for this study, the terms are arranged alphabetically.

Communication: Lippman (1997) defined communication as “systems that allow groups of teachers and students to send information and data to each other through networks or other technologies” (p. 7).

Computer: Computer, mostly uses interchangeably with microcomputer, is a small, standalone computer system designed for use by one person at a time which can be programmed to perform various tasks and has the capability to use software programs designed for specific purposes.

Computer Competency: Ennis (1992) delineated the computer competency including “specific mechanical, functional skills and knowledge of computers and the necessary subject matter knowledge and skills which one needs in order to use a microcomputer” (p. 10).

Computer Course: Computer course is compulsory for all subject areas in Turkish teacher training undergraduate program. This course was given at the freshmen and senior years of preservice teachers, but, different subject areas enroll this course in different semesters. Course is designed to provide necessary information for preservice teachers on basic computer skills and to introduce teachers to several commonly used computer applications such as word-processing, spreadsheet, databases, telecommunications, presentation programs and etc…

Computer Experience: Computer experience in this study is defined as the frequency of computer use.

Computer Literacy: In most cases, the term “literacy” involves the entire ability to read and write and ability to make calculations. After the beginning of information era, another type of literacy emerged; computer literacy generally referring to the ability to understand and use computers (Heinich, Molenda, Russell, & Smaldino, 1996). According to Lippman (1997), computer literacy is defined firstly by Arthur Luehmann in the 1960s meaning a set of basic abilities that each person should have with computer systems. However, computer literacy now has various meanings. For instance, Gurbuz, Yildirim, and Ozden (2001) explained the meaning of computer literacy as the essential familiarities

of pre-service teachers with computer technology that will help them to struggle in the professional advertise or be well-qualified individuals in the society.

Computer Related Basic Concepts: Basic concepts refer to be familiar with the computer terminology and jargon such as mouse, pixel, CD, floppy disks and so forth.

Curriculum: Curriculum for this study refers to the courses, experiences, and assessments necessary to prepare preservice teachers to teach students at a specific age level and to teach a specific subject area.

Databases: Databases are defined as a collection of information systematized by computer software to allow storage and easy retrieval through keyword searching; the program designed to accomplish these tasks. For example; Microsoft Access.

Demonstration Programs: Demonstration programs are defined as programs designed to allow people to display pictures and text to support their lectures or talks. For example; Microsoft PowerPoint.

Educational Technology: Educational technology is an emerging field that includes a variety of technologies such as computers, word-processing programs, curriculum-related software, research databases, the Internet, e-mail, presentation programs, databases, teleconferencing, and web-page development (Nanasy, 2001) and the uses of these technologies in a variety of settings to solve learning problems in educational environment (Jao, 2001) and includes the policy, structural, organizational implications and legal implications of the uses of technology as it applies to educational settings and has an important component the training of teachers and teacher educators (Kjetsaa, 2002).

Educational Technology and Material Development Course: Educational technology and material development course is compulsory at the fifth semester of teacher training programs in Turkish universities that designed for teaching the role of technology in instruction, types and main principle of designing,

developing and evaluating instructional materials, fundamentals of computer-aided instruction, evaluating educational software.

E-mail: Electronic mail is defined as messages sent via telecommunications from one person to one or more other people.

Fundamentals of Information Technology Course: Fundamentals of Information technology course is compulsory for the preservice teachers in Burdur Faculty of Education, Süleyman Demirel University in Turkey where the study conducted. The course was set at the freshmen and senior years of preservice teachers, but, different subject areas enroll this course in different semesters. It includes the definition of information and data, the tools for processing information and the evolution of information technology in the teacher training.

Hardware: Hardware is defined as physical elements of a computer including both the peripheral such as scanner, printer, microphones and etc… and the case together with the main board, CPU and other cards.

Information era: The ages after Soviets launched Sputnik in 1957 where most countries like USA magnify the importance of science and mathematics. Sputnik accelerated criticisms of schools. It guided a lot of research on curriculum development, and school innovation. Curriculum changes led to the new mathematics and the new science in the 1950s and early 1960s. Changes in English and social studies instruction followed in the middle and late 1960s. The launching of Sputnik in 1957 also influenced educational technology and instructional design.

Inservice Teacher: An inservice teacher is a practicing teacher who has already graduated from a teacher preparation program and working in the field as a teacher.

Inservice Teacher Training: Training and instruction provided by schools for teachers and staff employed by the school.

Internet: Internet is defined as a worldwide network that connects many smaller networks with a common set of protocols for sending and receiving information.

Multimedia: Multimedia allows presentations using several interrelated media sounds, text, and images as a basis for interactive communication (Sanders, C. S., 2002, p.6).

Operating System: Operating system is the most important program running on a computer performing basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers. For instances, Microsoft Windows, Linux, Dos and etc…

Perception: Jao (2001) defined perception as "a guiding rule on which behavior, a way of thought or action is based" (p.13). Most of the psychologists defined the perception as the interpretation of senses (Feldman, 1996; Santrock, 1996). Moreover; the meaning of sensation was also discussed in the literature; since, for a psychologist who attempts to find out the causes of human behavior, sensation and perception are assumed as elementary topics, since human behavior is so much a reflection of how we react to and interpret stimuli from the world around us. Sensation is what occurred when information makes contact with our sensory receptors – eyes, ears, tongue, nose, and skin (Santrock, 1996). Whereas sensation comes earlier than perception, psychologists have felt the dilemma of their exact boundaries. Feldman distinguished these two terms that individual's initial encounter with a raw sensory stimulus is sensation; on the other hand, perception is the next phase where the stimulus is interpreted, analyzed, and integrated with other sensory information.

Another essential issue of perception is its dissimilarity feature. It was confirmed that learning is affected by our existing knowledge which obtained through our past experience. Besides, one's existing knowledge makes it feasible to comprehend new information and events. By the same token, because of the differences in previous knowledge of human-beings, two persons' perceptions of the identical events could be relatively dissimilar leading to different interpretations being placed on neutrally identical perceptual inputs (Howe, 1995). Highlighting the significance for school

learning of students' own activities and existing knowledge points our concentration to the characteristics of the individual learner. Howe notified that if the educators did not pay such kind of attention, the higher level of school learning improvement would not be achieved. If so, various problems and issues of education may not be addressed.

Krech, Crutchfield, and Ballachey (1962) asserted that if we know how a person perceives an event or the attitudes of one's toward an object, it is probable to predict and control his/her behavior and for many people such as educators, economists, psychologists, sociologists, and so on, the prediction and control of the behavior of others are important wishes. As a second point, by understanding the society is a system of interconnected groups of people such as educators, males, females, clerks, and so on, it would be easier to realize that within a society and within groups in a society many values are shared. Furthermore, group values play an important role in the development and organization of the perceptions and attitudes of the individual. Then an individual reflects his/her social-class culture, and in the cultures of his various primary groups. Thus, it is an emergent action to recognize the values, attitudes or perceptions of the society to understand the individuals profoundly.

Preservice teachers are preparing to become classroom teachers who can effectively and flawlessly integrate technology into their curricular activities. Attitudes and perceptions toward teacher training courses provide insight into the satisfaction and comfort level of preservice teachers (Nanasy, 2001). These preservice teachers have certain perceptions related to what that status requires. Such perceptions are challenged or reinforced as preservice teachers contribute in school experiences (Elwood-Salinas, 2001).

Perceived Computer Competency Level: In this study, preservice teachers are grouped into three categories as novice, intermediate and competent with respect to their mean scores on a three points Likert scale of computer competency; (a) novice level preservice teacher has a mean score between

1.00 and 1.66; (b) intermediate level preservice teacher has a mean score between 1.67 and 2.34; and (c) competent level preservice teacher has mean score between 2.35 and 3.00.

Preservice Teacher: A preservice teacher is the one who is presently studying within a teacher education program with the intent of completing teacher certification requirements but has not yet completed student teaching assignments.

Preservice Teacher Training: Training and instruction provided by teacher training faculties for preservice teachers who are the prospective teachers for education. In Turkey, preservice teacher training continues for eight-semesters within an undergraduate education program of private and national universities.

Program Type: In Turkish higher education system, there two major types of program in universities, where available. First program is defined as the type of education starting at 08:30 till 17:00. On the other hand, with a higher tuition fee, the second program can be described as the program type of education starting at 17:05 following the identical curriculum with first program and generally instructed by the same faculty members. Both the first and second programs of subject areas have the same constitutional rights in the Ministry of National Education.

Spreadsheets: Spreadsheet is defined as software designed to store data (mostly numeric) by row-column positions known as cells*;* can also do calculations on the data. For example; Microsoft Excel.

Technology: With an all-purpose understanding, technology is defined in Merriam-Webster's Collegiate Dictionary as: (a) the practical application of knowledge especially in a particular area, (b) a manner of accomplishing a task especially using technical processes, methods, or knowledge, and (c) the specialized aspects of a particular field of endeavor.

Most scholars attempted to define the term "technology" in accordance with their own perceptions and studies. Some of them made a very general description that technology is any human-made or formed instruments,

processes, tools or devices (typically the newest and most advanced) that extends human capabilities in spheres of human existence such as the home, business, education, and industry (McHaney, 1998; Yasin, 1998).

Notwithstanding giving a definition, some others tried to give instances that technology is an innovation category to classify electronic and digital innovations ahead of just computers and included such things as CD-ROM, Internet, laser-discs, digital video, electronic media including TV and radio (Kjetsaa, 2002). Sometimes technology is only defined with an association with computer, for example; computer hardware, computer software and the peripherals associated with computers such as scanners, digital cameras, email, and the Internet (Novick, 2003). For proponents of education, technology is linked with teaching and learning process. According to Holden (1997), technology is "all electronic technology involved in the processes of human learning in schools, most notably computer technology" (p. 6).

In conclusion, the term "technology" often refers to a wide range of computer-based teaching and learning materials and applications, including all elements of computer use, Internet resources, various electronic communications, e-learning, web-based instruction and distance education. Thus the terms technology and computers are used interchangeably in this study.

Technology Education (Training): For Nanasy (2001) technology training refers to "specific training that preservice teachers have received or expect to receive on methods to incorporate educational technology into the classroom" (p. 6). By the same token, The National Council for Accreditation of Teacher Education (NCATE) defines technology Education as the study of technology providing an opportunity for students to learn about the processes and knowledge related to technology that are necessary for solving problems and extend human capabilities (Professional Standards for the Accreditation of Schools, Colleges, and Departments of Education, 2002). Some scholars like Kjetsaa (2002) combined technology education and training under the same

heading, such that technology education refers to “exposure and training in technology” (p.18). Therefore, through the study, the terms, technology education and training will be used interchangeably.

Technology Infrastructure: Technology infrastructure, in this study, refers to the resources required for an effective teacher training program. These resources include personnel (e.g., faculty, staff, students), productivity tools (e.g., curriculum, technology, professional development opportunities, supplies, and telecommunication technology), and physical facilities (e.g., buildings, libraries, classrooms, and laboratories).

Technology Integration: Technology integration is the infusion of technological tools and services, such as computer systems and the Internet, into a part of the educational environment within various subject areas (McDonald, 2002) including changes made to the curriculum as well as to educational facilities (Maninger, 2003; Pawloski, 2003). Even though for some researchers, there is a difference between the terms technology integration and technology infusion, these terms will be used interchangeably through this study.

Technology Integration Education: Technology integration education is the instruction provided for preservice teachers and sometimes for inservice teachers in how to use and implement information technologies to enhance classroom curriculum of different subject areas.

Technology Literacy: Knowledge and critical awareness of technology in terms of day to day use, importance to one's country, and to global interdependence (Yasin, 1998).

Telecommunications: Lippman (1997) defined telecommunications as “communications over a distance made possible by a computer and modem or a distance learning system such as broadcast TV” (p. 11).

Undergraduate: Ministry of National Education (MONE) in Turkey defines undergraduate education as a higher education covering a program of at least eight terms following secondary education.

Use of Technology: What preservice teachers must know and understand about information technology in order to use it in working effectively with students and professional colleagues in the (1) delivery, development, prescription, and assessment of instruction; (2) problem solving; (3) school and classroom administration; (4) educational research; (5) electronic information access and exchange; and (6) personal and professional productivity (Professional Standards for the Accreditation of Schools, Colleges, and Departments of Education, 2002).

Web Page Development: Web page development includes designing, developing and evaluating the Internet pages.

Word-Processing: Word-processing is defined as an application software activity that uses the computer for typing, editing and preparing documents. For example; Microsoft Word, WordPad and etc…

World Wide Web (WWW): World Wide Web is defined as a system on the Internet connecting sites through hypertext links.

Assumptions

For this study, the following assumptions are established:

1. The participants responded accurately to all measures used in this study.
2. The data were accurately recorded and analyzed.
3. Reliability and validity of the all measures used in this study are accurate enough to allow accurate assumptions.
4. The sample selected for this study represents the population.

Limitations

The following limitations are relevant to the study:

1. Validity of this study is limited to the reliability of the instruments used in this study.

2. Validity is limited to the honesty of the subjects' responses to the instruments used in this study.
3. This study is limited to a sample of preservice teachers in Burdur Faculty of Education, Süleyman Demirel University in Turkey where the study conducted.
4. This study is limited to eight different subject areas in Burdur Faculty of Education.
5. This study is limited to participants who volunteered to participate in the research.
6. The number of participants in each subject area is diverse.

The generalization of the results to the entire Turkish teacher training system may be limited. First, because the preservice teachers who participated in the study were enrolled at one university, the demographics of the sample may not generalize to other teacher education faculties in different universities.

Overview of the Reminder of the Study

Chapter 2 presents a review of the literature pertaining to the study. Chapter 3 reviews the method of the study. Chapter 4 presents the data collected. Chapter 5 provides a summary, findings, conclusions, and recommendations. The study concludes with appendices.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

A review of the literature was commenced for obtaining adequate knowledge of the technology perception in education along with comprehending the significance of work already done in the field. This knowledge provides the purpose of providing a perspective on how the technology perception in education has developed, and become established, and assists in the development and acquisition of the appropriate vocabulary (Hart, 1998). Particularly, the review of the literature looked for exposing the current information related to the following major and sub questions:

What are the factors that affect a preservice teacher's perception of technology in selected subject areas?

Sub Questions:

1. What are the descriptive characteristics associated with the following scales: (a) Technology Perception Scale (TPS) and sub-scales, and (b) Computer Competency Scale (CCS)?

2. Is there a relationship between preservice teachers' technology perception scores, and the following demographics: (a) gender, (b) subject area, (c) possession of home computer, and (d) perceived computer competency level?

3. How accurately can a technology perception score be predicted from a linear combination of the following demographics: (a) gender, (b) possession of home computer with or without Internet access, (c) perceived computer

competency level (novice, intermediate and competent) and (d) different subject areas?

4. Is there any significant difference between the technology perception of preservice teachers from different subject matters, gender, possession of home computer and perceived computer competency level?

5. Is there any difference between the subject matter areas and preservice teachers' perceptions of technology?

This chapter is organized according to five themes which provided grounding for this study:

I. Current Conditions and Practices in Teacher Education and Technology
II. Current Scene in Teacher Education and Technology in Turkey
    a. Overview
    b. Higher Education and Teacher Training
    c. Teacher Competencies
    d. Studies on Turkish Higher Education and Teacher Training
III. Technology Related Courses
    a. Computer Literacy Course
    b. Educational Technology Course
    c. Teacher Educators
    d. Technology Infrastructure
IV. Variables Associated with Perception Studies in Teacher Education and Technology
    a. Age
    b. Gender
    c. Subject Areas
    d. Possession of Home Computer
    e. Perceived Computer Competency Level
V. Summary

Current Conditions and Practices in Teacher Education and Technology

When the Soviet Union put its Sputnik satellite into space in 1957, everything has changed for the world. Technological improvements of civilizations turned out to be the most admired issue of each and every sector such as business, industry and as well as education. New concepts were added into our dictionaries such as micro-computers, information and communications technology [ICT], Internet and more prominently, their reflections on schools and even on the entire education systems. Technology has the power to convey an enormous resource of knowledge to every child in the countries (Education Technology Must Be Included in Comprehensive Education Legislation, 2001). These innovations forced every individual to encompass the necessary education and skills to struggle with the modern information era.

As the societies complete their transition into the information era, schools will revolutionize just as they did when societies moved from an agrarian to an industrial society during nineteenth century. That would generate what Light (2001) called “Information Society” referring to a post-industrial society in which information drives much of the economy and everyday life. Technology is changing at a breath-taking pace and will keep on doing up to the anticipated prospect (Eisenberg, 2003). With the introduction of information era, as Altan (1998) suggested, it seems that five important issues could be found on countries’ agenda: economy, the education, the environment, and technological and demographic change.

Tobin (1996) uttered as the economy began to revolutionize over the past decades, lots of the firms set off a recycling process. Millions of dollars were invested for new technologies. However, the managers of such firms definitely missed a point that investments to newer technologies could just facilitate the change. Huge amounts of investments could not cause change. What make the change happen are the people in the workplace. By the same token, we need new skills for citizens (Chauve, 2003). To facilitate the well integration into a

continuously-developing society, citizens must be able to familiarize themselves to innovative circumstances. We require such adaptation for both countering to the changing demands of jobs, and altering jobs as well.

Educational systems around the world are also changing rapidly in response to the technological and economic restructuring. The rapid nature of technology innovation creates a remarkable challenge for educators to stay up-to-date (Irving, 2003). Overall purpose of education is to prepare people to perpetuate and improve the society in which they live. Thus, internationally, an educational program must be associated to its political, social, and economic way of life (McCaslin & Parks, 2002). As a conclusion, new educational systems with continuously adapted to technological improvements are essential for modern times of information era (Altun, 1996; Davis, 2002). Teacher educators who have approved ICT are often in the role of change agents guiding educational systems' improvement of technology. ICT is to be realized as an facilitating technology which gives new answers to basic questions such as how to manage individual differences, how to deliver perfect-fitting education, and how to make education more appealing for both the student and the teacher (Van Den Dool & Kirschner, 2003).

As a result of its significance, the concept "technology" turned out to be the most universally debatable but the least definitely identified word in last decades. As an exaggeration; the argument about what is technology or what is not has started from the first invention of the human being. Simultaneously with invention, the discussion on the definition has also emerged. Goudy (2002) defined technology as "the tools that grow and change with society and serve to assist and extend human capabilities and knowledge" (p. 10). McRobbie, Ginns and Stein (2000) investigated a number of broad definitions of technology and noted that five important dimensions of technology:

> (a) technology has a human dimension - it is a purposeful activity, conceived by inventors and planners and can be promoted by entrepreneurs; (b) technology has a social dimension - it is used and

> implemented by society, it has effects on society, and it is influenced by value judgments; (c) technology is a process - it involves doing, making and implementing with materials, a knowledge of and use of tools, it draws upon a knowledge of materials, design practice, expertise and knowledge itself, it is subject to the laws of nature and may be enhanced by discoveries in science or may often precede science, and it is used to solve problems; (d) technology is situated - it is conducted within contexts and constraints; and (e) technology leads to the development of products, or artifacts. (p. 81)

Similar to other people, teachers also hold a diversity of concepts of technology. The ambiguity in the definition of technology, unfortunately, results several confusing activities in the classroom. Many teachers from different subjects have little educational background, since both science and technology are moderately innovative subjects in the primary school (Jarvis & Rennie, 1998). For instance, Jarvis and Rennie, in their studies, attempted to find out the factors that influence children's developing perceptions of technology. It was observed that many primary school teachers are inconsistent and unwilling to explain their students which classroom activities are technology for the reason that they are also undecided about its definition. Some of them perceive technology as the applications of science; while others see it as a complete human action about designing and making products and developing organizations. Similar results were obtained from the study of Yasin (1998) who examined the perceptions and curricular values of sixteen or seventeen year old students (*N*=520) in Malaysian public schools with respect to technology and the technology curriculum. Students were found to have a strong perception that technology involves invention and that it has to be an application of science. Thus, Yasin inferred that technology comes after science. Moreover, students whose views were more closely related to that of the scientific community, realized technology as a product or machine. Almost all students agreed that technology affected their lives that brought a comfortable and convenient life, less human energy was required, and it saved time. Students also believed that technology enhanced their learning and influences their future aspiration.

In the study of McRobbie, et al. (2000) preservice primary school teachers were asked two questions that when they read the word "technology" what comes into their mind and “what technology involves”. The first charming result of the study was that individually, preservice teachers’ perceptions of technology was not wide-ranging of the all dimensions of technology, on the other hand as a group, was comprehensive. Moreover, they found that a small number of preservice teachers included references to the human aspect in technology (34%). Besides, similar to the study of Jarvis and Rennie (1998), the product-orientation idea (68%) and the process inheritance role (31%) included in the idea of technology definitions. It was also uttered that ninety-two percent agreed upon learning more about technology and but surprisingly, fifty percent could not frame their minds whether technology has brought more good things than bad things.

Even though, there is no clear agreement upon the definition of technology, it is noticeable that technology could have an enormous impact on teaching and learning. Re-organization of school and classroom environments seems a prerequisite of integrating technology into the framework of teaching and learning. Using different technologies effectively in education involves shifting educators’ focus from teaching to learning. With the proper technology utilization, it could be used as a tool to assist teachers’ adjustment and expand what they perform in the classroom. Technology also presumed to eliminate the barriers of time (also explained in Dean, 2000) and distance. Technology could be converted into a very important tool in addressing increasing inequities of quality resources and quality learning experiences for all students (Lippman, 1997).

Dean (2000) asked inservice teachers (*n*=210) about their perceptions of the impact of technology infusion on their students' learning experiences. Inservice teachers delineated their perception in a clear consensus that student learning was being positively impacted by their technology infusion efforts. At least ninety-nine percent of the inservice teachers strongly agreed that their

students were able to participate in classroom technology activities, students experienced real profits from the utilization of technology in the classroom, and technology infusion resulted in improved student learning.

The report of the Web-Based Education Commission to the President and the Congress of the United States (The Power of the Internet for learning: Moving from Promise to Practice, 2000) was concentrated on meaning of the term “training”, frequently called as professional development and was noted that training implies much more than just building basic technology skills. The underlying definition of training should consist of developing a vision built on the perceptive that technology is a tool suggesting solutions to very old teaching and learning problems. Thus, training ought to be built on the idea of thinking with technology so as to approach old problems in new ways.

Similar to the definition of technology, the derived term “Information Technology” is also vague. Information technology is mainly not only related to computer use but also implying media education and other technologies (Lang, 2000; Lu & Miller, 2002). Information technologies for learning provide teachers with the tools to engage students powerfully in the learning process. Besides, the formats and the number of media technologies are increasing with the information era. Thus, preservice teachers should be prepared so that they are all aware of possible benefits and barriers of each type of media technologies (Heinich, Molenda, Russell, & Smaldino, 1996).

IT [Information Technology] is altering the global economy and considerably changing the way business and society functions. There must be a parallel adaptation in education to make certain that students have the necessary skills to succeed in the digital age. Needless to say that IT is becoming increasingly important in the classroom settings and there is a widespread interest in how IT is being applied (Science and Engineering Indicators report of National Science Board, 2002). Teachers will use technology as effectively and flawlessly as they use chalkboards at present. But, in order for technology to be incorporated into teaching, teachers need to have a strong

understanding of the role of technology and how it can be integrated throughout the curriculum (Education Technology Must Be Included in Comprehensive Education Legislation, 2001). Besides, when computer is considered as an educational tool, the most significant issue is the position of the teacher. For computers to be used in the classroom, teachers must have necessary knowledge about computers. Due to this fact, preservice and inservice programs for teachers and computer literacy courses for preservice teachers were developed and offered (Gurbuz, Yildirim, & Ozden, 2001). Correspondingly, computer literacy emerged to be an important key aspect in utilizing the course activities successfully (Baki, 2000). Preservice teachers today are realizing, particularly, the importance of computer literacy. They are growing up in an information-based society desiring knowledge of computer technologies to succeed both personally and professionally (Sanders D. W. & Morrison-Shetlar, 2001). Teachers of technology education are in a unique position to directly influence administration, peer, and student perceptions of the role technology in contemporary society. Technology education must inquire about moving beyond the diffusion of the most effective and economic usage of "tools" in contemporary society to comprise critical investigations of the social purpose of technology (Chafy, 1997).

Sometimes, the term “information technology” uses interchangeably with information and communication technologies [ICT] in daily life, and even in research studies. ICT refers to a series of technologies including the computer and which, when combined or interconnected, are characterized by their power to memorize, process or make accessible and to transmit to any place at all, a virtually unlimited and extremely diversified quantity of data (Bracewell & Laferrière, 1996). ICT is being used increasingly by global industry, international media, and academics to reflect the junction between computer and communication technologies. Thus ICT is a unification of IT and telecommunications among a set of activities and technologies (Digital transformation: A framework for ICT literacy, 2002). For education, and even in

other sectors, ICT is just a means, not an end. For the teacher training college and for the teacher, it is a fundamental piece of equipment, and what the educational system need is the pedagogic integration of ICT into education, which is much more complete redesign of learning environments (Van Den Dool & Kirschner, 2003).

In report of the International ICT Literacy Panel (Digital transformation: A framework for ICT literacy, 2002), the importance of ICT for work, education, and everyday life was discussed and the panel defined ICT literacy in the following way: “ICT literacy is using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society” (p.2). With this definition, taxonomy of ICT literacy was also classified with five components representing a set of skills and knowledge presented in a sequence suggesting increasing cognitive complexity. These five levels of ICT literacy are:

1. Access: knowing about and knowing how to collect and/or retrieve information.
2. Manage: applying an existing organizational or classification scheme.
3. Integrate: interpreting and representing information. It involves summarizing, comparing and contrasting.
4. Evaluate: making judgments about the quality, relevance, usefulness, or efficiency of information.
5. Create: generating information by adapting, applying, designing, inventing, or authoring information. (p.3)

The panel also declared that by providing a consensus on the definition of ICT literacy, the improvement of the quality of prospective education will be ensured. Similarly in the panel report, it was proclaimed that if serious problems threatening the achievement and the effectiveness of the ICT in education are overcome, the underlying potential of the higher levels of ICT literacy are asserted to have a power to influence not only individuals but also society in a good manner.

In “Teachers as Innovators” report (2000) of the Teacher Training Agency of United Kingdom (U.K.), funded by Oracle and Compaq, main advantages and

disadvantages of ICT in teaching were discussed by considering the results of surveyed inservice teachers. The possible advantages of ICT in teaching were divided into two categories; (a) concerning the students and (b) concerning the teachers. The most common response of teachers relating with the major benefit of ICT with respect to students is the increased motivation. The others were listed as increase of students' interest and improvement of their concentration, and making the instructions enjoyable and fun. As a result of the ICT utilization benefits on students' ability to learn were also debated that students have more control of their learning (also noted by Dean, 2000; Mills & Tincher, 2003). By using ICT in teaching, it was also offered the students with the opportunities of possessing necessary ICT skills and preparing them for their future in a technology based society. On the other hand, when advantages of ICT for the teachers were argued, the most common responses were of that the improvement the teaching strategies on hand and expanding activities. This also resulted to increase the teachers' satisfaction of their own lessons (also noted by Dean, 2000). It was also suggested in the report that using ICT, it turned out to be easier to concentrate on the learning mission rather than on the process. Additionally, letting teachers do things that they wouldn't be able to do otherwise and the advancement of the Internet providing them with more varied and improved materials to employ in their teaching were stated as the advantages of ICT in teaching for teachers.

Nevertheless, the responses that were given concerning the disadvantages of using ICT in teaching divided into six main categories. First of all, the greatest disadvantage was reported as having inadequate resources and support. Under this heading, the major problems were listed as lack of accessing to computers for ICT, difficulties associated with requiring reserving access to ICT resources beforehand as careful planning was needed to accommodate, not having enough computer access for all students in a class, out of date resources, and not having enough technical support to use ICT effectively in their teaching. As a second disadvantage, technical problems which in many cases were

related to a lack of adequate resources were noted. It was also claimed that technical problems could outcome in the de-motivation of students and the removal of time and resources from other important curriculum areas. As a third disadvantage stated by teachers was using ICT in their teaching being time-consuming in terms of the preparation before and also during the lessons (also explained in Dean, 2000). Cost of resources was listed as the fourth drawback of ICT in teaching. As a fifth point, need for extra supervision was stated. Some teachers reported that there were difficulties involved in teaching large groups all at the same time, and that one to one supervision was often necessary. The last but the most important drawback for this study was the inadequate training. A few of the teachers realized that they had not had adequate training for using ICT. Other teachers argued that there was a deficiency in investment in staff training. In the "Teachers as Innovators" report, two extra disadvantages of using ICT in teaching explained by individual teachers were that there is too much concentration on word-processing rather than using ICT in a wider range of tasks, and that girls could be turned off learning by its use.

In the dissertation project of Sanders C. S. (2002) the possible effects of integrating multimedia in technology education to improve college student comprehension, problem-solving skills, and attitudes toward instructional effectiveness were investigated. The study results demonstrated that: (a) when student understanding was focused there was no clear evidence that the multimedia-enhanced lectures were more or less effective than are traditional teaching methods; (b) multimedia lecture methods might increase the time students need to perform a task; (c) multimedia lecture method might product in better performance accuracy with respect to conventional lecture method; and (d) with a concentration on students' attitudes toward instructional effectiveness, there was no evidence that multimedia-enhanced lectures were more or less effective than are conventional teaching methods.

In their research on implications of IT for teacher education, Russell G. et al. (2000) firstly stated that IT was most frequently used in the classrooms for

information purposes, creative purposes, and educational programs and games. Besides, very little use was made of IT for communicating with others. Furthermore, when it was asked about our understanding of the nature of schools and schooling would certainly be altered by IT, eighty-one percent of teachers agreed with that statement. Ninety percent approved that IT was a valuable addition to the quality of teaching and learning, and eighty-six percent agreed that IT had applications in all subject areas. On the other hand, teachers were able to recognize several obstacles to the effective implementation of information technology. Both the teachers and the principals surveyed about concerns on resources, support, and the sufficiency of training and professional development. The obstacles to the effective implementation of information technology were summarized as; (a) costs of presenting ample hardware and software, (b) availability of hardware and software for teachers, and (c) availability of information technology support services in the schools.

Franklin (2003) designed a research on the purpose of examining the ways elementary teachers use computer technology for instructional purposes and the factors that influence their use of computers. Data revealed the four factors that encourage teachers' use of computers: (a) access and availability of the hardware and software resources, (b) preparation and training, (c) leadership, and (d) time. The findings indicated that eighty-four percent of the teachers felt either well or very well prepared to integrate technology into curriculum, and that they were able to overcome the typical barriers to computer use in elementary classrooms. The teachers overwhelmingly indicated that computers have considerable potential for allowing students to discover or construct ideas for themselves. The elementary teachers indicated that their greatest barriers to computer use were (a) too much curriculum to cover, (b) lack of time in the daily schedule, and (c) high stakes testing.

Most studies have attempted to discover the advantages and disadvantages of ICT in different levels of education, but, we are to accept that education is a conservative system that keeps social order for the future.

Unfortunately, conservative systems refuse to accept changes, and more typically they resist the opportunities. Integrating ICT into education is also resisted by such a conservative system. However, one of the resistance reasons could be recognized just by presenting the big opportunities of ICT in education but not dealing with its drawbacks. When the system encounters with a situation that ICT fails, then level of resistance to alteration will definitely increased. Nonetheless, the proponents of ICT in education often demonstrate that ICT is a panacea, thus they fail. Instead, we should associate the educational requirements of the communication society with the opportunities of ICT for teaching and learning. We should always inform others such as teachers, stakeholders, supervisors, teacher educators, and even deans of education faculties, about the possible advantages and disadvantages of utilization of ICT in education (Hadzilacos, 2003).

The underlying reason of why all governmental or institutional authorities deals with technology training of preservice teachers should be summarized with the most impulsive result of Volk' work (1999). Volk studied on students from Hong-Kong on attitudes toward technology and observed that a stronger motivation and interest in technology exists for every student who has prior contact to technology and additionally, students indicating they would prefer a technical profession. Besides, Volk notified that the more opportunities that exist for both groups of students to explore technology through school learning activities, the more readily they are to contribute in further technology classes. This assertion is contributed to Christensen (1997) that**,** if teachers perceive that the computer is appropriate for their work-life, as a result their students will realize the computer as significant and will also tend to have higher attitudes toward school. Thus, it may be stated that positive teacher attitudes toward IT promote positive attitudes in their students.

Throughout the children's school life, the teacher is the most important one perceiving as a potent model and has a direct influence on students' prospective lives. The responsibility of the teacher is not limited to the

attainment of knowledge and the development of skills, but is also an important influence on the development of values (Bergen, 2003). All action, non-action, and reaction, every small piece of verbal and nonverbal behavior of the teacher is noted by the children, and many of them turn out to be integrated into children's repertoires. Even though schools contend to teach children basic skills and conceptual knowledge, they do manipulate children's attitudes, perceptions and values. Attitude, perception and value learning and modification have been established at every level of school life of a human-being. Because the experiences children have in school influence attitudes, perceptions and values, teachers must be conscious about the perceptions they demonstrate, how children form attitudes, perceptions and values, and what values the school should transmit in a democratic society (Seefeldt, 1980). In addition, teachers are also important determinants of children's educational and social achievements. If teachers are not persuaded on the value of technology in teaching and learning, technologies will have little impact on the educational progression (Underwood, Cavendish, & Lawson, 1996). Thus, in influencing the attitudes of all students, the way teachers are prepared is a paramount importance. The sufficient training of teachers is indispensable in developing teachers competent to teach technology. Teacher education has a responsibility to provide the tools and experiences that will prepare preservice teachers for using technology in their classroom instruction (Fisher, 2000). In the National Education Association report of Technology in schools (n.d.), it was acknowledged that in order for today's students to completely succeed in the 21st century, technology must be an essential part of the educational experience.

Under the light of Volk's work (1999), it should be concluded that if the teacher let students know what the technology is or let them experience on technology to form their own meaning, then children will perceive technology more favorable. Therefore, the most important factor that will shape the perception of technology in the students' mind is the teacher who should firstly

contact with technology deeply. This increases the importance of technology training efforts of preservice teachers in governmental or institutional perspectives. Additionally, Lu and Miller (2002) revealed that the professional preparation of teachers, internationally, is influenced by their opportunities and decisions regarding their use of technology and is often dependent on their level of instructional technology knowledge and skill.

In the study of Whetstone and Carr-Chellman (2001), it was asked preservice teachers to rank computers in terms of the role they would play in changing schools, seventy-six percent of preservice teachers (83% of English preservice teachers, 91 % of math preservice teachers, 54% of science preservice teachers, 73% of social studies preservice teachers, and 100% of second language preservice teachers) noted they felt computers would have a considerable role in changing schools. Whetstone and Carr-Chellman gave some appealing explanations for the responses: (a) whether we like or not , computers are the wave of the future; (b) in the future, students will be taught at home by computer networks; (c) someday computers can be used to teach students practically everything; (d) computers already have changed society, thus schools must follow. Moreover, preservice teachers thought that computers were the principal agent accountable for change, instead of the people who implement them. Boshuizen and Wopereis (2003) attempted to demonstrate how ICT use will affect our prospective life:

> Helping pupils and students to learn to know is not easy when we are dealing with ICT. The introduction of ICT has changed both the process of learning and the content to be learned in many ways. ICT is not only a matter of equipment, computers and informatics; we are also moving towards an information and communication society, affecting all aspects of life, work, and play. Also, the disciplines taught in schools and universities are changing as a consequence of these new technologies; depending on the domain new tools have been developed that are instrumental to the domain and to working in that domain. (p. 150)

In Lang's study (2000), almost all teachers indicated that they learned something about computer use from the IT course; from a hundred percent of

teachers, who learned something, fifty-nine percent learned through self-studies twelve percent through teacher training in the school, eighteen percent through inservice teacher training by state institutes and only five percent through university studies. It should be noted that in Ellis (2003) self-studies ranked as a most common method of learning and practicing computer-based technology. Teachers especially would like to learn more about computers. They agree that computers make a subject more interesting and computers help to teach more effectively. Lang also made a comparison of different countries on the issue of teacher training needs. For the countries Austria, Bulgaria, Greece, India, Japan, Israel, Latvia, Slovene, Thailand, The Netherlands and West-Germany mean scale values are lowest for the scale "self-confidence" and highest for "training need". This international tendency of training need might be a result of the very fast development of computer technology and educational goals and the lack of realization in education because of teachers' lack of knowledge and skills and problems.

In the "Preparing Tomorrow's Teachers to Use Technology (PT3)" project of Arizona State University, preservice teachers stated that even after they had completed the required technology-infused course activities, they did not feel that the experiences supplied in the teacher education program effectively prepared them to utilize technology in prospective teaching and learning activities. Besides, they added that more focus needed to be given to grant training on specific technology skills, as contrasting to broader pedagogical issues (Brush et al., 2003).

Helping students learn to apply technology requires a major change in the way computing and technologies are often taught in school. It denotes shifting from teaching isolated computer skills to teaching integrated IT skills (Eisenberg, 2003). It is obvious that technical competence alone will not ensure successful classroom implementation. For this reason, teachers need to learn the pedagogy of the computers as well. Teachers could possess both basic and advanced skills, but inappropriate pedagogy to implement them their classes

might be less effective, and some students might even perceive them as irrelevant. Additionally, if teachers have computing skills but are not confident of their ability to integrate computers in their teaching activities, the computers might be under-utilized (Russell G., Finger & Russell N., 2000; Ellis, 2003). In the study of Altun (1996), it was declared that by comparing with the use of new technologies, the existing teaching methods are essentially chalk-and-talk which is inefficient for effective teaching. Therefore, it should be concluded that new methods of teaching are essential.

Application of new technologies would maintain new methods of teaching and learning. Understanding new technologies might assist an individual to comprehend topic better. Simpson et al. (1998) commented that the course directors were also aware of the general lack of the pedagogical use of ICT within their courses, realized the need for more use of ICT to be integrated into the teaching of students and were aware of staff limitations in terms of skills; however, many seemed to lack the information or authority to ensure coordination, coverage and appropriate programs of directed staff development. The study findings of Goudy (2002) revealed an interesting difference in the perception between dean and instructor that eighty percent of education faculty deans indicated their preservice students was prepared to integrate technology. On the other hand, the teacher educators claimed that their preservice students were prepared by a more modest fifty percent.

Preparing teachers to use computer-related technology in classrooms is an exciting challenge for the teacher preparation institutions. Teacher education institutions are frequently criticized for the insufficient preparation of teachers about using educational technology in the learning and teaching process (Topp, Mortenson, & Grandgenett, 1996). Ellis (2003) concluded that current teacher training lacks the richness in content and focus to prepare teachers to use more time-intensive and/or advanced computer-based technology applications and appropriate software and training is not extensively available to teachers. A noteworthy body of research exists in the discussion of deficiencies of current

conditions and practices in teacher education and technology. An earlier study (Bruder, 1989) stated that technology training at the undergraduate level was insufficient for a number of reasons such as lack of time in undergraduate programs, technology resistant faculty, and diverse competency requirements. Another problem of technology related undergraduate teacher education was stated by Bruder (1989) as universities were likely to pay more attention to inservice teachers asking for additional training, more willingly than training preservice teachers and preventing them from becoming the next generation of teachers who need re-training.

In the work of Russell G., Finger & Russell N. (2000), it was acknowledged that even though eighty-eight percent of the teachers agreed with the statement that it is essential for all teachers to be technologically literate, there were low levels of satisfaction with the availability of training. Moreover, forty-seven percent did not agree that availability of training was sufficient. Results escalated that five percent of teachers positively agreed that they were able to follow new programs and educational applications, and only six percent definitely agreed that they were sufficiently educated about infusing IT into the curriculum. Moreover, in the “Teachers as Innovators” report (2000), it was proclaimed by many of the teachers that they had gained from the training they had received, however, they still wanted to get more training to struggle with ICT in their teaching. Statistics released by the U.S. Department of Education in April 2000 found that less than thirty-five percent of teachers felt they were "well prepared" or "very well prepared" to use technology effectively (as cited in Technology in schools, n. d.). According to the New York Times, sophisticated computer equipment and Internet connections are progressively more common in American classrooms, but many teachers do not recognize how to use the multi-billion dollar equipment to assist in their teaching (Mendels, 1999).

In Novick’s dissertation (2003) female preservice teachers reported considering there was an expectation that they become proficient in computer technology integration in their teacher training program, however did not always

feel they had been supplied the tools or skills necessary to fulfill those expectations. The data revealed that there was a divide in what they were taught was important in terms of computer technology and the messages they received and the behavior they observed during their residency semester. Female preservice teachers also reported a lack of emphasis on computer technology at the K-12 level.

Nanjappa (2003) investigated the beliefs that teachers in India have about technology integration, and how they might be influenced by professional use of computers, concerns, and computer self-efficacy. The sample consisted of school teachers (*N*=267) teaching regular school subjects in grades 1 through 10. Teacher's beliefs about the impact of technology integration on classroom instruction and students were strong. However, teachers' beliefs about their own readiness to integrate technology were comparatively weak. Approximately seventy-five percent of teachers reported that they never used computers for their professional teaching tasks.

While there was evidence that preservice teachers used IT for their personal and professional productivity, they knew very little about managing classroom learning activities within a technology-enriched environment and infusing IT into the teaching and learning process. In general, the preservice elementary teachers involved in study did not feel that their preservice teacher training program completely provided the sorts of experiences needed for them to use IT effectively in their future practice (Duran, 2000).

Willis and Mehlinger (1996) worked on much of the literature on IT and teacher education and summarized the entire literature in one sentence: Most preservice teachers know very little about effective utilization of technology in education. Willis and Mehlinger continued that educational leaders strongly agree upon the considerable need for increasing the amount and quality of instruction teachers received about technology and technology in education. They emphasized over and over that internationally, preservice teacher

education is not preparing educators to work in a technology-enriched classroom.

There is also a huge amount of research indicating the possible reasons of deficiencies in current conditions and practices in teacher education and technology. Andrew (1996) informed that the reasons of failing to integrate technology into education or into teacher training programs were vary that some are related to the person and some the institution. Most of the times, it was assumed that with the purchase of hardware, software and Internet connections, the problems of institutions would finish with a success. Nonetheless, teacher training institutions are recently gradually recognizing that the most important expenditure should be on the human portion (Technology in schools, n. d.). Teachers appeared to obtain their IT skills in diverse ways and with varying degrees of success. Such individual differences and learning styles of preservice teachers, thus, should be considered within the teacher training programs and their curriculum.

Ritchie and Rodriguez (1996) affirmed the following constraints of teacher training: (a) a lack of funds; (b) teachers' beliefs on the value of technology; (c) inappropriate allocations of existing technologies; (d) a lack of understanding in how technologies can enrich the quality of education; and (e) a lack of support from school leaders. They highlighted that overtly or covertly, the beliefs of teachers could also damage the use and impact of technology. Lastly, they noted that teachers' understanding of how technologies could be incorporated in the school environment to enhance education is more important than their technological skills.

Another exciting point was uttered by Kirschner and Davis (2003). They asserted that teacher educators, preservice teachers, instructional designers, local and governmental affairs were exaggerated the issue of computers in education. They warned that it should be stopped to treat the computer as something special. As long as we go on thinking of the computer as being something extraordinary in education, then they will never become "normal".

This view is shared by Kortecamp and Croninger (1996) that integrating technology in teacher education programs is a necessity, not a luxury.

This section of the literature review demonstrated that everything has changed with technological improvements in our information-based era. All systems like economy, industry, and education required a parallel adaptation process. Unlike the other sectors of work-life, scholars of education emphasized that adaptation of education with technological innovations are not achieved. Most of the research data revealed that the way preservice teachers are being trained is not sufficient to struggle with the challenges of modern times. There is also a large body of international surveys verifying that both preservice and inservice teachers do not feel prepared to use new ICTs in their classrooms. Even though most of teachers were required to enroll at least one educational computing course, still, some of these teachers complained about technical competencies, and some others bothered about their knowledge of the integration of their technical competencies into their instruction. Needles to say, teachers are aware that using technology in the classroom settings will improve their students' learning, however, teachers could not utilize computers into their classrooms with all possible advantages. In order to infuse technology into the entire school curriculum and their professional lives, they must be trained as successful as they could be proficient and confident users of technology. Teacher educators, technology infrastructure, quality of technology related courses, attitudes, values, and perception of self will come together to serve for this vital purpose.

Most of the academics are more concerned about the teacher training for developing and under-developed countries. The problems of education may be influenced by the economic level of a country. For countries that have finished their technology infrastructure redesigning, the problems of education as well as teacher training will overcome more straightforwardly than other countries. Therefore, developing and under-developed countries need extra focus to deal with their teacher training situations and problems.

Current Scene in Teacher Education and Technology in Turkey

Overview

Turkish education system was established on the ideas of Mustafa Kemal Atatürk, the founder of Turkish Republic. Atatürk uttered: “Today, our most important and most productive task is the national education affairs. We have to be successful in national education affairs and we shall be. The liberation of a nation is only achieved by this way” (MONE web site). Education in Turkey is centrally directed, controlled and generally funded by the Ministry of National Education, and it is free at the public schools from kindergarten through higher education.

The Council of Higher Education (YÖK) is the planning, coordinating, and policy-making body for higher education in Turkey. The Turkish Republic Constitution defines higher education institutions by the Article 130:

> Universities consisting of various departments, having public legal entity and scientific autonomy are established by the government by means of laws, in a system based on principles of modern education and instruction, in order to provide education at several levels after secondary education, to perform scientific research, publication and consulting, to serve the country and humanity, with the purpose of raising manpower to meet the needs of the country.

Focusing on the population of Turkey, it could be straightforwardly recognized that majority of Turkish citizens are in young ages (0-24). In Turkey, the ratio of population between ages 0-14 has decreased to 30.0% in year 2000 from 32.8% in 1995 whereas the ratios of age groups 15-64 and 65 + have increased. The population increase ratio began to fall but 37.3 million people making up 57% of the population belong to 0-24 age group. Moreover, the enrollment rate in the 2000-2001 academic year has reached 10.1% in Pre-primary education, 100.7% in primary education, 64% in secondary education (22.2% in vocational education and 41.8% in general high schools), 28% in

higher education, 17.8% of which is accounted for by formal education (Ministry of National Education, Research, Planning & Coordination Department, 2002).

The dimensions of youth in the population determine the potential need for education and training in that country and the bigger the number of youths in the population, the bigger the need for education. That requires these countries to allocate more of their national income to education, in order to provide educational occasions to their children. Simultaneously, it is important how the expenditures are distributed among different functional categories in terms of education quality (teacher salaries, etc), the condition of education buildings (maintenance, mending, etc), changing population distribution and trends in school entrance, in relation to obtaining the adequacy of the education system (construction of new buildings, etc). Decisions on resource allocation in the system affect the nature of education.

With the new-millennium, the Turkish national education system penetrated into a progression that education legislation efforts were organized on the basis of such principles as

a) European Union norms; studies were being made for the adaptation of the Turkish education system to the education systems of the countries of the European Union,
b) Total Quality Management principles; in education is the enforcement process of an administrative approach in which each denominator of education (education personnel, students, families, etc) participates actively in the decision process of education and characterizes the increasing customer satisfaction with continuous improvements,
c) Solution of the practical problems and ensuring adaptation to the daily requirements.

In the speech of the Ex-minister of National Education, Metin Bostancıoğlu (December 10, 2001) stated that Turkish national objective and policy in relation to IT is solely based on "keeping pace with the information age, to raise people who think universally and act nationally, to become a

society of information and technology, to support each level of the education system with technology so as to continuously increase the competitive power of our people and our society". Besides, he added that within this framework of IT integration process; a total of 221.000 teachers have been trained in the use of computers, and primary education inspectors have had an intense inservice training. A similar effort from Ministry of National Education was on the issue of computer-assisted education for spreading the use of computers. In the academic year 2000-2001, the number of schools with computers has reached 5.536.235 IT classrooms have been installed in secondary education schools.

When inservice training of teachers is discussed, it was realized that ministry has been organizing inservice training activities in collaboration with related institutions and organizations in order to increase the quality and effectiveness of education. Among these, priority is given to "computer, foreign language, education management, total quality management, time management, change and renovation".

Developing countries like Turkey with the intention of reaching other countries in science and technology areas realized the fact that the practical applications of IT are the keys to scientific knowledge. In the report of Higher Education Council of Turkey (Report on re-designing the teacher education programs at the faculties of education in Turkish universities, 1998), it was accepted that there occurred congestion in teacher training system of Turkey at the beginning of 1990s. Confusion in the mission of education faculties leaded a shortage or excess in the number of teachers from some subject areas. For instance, report illustrated that even though primary and early-childhood education areas are the most essential subject matters of an educational system, at the beginning of 1990s in Turkey, there happened a great gap with respect to the number of teachers in these areas. As Altun (1996) dictated it requires about ten years engaging new technologies in such developing

societies, thus, the intervening stage to the attainment of scientific knowledge necessitates a good knowledge of IT as well as a foreign language.

Higher Education and Teacher Training

Teacher training might be affected more significantly than others fields by changes in computer and technology education; therefore, with a national push to restructure education and increase the use of computer-related technology in the classroom (Sadera, 1997) many teacher preparation departments need to be rewriting technology courses first developed in the early 1980s (Fisher, 1996). The report of World Bank (1993) on informatics and economic modernization of Turkey pointed that Turkey was not investing enough for disseminating computer skills throughout its younger generations. Report proposed that implementation of the computer assisted education program under the Ministry of Education needs to be strengthened, especially with regard to: (a) teacher training; (b) curriculum development; and (c) relevant software availability. On the other hand, same report agreed that the computer aided education project appeared to have some certain performance obstacles. First, the available software was not integrated with curriculum developments. Second, there was a severe shortage of suitably trained teachers. Although program implementation was continuing, it was at a reduced growth rate (less than 40% of target) and with significantly reduced expectations.

The idea of integrating computer literacy courses into preservice teacher education programs go back to the extension of basic education from five to eight years in 1997 in Turkey. The Ministry of National Education in Turkey has been in the process of redesigning curricula and furnishing all basic education schools with IT rooms. This reform has direct implications for teacher training institutions. For example, from 1998 onwards, a computer literacy course became a must course for all preservice teachers to fulfill the requirements for teaching credentials. Accordingly, all schools of education in Turkey have started offering computer literacy courses for their student teachers to fulfill this

requirement (Gurbuz et al., 2001). Report on re-designing the teacher education programs at the faculties of education in Turkish universities (1998) also pointed another scope of the computer literacy course that this course should make preservice teachers be familiar with the tools of IT. The “Educational Technology and Material Development” course was also placed in the teacher training curriculum as a supplementary course of computer literacy which mainly planning to concentrate on the technology integration. In the same report, it was proclaimed that making the preservice teachers computer literate, making them familiar with information access and dissemination by using Internet, by these ways making them designing and developing instructional materials were assumed to be the major aims of preservice teachers training programs.

One of the essential dimensions of the National Education Development Plan is the "YÖK (The Council of Higher Education) / World Bank Preservice Teacher Training Project" which was somewhat implemented under the idea of a unified training effort between the colleges of education and the districts that hire the teachers is one way to ensure effective technology use in the classrooms by properly trained teachers. The purpose of the work, which was started in 1994, has been revised and expanded in 1996 so as to ensure renovation in the teacher training system. As a result of the work carried out by the Ministry of National Education and YÖK in cooperation, under the project, a restructuring has taken place in education faculties. Considering the teacher requirements in relation to the eight-year of primary education implemented by the Law no 4306, teacher training programs have been reorganized with the cooperation of the Ministry of Education and the Council of Higher Education in order to meet the short and long term teacher requirements of the primary and secondary education institutions. The new system that has been implemented since 1998-1999 academic year is based on the principles of;

1. Training pre-primary and primary school teachers with bachelor's degrees,

2. Training secondary school teachers; with bachelor's degrees of four years for
    a. Foreign Language,
    b. Music,
    c. Art,
    d. Physical Education,
    e. Special education,
    f. Computer Teaching Technologies subjects
3. Training secondary school teachers; with non-dissertation graduate degrees (3.5+1.5=5 years or 4+1.5=5.5 years) for
    a. Science,
    b. Mathematics and
    c. Social studies.

Also, in order to employ one teacher in several areas, the practice of a compulsory second subject has been introduced in the teacher training programs for primary education schools. For instance; for science teachers, elementary mathematics teaching; for social studies teachers, Turkish language teaching; and vice-versa were designed as minor areas of their teacher training curriculum.

The Ministry of National Education now has five members in the "Turkish National Committee of Teacher Training" which audits, evaluates and develops programs implemented in the teacher training higher education institutions and acts as an advisory council of the Council of Higher Education in making decisions related to teacher training activities.

At all types and levels of schools under the Ministry of National Education, to increase the quality of education and success of students, to increase the capabilities of the personnel and the teachers, to develop their vocational skills, to provide more efficient and productive utilization of resources and to use technology efficiently in education are targeted.

Considering the contribution of IT tools used in generation, management, presentation and sharing of information on education in the long run, services such as production and development of audio, visual and quantitative education tools or adaptation of developed ones to be used in formal and non-formal education in the field of education technologies and services such as public and private selection tests, graduation tests and data processing activities of central and provincial organizations of Ministry of National Education were assumed to be undertaken.

With the extensive use of computer and computer based tools in daily life, it became necessary to learn how to use such tools at school due to integration of concepts like technology education, technology assistance and education. For this reason, courses for teachers, school directors, primary education inspectors and ministerial inspectors aiming use of information technology in education, formatter teacher training courses to teach computer hardware and software, and computer literacy courses for Ministry of National Education employees were arranged.

Teacher Competencies

Article 43 of the Basic Law on National Education defines teaching as a profession that requires special expertise. Article 45 of the same law indicates that teacher training consists of knowledge and skills in general subjects, special subject areas, and professional studies. The commission consisting of the related units of the Ministry of National Education and the university representatives has completed its work on the identification of teacher qualification indicators between 2000 and 2002. These indicators were grouped into three;

1. General Background Knowledge
2. Subject Matter Expertise

3. Pedagogical Formation Knowledge which was divided into 14 competencies and 206 sub-competencies. These 14 competencies are namely as
    a. To be aware of developmental stages of children,
    b. instructional planning,
    c. instructional material preparation,
    d. methods of teaching,
    e. classroom management,
    f. measurement and evaluation,
    g. guidance,
    h. development of basic skills,
    i. special education,
    j. adult education,
    k. planning extra-curricular activities,
    l. self-development,
    m. development of school,
    n. development of school-environment relationships.

Teacher qualification indicators are used in providing the following services: (a) defining teacher training policies, (b) pre-employment teacher training, (c) selecting teachers, (d) auditing teachers and evaluating their performance, (e) teachers' self-improvement, and (f) inservice teacher training.

Studies on Turkish Higher Education and Teacher Training

With the increasing number of both private and government universities and technologically oriented learning environments, use of technology resources has become an important research topic for Turkey. A significant body of research exists in the area of Turkish higher education and teacher training. Here, it would be attempted to summarize some essential studies.

An earlier study of Altun (1996) listed the problems of teacher education before the restructuring of higher education in Turkey that particularly in teacher

education faculties: (a) the number of teacher educators was inadequate, particularly in the area of the use of IT in education, (b) research activities were ignored, and (c) a limited number of professional journals and books were produced and provided by the universities.

Maybe, the greatest problem of Turkish education system underlined what Altan (1998) reminded the old saying in Turkey: "If you cannot be anything you can at least be a teacher" (p.411). Teachers and the job of teaching seem to be underestimated in the Turkish culture. Since the one's value attracted by the society (Krech et al., 1962), then, it is expected that contemporary Turkish teacher would also be affected by this old proverb.

Arat and Guclu (1999) stated that even though Turkey will have plenty of experts with the new millennium, there are still big problems for reformation. Arat and Guclu focused on gender differences that more than two-thirds of the country's 1.400.000 students are male. Furthermore they asserted that a fifth of Turkish women are still illiterate. Also, the average time a Turk spent in school was still only between three and six years.

In İmer's study (2000), it was attempted to determine whether the preservice teachers at Turkish education faculties acquired sufficiently the qualities related to the usage of computer in education. As a part of study, education faculties (N=68) were divided by preservice teachers into three groups concerning their adequacy of computer possession (inadequate, moderate, adequate). 25 education faculties (M=54.52) were rated as adequately computer possessed, 17 education faculties (M=48.35) were rated as moderately computer possessed, and 26 education faculties (M=43.71) were rated as inadequately computer possessed. It should pointed out that Burdur School of Education, Süleyman Demirel University was placed in the last category that having insufficient number of computers by its preservice teachers. In the findings of İmer's study, it was claimed there were almost no computer-aided instruction within pedagogical formation and subject matter expertise courses. When computer competency was considered, it was found that

preservice teachers from faculties possessing adequately number of computers had higher scores than faculties possessing moderately or inadequately number of computers. Furthermore, when concentrated more on the usage of computers in education, it was observed that preservice teachers did not differentiate with respect to their education faculties. However, İmer pointed that the knowledge level of preservice teachers on the usage of computers in education (*M*=29.05 over 70) was slightly lower than general computer competencies (*M*=44.85 over 95). This meant that preservice teachers at the education faculties acquired the qualities related to computers at middle level. It was also determined that computers were used in educational administration and research facilities.

Namlu and Ceyhan (2002) were undertaken a research on preservice teachers' computer anxiety level affecting negatively computer usage in education; from the personal specifications, personality and computer experience were investigated. They observed that level of computer anxiety was higher for female (*M*=50.45) than male (*M*=45.30). They proposed that this difference could be clarified by culture and cultural differences that in Turkish culture, females and their perception were less technologically supported than those males. Besides, they focused on subject area differentiation and computer anxiety. They acknowledged that if a subject area did have a computer course, even tough it was indirectly related with its undergraduate education, subject area could not be predictor of computer anxiety. It was also determined that computer competency level was negatively related with computer anxiety.

Even though the re-designing the structure of Turkish teacher training programs regarding to closing the gap between what is expected and needed in inservice teaching and what is thought in preservice teaching , the debatable connotation , asserted by Çakıroğlu E. and Çakıroğlu J. (2003), showed that system still has some deficiencies;

> In our experiences as students and as graduate assistants in a teacher education institution, we suffered from a lack of connection between the knowledge that we studied at university and the schools in the country.

> Like most of our fellows, we thought of our university education as a separate world from the schools in terms of knowledge about teaching. (p. 262)

Odabasi (2000) altered the discussion to the faculty educators. For adapting higher education students to information era, educators of faculties would play an important role. Therefore faculties are the most important places that technology directed instructions were provided. Odabasi was conducted a study in a Turkish university (Anadolu University) to find out the faculty use of technology resources from the points of familiarity, use and effective factors as incentives and barriers. Unfortunately, it was found that faculty members were mostly familiar with the traditional resources such as audio (61.8%), video (58.3%) and film (53.5%). Technology resources that the faculty members commented as having no familiarity with were computer conferencing (47.9%), statistical computing (44.4%) and word-processing (42.4%). When the faculty members were asked to rate the importance of various factors affecting the utilization of technology resources, the staff indicated that the availability of the technology (73.6%), increased student interest (69.4%) and increased student learning (61.8%) were the most important. Frequent use by other colleagues was the least important factor perceived by the faculty (42.5%). The next factor evaluated as less effective to the use of technology resources was the administrative support (13.2%). As for the barriers to the use of technology resources that the faculty rated the most significant barriers in the use of technology resources as lack of easily accessible equipment (63.2%) and lack of interest in technology (38.9%). The barriers rated as not important were lack of contribution to professional advancement (57.6%) and lack of relevance to the discipline (41.0%). The results of the study indicated that the faculty was familiar with the older technologies but lacked familiarity with the current technology resources. However, when it came to the utilization point, faculty used the current technology but this time rather in the old fashioned sense, for example, word-processing. This highlighted a dilemma which could be explained thus: the

faculty knew the old fashioned resources best, but used the new technology most. There seemed to be a lack of inservice training on the recent uses of the current technology. The results of this study have several implications for higher education institutions in Turkey. First, the institutions should provide inservice training for the use of technology resources in teaching and learning environments. Second, teaching resources should be easily available and accessible to faculty members. The last, but perhaps not the least, released time and scholarships abroad should be provided to faculty so that they can improve themselves in the new fields of education such as use of technology resources.

As a last point, the data from the study “Commonness and Usage of IT” (January, 2001) of Information Technology and Electronics Research Institute of Scientific and Technical Research Council (TÜBİTAK) of Turkey would be mentioned. Turkish citizens’ general usage of computer was determined as 17.1%, not depending on possessing a home computer. The percentage of possessing a home computer in Turkish homes was found as 12.3. When socio-economic-status was considered for possessing a home computer, it was observed that while, the percentage of possessing a home computer from upper-incomes was 64.7%, this ratio decreased to 2% for lower-incomes. The underlying reasons of possessing a home computer were also investigated. Using Internet and e-mail (37%) were the most popular reasons of buying a home computer. Using for educational purposes (13.3%) was the least trendy reason of having a computer even subsequent to playing computer games (20%). Only 7% of Turkish homes were determined to have an Internet access.

To sum up, it is affirmed that there is a slight improvement subsequent to the re-designing of the teacher education programs at the faculties of education in Turkish universities. However, it is also concluded from the researches about Turkey and quality of teacher training, the problems on lack of technology competencies and their integration into education are still continuing.

On the other hand, most of the teacher educators and their preservice teachers perceive the technology in teaching favorably and are eager to expand

their competencies to employ technology in teaching. Moreover, introductory computer literacy courses and educational technology courses assist preservice teachers develop more favorable perception toward computer and its integration into instruction. This will probably increase the dissemination of technology supported education all over Turkey.

Technology Related Courses

Preservice teacher training is one of the main tasks of higher education. Particular components of a teacher education such as fundamentals courses, preservice teachers or technology courses are particularly associated to a number of issues in the field of information technology and teacher education. There is also a set of topics, questions, and problems that are pertinent across the entire areas of information technology use in teacher education (Willis & Mehlinger, 1996). There assumed to be three major issues repeatedly identified by most of research as important for initiating ICT into the classroom; (a) “Control” (possessing skills of ICT, being confident, encompassing control over technology) as an enabling and psychologically encouraging factor, (b) “Resources” (number of available computers), and (c) “Inner dissatisfaction with the current status” as a motivating and activating factor (Demetriadis et al., 2003). Having control on various technologies require being technology literate, having sufficient number of resources need a well-equipped technology infrastructure and perceiving technology favorable come together and guide for effective technology integration into education. Technology integration is a re-creation or re-organization of the learning environment with computers and related technologies. Besides, technology integration must be viewed in terms of function rather than application, process rather than approach (Mills & Tincher, 2003).

In most European countries there are special courses or modules for preparing preservice teachers to use ICT in general and in their area of

specializations. Increasingly technology related courses such as computer literacy, fundamentals of IT and educational technology, are turning out to be compulsory courses within the curriculum of teacher training programs of most countries. However, there are still many countries which only have courses for preservice teachers which may be selected voluntary (Yildirim, Kynigos, Potolea, Dumont, & Aufenanger, 2003). The strengths of learning about and through new technologies (especially, computers) will only be comprehended in their appropriate assortment, proper use, and precise combination. The challenge for faculty in both the school district and university is integrating these resources into the curriculum (Fisher, 2000).

The type of learning experience can facilitate the development of a more comprehensive view of technology (McRobbie et al., 2000). Therefore, all educational systems initially need well-qualified (full of learning experiences related with technology in training programs and in schools) and constructive perception oriented technology related courses. Issues related to technology education were either experienced or raised upon reflection on experiences. Studies indicated that even when access to technology and connectivity exists, preservice teachers might have unequal learning experiences (Education Technology Must Be Included in Comprehensive Education Legislation, 2001). Correspondingly, Simpson et al. (1998) underlined that the more preservice teachers used ICT, the more they observed how ICT could be used to extend children's learning and were confident they would be able to keep pace with prospective developments in ICT.

McRobbie et al. (2000) discussed another particular feature of gaining learning experiences from technology related courses. The learning experiences could also increase the conscious awareness of preservice teachers particularly concerning materials and their properties. Preservice teachers already possessed this knowledge within introductory teacher education courses, completed in the freshman and sophomore years and providing students with basic technology encounters (Hadley, Eisenwine, Hakes, & Hines, 2002);

nevertheless they had taken it granted until faced with the need to draw on that knowledge to solve problems in the technology part of study.

Simultaneously with possessing an experience, being volunteer to enroll a technology related course is a further issue that teacher educators should be focused on. In their study of current practices of preservice teachers; Whetstone and Carr-Chellman (2001) reminded that only twenty one percent of preservice teachers voluntarily completed a computer course. What escalated in that research should be examined under the light of the argument that, the more new skills students gained from the class, the more they valued the class and the more it contributed to their professional development (Yildirim, 2000). The evidence from these studies force conclude that to increase the volunteer participation of preservice teachers to the technology related courses, courses should be designed in accordance with their needs and expectations.

Williams, Coles, Richardson, Wilson and Tuson (2000) designed a research on teachers' developing ICT needs and observed that teachers' ICT needs were likely to be complex. The needs identified in the study could be classified into the three main parts: (a) access to ICT, (b) appropriate training in terms of skills, knowledge, relevance to educational goals and priorities, and delivery, and (c) continuing support to encourage development beyond initial teacher education or training. Moreover when asked to make a list of characteristics of training they regarded as valuable, they identified the followings; (a) appropriate to classroom use, (b) has a applied practical element, (c) provides immediate help, (d) provides opportunities to work and share ideas with other teachers. The factors pointed as contributing to poor training included: (a) under-qualified teacher educators, (b) training set at a pace inappropriate for their own stage of development, (c) inadequate numbers of computers to provide adequate access during the course, and (d) too much information or too much jargon.

Inservice teachers also feel optimistic about ICT in education. In the study of Simpson, Payne, Munro and Lynch (1998); the overwhelming majority

(more than 80%) indicated they were not bored with computers, were stimulated and motivated by their engagement with them and they felt comfortable to learn how to use computers. Moreover, they recognized that computers are going to form almost every aspect of their prospective life. On the contrary, fifty percent of the study participants were anxious that usage of computer could lead to less socialization between people, and were distributed that their future pupils might know more about ICT than they did.

Although the optimistic view of inservice teachers, as preservice teachers complete their teacher education programs, they are often faced with the reality that their teacher education program did not prepare them to use technology in their teaching (Baki, 2000). For instance; it is of concern when students find that the principles, values, skills, and understanding developed over the courses of their undergraduate education emerge to fail to match the expectations of schools. It is still more when it would appear that schools and training institutions, working from the same legislative regulations, develop programs of study which appear to be unsuccessful to match each other philosophically and practically (Mattel & Penny, 1997).

Early computer technology enterprises in schools were essentially technology centered. Conversely, learning how to use IT in the learning environment requires pedagogic understanding of what computer assisted learning applications are trying to do and of what the hardware and software are capable of doing, rather than accessing to hardware and software alone were sufficient to guarantee successful grasping IT in schools (Laferriére & Breuleux, 2002) . Afterward, later initiatives of IT tended to focus on pedagogic rather than technical concerns (Lu & Miller, 2002). Thus, by being a new trend, a background in technological theory and recommendations on how to organize activities with technology appropriate for children were incorporated in teacher preparation programs (Volk, 1999). With the increase of consciousness, IT in teacher education has become an ordinary activity, rather than an area of specialization. It also indicates that specialists in this area were in increased

demand (Davis, 2000). Even tough, pedagogy of teaching with technology was generally positioned in teacher training curriculum; as Bruder (1989) stated , since most of the undergraduate studies focus first two years on a general education rather than specialized programs, preservice teachers could not be prepared effectively use technology in a real instructional sense.

Therefore, during their teacher training, preservice teachers may be required to take an instructional technology course (Gilley, 2002), since, instructional technology including computers, televisions, video cameras, video editing equipment, and TV studios, offers preservice teachers the tools to access, manipulate, transform, evaluate, use, and present information (Lu & Miller 2002). To get the best benefit from instructional technology course, instructional technology may be integrated into methods courses instead of standing as its own course (Gilley, 2002). That view is shared by the International ICT Literacy Panel (2002) that through experiences that combine cognitive and technical learning, ICT literacy could best be accomplished. ICT literacy skills need to be infused properly into curriculum addressing cognitive skills as well as those addressing IT and technical skills so as to guarantee enhanced ICT literacy. On the other hand, a single focused course will limit the learners' realization of ICT literacy.

Elwood-Salinas (2001) focused on the preservice teachers' perceptions of their values and expectations regarding technology-integrated experiences in a secondary methods course. Four major themes emerged as the essence of their experiences: (a) develop technology-integrated experiences throughout preservice education; (b) model exemplars and theories; (c) provide technology-integrated experiences human resources and knowledge; and (d) provide an educational technology competency course. Elwood-Salinas suggested that if teacher training programs, especially methods courses, are to be restructured to enhance prepare classroom teachers for the integration of technology, an awareness of the preservice teachers' perceptions is appropriate and timely.

Willis and Mehlinger (1996) discussed an important feature of technology related courses that a separate "technology for teachers" course is inadequate worth if it is isolated from the rest of the teacher education program. They proposed some significant properties of how an effective technology course should possess such that:

> Regardless of the perspective on introductory courses, most experts agree that more is needed. Unless students see the use of technology modeled in their other courses, unless they have an opportunity to make the connection between technology and instruction in the subject or level they will teach, unless they have an opportunity to see effective use of technology modeled by teachers in classrooms and have an opportunity to use it themselves under the guidance and mentorship of experienced practitioners, they are likely to graduate with limited professional skills in this area and harbor a questionable attitude toward the use of technology in education. (p. 1001)

Gilley (2002) discussed the possible drawbacks of making instructional technology as a separate course in the curriculum or infusing in throughout the whole courses in the teacher training curriculum. Making instructional technology its own course and isolating it from content-specific curriculum applications and may create the sense that it is a separate topic, not connected to instruction. Infusing instructional technology into other methods courses, on the other hand, makes it hard to guarantee that all students are being prepared adequately because it assumes a level of proficiency and interest among the faculty teaching the methods courses that might exist in some cases and not in others.

Even earlier than preservice teachers' beginning of their teaching career, they could recognize the gap between the teacher training institutions and schools. As being a duty of the teacher training institutions; preservice teachers are equipped with conceptual knowledge concerning about the teaching profession. Subsequently, preservice teachers are sent to practice to expand their professional experience in real school environments. During the practicum, they keep in touch with their classroom environments, students, supervising

teachers and school administrators. What is expected, the preservice students, with the collaboration of their mentor teachers, implement technology-rich units during their practicum experience (Davis, 2003). Yet, the practicum is the most neglected area in teacher training. Preservice teachers spend hours learning about their subject and general education, but little time on learning how to teach and actual teaching (Altan, 1998). Preservice teachers mostly could not establish a connection between what they are learned in their teacher training sessions and the realities of schools. In many cases, the field experiences were perceived by preservice teachers, supervisors, and teacher educators as less beneficial to teacher education (Kiraz, 2003). Three major difficulties delaying the development of effectively ICT integration into teacher training could be identified as; (a) student access to computers, (b) the ICT policy adopted by initial teacher training providers and (c) the lack of encouragement for students to use ICT on teaching practice (Murphy and Greenwood, 1998).

Cuckle and Clarke (2002) conducted a study in U.K. on teacher-mentors about their role in ICT facilitating in schools. Teacher-mentors were asked what they did to prepare preservice teachers to use ICT in their teaching. Within all subject areas, there were varying levels of preparation. Fifty-four percent of mentors across the whole array of subject areas reported the following which were sorted out as active preparation: (a) arrange for preservice teachers to observe lessons during which ICT was used, (b) arrange for preservice teachers to panel teach part of the lesson or part of the class using ICT, (c) draw up schemes of work with preservice teachers at the beginning of the school experience, give them a specific ICT task to complete, (d) provide opportunities for preservice teachers to use packages and demonstrate applications before preservice teachers prepare lessons, and (e) provide on-the-job training. Furthermore, thirty-six percent of mentors across the whole range of subject areas reported the following which were sorted out as helpful preparation: (a) general help with preparing resources for lessons using ICT, (b) making links with the IT department for the preservice teachers to get help and advice, and

(c) general encouragement for preservice teachers to use ICT, make suggestions, invite them to examine resources. Ten percent of teacher-mentors reported almost no help: (a) lack of encouragement because of lack of access to computers and (b) very little or no preparation. This small number of teacher-mentors (*n*=17) who reported themselves as not particularly helpful tended to be in the subject areas where preservice teachers had beforehand reported the least amount of ICT use in teaching. These subjects were English (6), history (5), French (2); the other four were teachers of mathematics, biology, geography and design and technology.

Similarly, since teacher training is a multifaceted process, Baki (2000) and Davis (2002) noticed that courses of preservice teacher training program should be carried out in the school environment rather than as a school-isolated teacher training programs. When courses of preservice teacher training program in schools considered how teachers learn and how they feel about their learning and training, they can figure out models of how preservice teachers would use computers in their own classrooms. Lea (1999) advocated that collaboration between universities and schools should be encouraged and these programs shared the technological resources and training time. A supportive data was gathered from Barton's research (1996); it was debated that many preservice teachers did not feel confident in their use of IT. Often the hardware they found in school was different from that used at the university. If the school did not give an unambiguous guide, students believed there were too many barriers preventing them from using IT in their teaching. According to the results of Duran's research (2000), the preservice elementary teachers found themselves in technology-rich K-12 classrooms during their school experience course. But, they observed only a few examples of effective technology use by mentor - teachers.

Simpson et al. (1998) argued that the main focus of the technology related courses should be on the variety of uses to which ICT could be placed within a classroom environment. Andrews (1996) anticipated some guidelines

that technology related course designers need to concentrate. Andrews recommended that they should focus on the fact that course members:

- have had differing prior experiences of computers;
- might have responded differently to very similar prior experiences;
- need appropriate problems on which to work;
- have differing learning styles;
- have differing perspectives on subject area and its teaching;
- are slow to change existing beliefs and practices;
- have differing needs in relation to classroom implementation;
- learn more effectively when training takes place in a familiar environment;
- become confident with regular rather than irregular computer use;
- become competent when they can consolidate ideas soon after training; and
- might frequently need the support of a sympathetic helper. (p. 313)

Lea (1999) designed a study for the purpose of comparing two groups, middle school educators and professors of education, with regard to their perceptions of the computer technological skills and knowledge that should be taught to prospective middle school teachers. The data showed that middle school educators and professors were in agreement on the perceived necessary computer technological skills and knowledge for middle school teachers. Furthermore, study generated a recommended list of computer technological skills and knowledge for preservice middle school teachers that will help teacher training programs. Under the light of findings from the research, Lea formed the following technological skills and knowledge which were both the panel of experts and the professors of education agreed upon their extreme importance:

- Using a word-processor.
- Using a CD-ROM.
- Accessing/sending e-mail.
- Research via the Internet.
- Knowledge of ethical use of computers, especially the Internet.
- Integrating computer technology into existing curriculum. (p. 133)

Lea (1999) also warned that the six skills listed above will not automatically occur in the classrooms. Time (also discussed in Dean, 2000) and accessibility to equipment were major barriers for using and integrating technology.

As a recommendation from McRobbie et al. (2000), integrating an independent project into a preservice teacher technology unit of study might offer the stimulus for intensifying awareness of technology and technology education. The study results of McRobbie et al. showed that the independent IT projects provided opportunities for authentic and personal experiences; construct a more comprehensive perception of technology including a deeper understanding of design practices and their complexity and interrelatedness. The idea of independent projects was also shared with Lynch (2001). Lynch revealed that opportunities to integrate technology in project-based learning situation were a predictor of both technology value-beliefs and skill self-efficacy.

However, it is profoundly critical to say that preparing new teachers who are technology integrators will necessitate a specialized education curriculum that is infused with opportunities for preservice teachers to learn with technology and model technology use throughout their professional preparation (Mills & Tincher, 2003).

Computer Literacy Course

Preservice teachers' attitudes toward working with computers are important indicators of their future use in instructional settings. The study of Hunt and Bohlin (1993) found a strong relationship between previous computer experience and computer attitudes. Definitely, this might not be a cause-and-effect relationship, yet, it recognized that particular types of computer experiences can alter attitudes toward computers. Thus, as a recommendation from Hunt and Bohlin, computing classes be taught in a way in which the preservice teachers would have many opportunities to work with the computers and that these experiences to be successful and motivating. In Sadera's

research (1997), it was intended to find out the effects of formal computer instruction, thus, a t-test was computed to compare those who had received formal computer instruction and those who had not. The study results illustrated that participants who received formal computer instruction rated their computer proficiency, in all categories, higher than those who had not received formal computer instruction. However, it has not been clearly established which student characteristics, instructional procedures, and curriculum content paramount encourage the attainment of computer literacy (Woodrow, 1992).

In Hunt and Bohlin's survey (1993), it was observed that most students (77%) felt comfortable taking a computer class, and nearly all (96%) indicated that it was important to them that they do well in such computer classes. Even though nearly all of the students (96%) realized that computer expertise would assist them find jobs and eighty-eight percent thought working with computers would be important to them in their work, only sixty-nine percent uttered a need to master the use of a computer. However, approximately twenty-five percent disagreed with the items "It wouldn't bother me at all to take computer courses" and "I would feel at ease in a computer class."

Recent researches suggest that computer literacy courses someway influence attitudes toward computers by increasing computer experience of participants. The pretest-posttest study of Woodrow (1992) measured the change in knowledge of computers and attitudes toward computers among thirty-six preservice teachers enrolled in an introductory computer training course which covered basic computer programming skills. Significant gains were achieved in attitudes toward computers, better than that, attitude gains were correlated with achievement in the course. For this reason, it was recommended that immense care must be provided to design of introductory computer courses for preservice teachers that make certain the development of their computer literacy as enhancing their attitudes toward computers. Thus, introductory computer courses for preservice teachers must be directed towards

achieving two major goals that increasing preservice teachers' level of computer literacy and improving their attitudes toward computers.

Similar results were obtained from the study of Dean (2000) that the most significant change in a technology related course was in computer attitudes resulting with a reduction in participants' anxiety about technology use and an increase in their perception that school is a better place with computers. Constructive changes were also observed in teachers' perceptions of technology's impact on students' writing and technology's benefits to student creativity.

In the study of Gurbuz et al. (2001), it was supported the view that participation in a computer literacy course affected preservice and inservice teachers' attitudes toward computers positively. Also, preservice teachers developed positive attitudes, their anxiety was lowered, and confidence was increased with computers subsequent to the contribution in a computer literacy course. However, Gurbuz et al. commented that preservice teachers were also students working on their teaching credentials; they felt computers provided a great benefit to them in their own education and, consequently, it helped them develop positive attitudes toward computers.

Nonetheless, the literature fails to explore which teaching activities are most effective in improving students' computer experience and developing their attitudes (Gurbuz et al., 2001). In the study of Yildirim (2000), it was asked to explain the effects of the educational computing course on preservice teachers' attitudes; the preservice teachers leant to express them in general terms. They thought the course helped them develop positive attitudes by; (a) making them more comfortable using applications, (b) helping them achieve more confidence, (c) increasing their consciousness of computers and their applications, and (d) representing how computers could be infused into the school curriculum. As a supplementary point from the study of Cuckle, Clarke, and Jenkins (2000) is that there was still a positive belief of preservice teachers about use of ICT in schools. Preservice teachers perceived the use of ICT in schools as growing in

importance in the prospect; on the other hand there were less positive remarks where preservice teachers considered that ICT was not relevant to their subject or that it should be taught as a separate subject outside their discipline.

Hunt and Bohlin (1993) also studied to determine the entry attitudes of students enrolling in educational computing classes. Key findings included that students enter these classes with a wide range of experience using computers and that these previous experiences are the best predictors of their attitudes. Hunt and Bohlin exerted on the importance of this finding to teacher educators was that preservice teachers generally agreed upon the ability to use computers was a useful skill for living in today's contemporary society and they had positive attitudes toward using computers; however, many preservice teachers did not see that they needed a firm mastery of computers for their' prospective work-life. Additionally, the findings of Gurbuz et al. (2001) demonstrated that prior computer experience and knowledge formed preservice teachers' expectations of the course. Preservice teachers with earlier experience registered in computer literacy courses anticipated that they would be able to improve their existing computer skills and explore advance computer applications and even programming languages. On the other hand, preservice teachers with none or little prior knowledge of computers expected computer literacy courses to initiate them to basic computer skills and applications. They also believed that the course should help them increase their confidence about the computers. It was also observed in the study of Gurbuz et al. that basic computer literacy courses are most effective for those with no prior experience.

One of the foremost implications of Murphy and Greenwood's (1998) study was that, in spite of preservice teachers' perception of being "trained" to use ICT, over seventy-five percent of the students had never used a computer in classroom during their school experience. This idea is somewhat related with another aspect of the technology related courses is being sustainable during professional life of a teacher. By accepting the notation that technology changes every minute in the modern world, there needs to be an adaptation process of

teachers to all these innovations into the education. Consequently pedagogical advice and training for teachers desires to be offered alongside training about the content of new curriculum development (Jarvis & Rennie, 1998; Nanasy, 2001).

Heinich et al., (1996) discussed about the general objectives of a computer literacy course. They proposed that courses including computer literacy instruction should aim three types of objectives; knowledge, skill, and attitude. In the knowledge objectives, teacher educators should include being familiar with terminology, identifying components, describing applications, and analyzing social and ethical issues concerning the utilization of computers. Focusing on skill types of objectives, teacher educators are supposed to take account of keyboarding and the ability to use computers for a diversity of applications. As a last type of objectives, attitude objectives, concentrate on acceptance of the computer as a valuable tool in the workplace (in schools, in teacher training programs, in personal and professional activities).

Computer related courses differentiate with respect to their course names and syllabus. Even though such kind of assortments, computer related courses attempt to ensure at least minimal computer literacy. According to Hoffman (1996), effective courses could even help preservice teachers build up specific skills and identify hardware, software and strategies they would be able to use for classroom management and for teaching and learning. These kind of courses struggle to help naive preservice teachers form a vision for their future classroom consisting using technology as a tool for achieving their and their students' objectives. However, Hoffman warned that even a best 20-week course in using classroom technology would be of little value when the preservice teacher found her or himself in a classroom with out of date, out of use, or nonexistent computer hardware and software.

Goudy (2002) encompassed twenty-seven technology course syllabi from 24 colleges and universities, and 42 surveys from 24 colleges and universities, all representing the US News and World Report's Graduate School ranking for

2002. Four key components were obvious on all of the syllabi examined in the study: (a) the need for all students to use computers mainly focusing on the utilization of software such as MS Office, Dreamweaver, FrontPage, Photoshop and others; (b) a series of computer projects included activities such as the development of interactive lesson plans, the designing of educational Web pages, databases, PowerPoint presentations, and others; (c) the use of the Internet as an instructional tool where nearly eighty percent of syllabi required the use of the Internet for such tasks as WebCT, list-servs, posting of web pages, email, research, and access to online educational resources, including the syllabus itself and; (d) the assessment/grading method engaged by instructors.

The report of New Jersey Core Curriculum Content Standards for Technological Literacy (2001) attempted to depict technological literacy standards, so that teacher educators could design their technology related courses accordingly. The standards include:

1. Computer and Information Literacy
    - A. Basic Computer Tools and Skills
        - a. Keyboarding
        - b. Word-processing
        - c. Internet usage
        - d. Spreadsheets
        - e. Database concepts and usage
        - f. Publications and presentations
    - B. Application of Productivity Tools
        - a. Social Aspects
        - b. Information Access and Research
        - c. Problem Solving
2. Technology Education
    - A. Nature and Impact of Technology
    - B. Design Process and Impact Assessment

C. Systems in the Designed World

Almost all of the computer literacy courses include word-processing software in their syllabus. It was assumed that the most pressing computer need both for teachers and students is the ability to use a computer as a word processor (Woodrow, 1991; Ellis, 2003). The underlying reasons of why such word-processing software is wide-spread could be realized in the explanations of Bracewell and Laferrière (1996) discussing the possible benefits of word-processing software. Bracewell and Laferrière stated that the characteristics of word-processing software effectively guide students to concentrate more on the actual content and editing of a text. Once students have gained this skill, they also use it with more traditional tools. Through greater metacognitive and metalinguistic awareness, writing with a computer can also give students a motivation to think about language and to better assess the appropriateness of the terms they use. These explanations were also shared by some other researchers (Woodrow, 1991; Murphy & Greenwood, 1998) that students could improve the quality of their written work in any subject by using word-processing allowing them to reflect on what they have written and make changes easier and faster. In the conducted research of Hunt and Bohlin (1993) students were asked to estimate how many times they had previously used a computer for word-processing, programming, spreadsheet, database, and recreational applications. Not surprisingly, students reported having many more experiences using computers for word-processing than for programming, spreadsheets, or database analysis. On the other hand, just ten percent of the students had more than ten experiences using databases or spreadsheets, and only twenty percent had more than ten programming experiences. In the study of Durndell, Glissov and Siann (1995) about gender differences on computing in secondary schools, an exception was found that there were no significant gender differences in the use of computers outside school for word-processing. By using the word-processing for their assignments, letters, etc. offered students obvious practical

advantages. Thus, gender differences on this aspect of computer use would be lower than on other aspects of computer use.

Especially in the recent years, the usage of Internet has increased in the fields of communication, entertainment, advertisement, media, and technology. The usage of Internet is not very common in every segment of education from early childhood to the doctoral studies and even more. In Ellis' study (2003), elementary school teachers (*N*= 142) responded that the most common use of computer-based technology was accessing information via the Internet. In the study of Fisher (2000), the free responses indicated a need for increased focus on the Web. This new teaching resource also guides to a numerous of questions regarding instructional characteristics of web media. Additionally, Internet is the most important product for the computer technology and it began to be used in many fields. Internet technology has swiftly and considerably influenced both the way of human communication, and the mediation of teaching and learning. In contemporary and future societies, it is clear that Internet literacy plays and will play an essential role for all citizens to become information literate and lifelong learners (Tsai C., Lin, & Tsai M., 2001). As an expected result of Internet connection distribution, nearly forty percent of all college classes used Internet resources as part of the syllabus in 1999, compared with fifteen percent in 1996 (The Power of the Internet for learning: Moving from Promise to Practice, 2000).

On the other hand, in the research of Altun (1996), relatively lower percentages occurred for spreadsheets and database programs. Altun proposed some reasons about these lower-rated results that the limited use of spreadsheets and database programs might be connected to unavailability of such programs. Moreover, a large number of preservice teachers also reported that they knew about spreadsheet programs, but they verbally pointed out these must be very complicated applications and so they did not attempt to learn how to use them.

Woodrow (1992) focused on the knowledge of the fundamentals of programming a computer and ability to read and write simple computer

programs. Woodrow acknowledged that these were frequently cited as components of computer literacy for teachers and was expected that computer literate teachers would possess moderately proficient programming skills.

Irrelevant topics are another problem of computer literacy courses. Dean (2000) proclaimed that additional training was needed for teachers; on the other hand, participants did not want training on subjects they perceived to be of little relevance. For example, participants had little interest in training on computer history which is also common in most of the computer literacy course. This lack of interest in what was perceived to be irrelevant information remained nearly unaffected following the study. The study demonstrated that training will be valued if teachers believe it to be of instant use in the classroom. Teachers' lack of time forces them to seek training only for topics that will have an immediate benefit. Thus, as a recommendation from study, teacher training programs should make good use of the scheduled time and they should avoid topics which appear unrelated with teaching (e.g., computer history) or topics which are not immediately applicable to classroom.

Somewhat, far from the scope of a computer literacy course, Hunt and Bohlin (1993) uttered about recreational use of computers that was assumed to be the strongest predictor for the liking and confidence. Recreational use of computers was found a self-selected activity that was suitable as an indicator of a positive attitude about using computers, and choosing to use computers for recreational purposes would point out that the individual is confident of his or her ability and expects to be successful. Ellis (2003) observed that the third common use of computer within elementary school teachers (*N*= 142) was recreational or educational games. This leads us to provide opportunities for preservice teachers using recreational applications so that they could develop a feeling of confidence.

Maninger (2003) studied on preservice teachers (*N*=27) and suggested when preservice teachers are given instruction in specific computer software integration techniques, they are more confident in the use of those techniques.

Thus, computer literacy course may propose such kind techniques on specific educational or non-educational software. Nevertheless, Kortecamp and Croninger (1996) acknowledged that the preservice teachers' computer applications course taken prior to enrolling in the methods courses addresses most of the training needs of students.

To keep the content of technology related courses up-to-date, in accordance with the today's technological society; technological literacy should be highlighted by its inclusion as a separate standards area which concentrates on both computer literacy and technology education (New Jersey Core Curriculum Content Standards for Technological Literacy, 2001).

An outstanding point from the research of Simpson et al. (1998) in Scotland that in none of the teacher training institutions did the courses offer preservice teachers with what they observed as an sufficient introduction to the pedagogical use of ICT.

Based upon the views of the teachers surveyed in the study of Woodrow (1991), introductory computing courses for teachers and secondary students should: (a) commence with the development of word-processing and keyboarding skills, (b) provide sufficient time for students to master the skills of word-processing before progressing to other applications, (c) give production-tool applications relating to data retrieval, analysis, and presentation, (d) use integrated application programs to reduce the proliferation of commands, (e) promote positive computer attitudes, and (f) leave all programming skills to specialists' courses.

A study of the technology competencies of preservice secondary mathematics teachers (*N*=28) was implemented by Alghazo (1999). The results revealed that overall students' technology competency improved significantly. Students had significantly improved in word-processing, spreadsheets, computer skills, communications, graphing calculators and web-pages development. On the other side, no significant improvement was observed in multimedia, database and presentation. The qualitative results showed that

students were excited about the technology competencies they gained and would be prepared to teach with technology with some more self-training. Preservice teachers uttered that concrete experiences in learning with technology were needed.

For the study of Nanasy (2001), the preservice teachers reported their computer competencies. The highest level of computer competency seemed to be in word-processing, email, and the Internet. When asked about future interests, the most frequently selected areas were web-page development, instructional software, desktop publishing, and presentation programs.

Duran (2000) investigated what perceptions preservice elementary teachers have regarding the extent to which their institution is providing the experiences needed for them to integrate information technology into the teaching and learning process. Sixteen preservice teachers from Southeastern Ohio within three focus groups - fall, winter, and spring - participated in the study. All preservice teachers took the IT course as compulsory in their teacher training curriculum. Most preservice teachers stated that the course introduced them to introductory IT skills such as word-processing, spreadsheets, databases, presentation software, and communication. However, the common idea among the preservice teachers was that one required technology course did not meet their needs to use IT in their future work-life. Their experiences were mostly built around communication tools such as e-mail and the Internet. The fundamental issue for preservice teachers was the need for instructional support addressing the task of implementing IT in the teaching and learning process. Besides, preservice teachers complained about the lack of any cite of real classroom management skills within a technology-enriched environment. Preservice teachers were also mainly concerned about the design of the course in their curriculum. Several preservice teachers criticized having only one educational computing course in their entire program. Preservice teachers strongly felt that there should be two separate classes: one where they could learn about the technology and one where they could learn about applying the

technology. However, preservice teachers explained that it was expected them achieve these two courses in a condensed course. Moreover, some of the preservice teachers suggested that IT instruction should be integrated into other courses and activities rather than being limited to a single course.

Educational Technology Course

As a part of the reorganization of the teacher education program in Turkey also included a content-based educational technology foundations course as well as other countries (Doering, Hughes, & Huffman, 2003). Goudy (2002) delineated the educational technology as the educational use of the most contemporary technologies for the point of teaching and learning. Van Den Dool and Kirschner (2003) attempted to make a more clear the definition of educational technology that, the applications of all kinds of old and new media and tools as part of the total design of the educational process. Besides, teachers must learn when and how to use these tools for carrying out their profession (Boshuizen & Wopereis, 2003). A long list of educational technology tools could be written, but the majors are: digital microscopes, digital cameras, telecommunications tools such as email or using Internet web sites, PowerPoint and other multimedia presentation program, simulations either online or on CD-ROM, CD-ROM software applications, spreadsheets, electronic calculators, and web page authoring software (Irving, 2003). Additionally, if these new technologies are used in such a way concerning exploit their potential, the teacher interacts with students much more than in a traditional classroom, as a facilitator, a mentor, a guide to the discovery and gradual mastery of knowledge, skills and attitudes (Bracewell & Laferrière, 1996; Nanasy, 2001).

Educational technology when used in meaningful way in support of innovative pedagogy can provide enriching and extremely encouraging educational opportunities. Administrators and educators in teacher training programs recognize the value of technology in the classroom and support increasing funding designated for school computers and Internet access.

However, it is equally important that administrators and educators should remember the need to provide all teachers with the knowledge and support necessary providing that they can better utilize technology in their classrooms and better integrate it into school curriculum (Znamenskaia, 2000).

One of the greatest guarantees of educational technology is the potential for widespread, equal access to ideas, information and learning. Education technology should not be focused on just connecting computers to the Internet, but rather on connecting children to new learning opportunities. Funding for education technology needs to reflect all elements of the integration process. (Education Technology Must Be Included in Comprehensive Education Legislation, 2001). On the other hand, Fisher (2000) pointed that while there could be no hesitation that a well-equipped classroom with tools of technology would improve production and efficiency, it is ambiguous how this technology will provide educators with the opportunity to provide better ways to educate students.

For the past three decades educational technology has been an increasing issue of research and interest. Most researchers have studied best practices on how to incorporate technology in education. Different research samples were selected such as preservice and inservice teachers, school administrators, teacher educators, and children. One of such studies belonged to Hornung (2002). The purpose of this research was to offer a thorough glance at teacher training programs and the outcomes of preservice teachers' preparation relating computer technologies. Three hundred ten preservice teachers and one hundred forty one supervisors participated in an on-line survey. There occurred no significant differences between the perceived level from the preservice teachers and what the supervisors' observed for preparedness with using computer technologies and self-efficacy level. They both concluded that the majority of the student's perceive themselves and were observed as being prepared, yet not very prepared, and positively self-efficacious to use technology as an instructional tool. However, the preservice

teachers had a more positive attitude towards computer technologies than their supervisors observed. It is concluded that the educational experience of the preservice teachers gave them a more affirmative attitude concerning the role of technology in teaching.

The longitudinal study of Cifuentes (1997) was focused on the preservice teachers in the introduction to educational technology course at Texas A&M University and effective master teachers in two professional development schools. Preservice teachers were surveyed over two and a half years to identify a tendency in envisioned teaching methods, and inservice master teachers were surveyed in professional development schools to identify their choices of teaching methods. The study compared the teaching methods employed by inservice master teachers with the methods envisioned by the preservice teachers both before and after implementation of the model for professional development in the educational technology course. The survey revealed methods rankings by preservice teachers as follows, from first to last preference: lecture, discussion, demonstration, questioning/tutorial, student performance, self-directed study, and prepackaged, stand-alone instruction. Prior to taking the course, preservice teachers predominantly saw themselves as implementing teacher-centered methods; they realized themselves as lecturers first, discussion leaders second, and demonstrators third. Comparisons of rankings of methods by preservice teachers before taking the course and over five semesters, ranging from the spring of 1994 to the summer of 1996, indicated that preservice teachers' envisioned choices of methods had altered very little.

Inservice teachers ranked the methods in the following order different than preservice teachers: student performance, discussion, questioning/tutorial, lecture, demonstration, prepackaged, stand-alone instruction, and self-directed study. Inservice teachers preferred more student-centered methods than the preservice teachers where they preferred less. With a comparison, it was definitely observed that preservice teachers ranked lecture either first or second, whereas inservice teachers ranked lecture fourth. Besides, preservice teachers

ranked student performance fifth, whereas inservice teachers ranked it first. Preservice teachers ranked demonstration third, whereas inservice teachers ranked demonstration fifth as a method choice. The order of methods after taking the educational technology course was in that array: discussion, demonstration, lecture, student performance, questioning/tutorial, self-directed study, and prepackaged, stand-alone instruction. When compared to the inservice teachers' methods, preservice teachers still fluctuated. The results also indicated that the educational technology course maintained an alteration from disseminator of information to facilitator of learning. Thus, preservice teachers changed their privileged methodology from teacher-centered to more student-centered (Cifuentes, 1997).

Jao (2001) investigated the preservice teachers' (*N*=70) attitudes and confidence levels toward educational technology standards and selected instructional software applications. The most outstanding result of the study was that after enrolling an educational technology course, preservice teachers had more positive attitudes. Additionally, preservice teachers' confidence level increased in performing the surveyed skills and in teaching them at the grade levels they planned to teach. Preservice teachers also had more positive attitudes toward a variety of instructional tools. It was found that the development of a positive attitude and an increase of confidence level toward the use of technology were related to the positive curriculum design and implementation. Thus, with a positive attitude, it is expected that the preservice teachers will adopt and incorporate technology-based instruction into their classrooms. By focusing more on the Jao's data, preservice teachers moderately strongly agreed that (a) a teacher needs to know how to develop simple hypermedia and multimedia products applying basic instructional design principles; (b) a teacher needs to know how to use a computer projection device to support and deliver presentations; (c) a teacher needs to know how to use teacher utility and classroom management tools for a specific circumstance; (d) a teacher needs to be able to recognize basic principles of instructional design

related with the development of multimedia and hypermedia learning materials ; and (e) a teacher needs to know how to use imaging device such as scanners, digital cameras, and video systems and software.

Secondly, the data (Jao, 2001) revealed that preservice teachers had a positive attitude toward technology standards before the formal training and a more positive attitude toward technology standards after the formal training. Preservice teachers highly agreed that (a) a teacher needs to know how to use advanced features of word-processing, desktop publishing, graphics programs and utilities to develop professional products; and (b) a teacher needs to know how to use terminology related to computers. By the same token, preservice teachers also concentrated on the advanced applications of ICT in education like distance education. Preservice teachers agreed that a teacher requires knowing how to examine demonstrations or uses of broadcast instruction, audio/video conferencing, and other distance learning applications. As being parallel, the Internet and its beneficial uses were also surveyed that preservice teachers moderately agreed that (a) a teacher needs to be able to identify, select and integrate video and digital images in varying formats for use in presentations, publications and other products; (b) a teacher needs to be able to collaborate in online workgroups; (c) a teacher needs to be able to design and publish simple online documents that present information and include links to critical resources and (d) a teacher needs to be able to conduct research and evaluate online sources of information supporting and enhancing the curriculum. The results of this study may be used as a guideline for designing prospective effective educational technology courses.

The most important contribution of Znamenskaia's work (2000) was kept in its description of future teachers' novice perceptions about educational technology. The study described nine novice perceptions regarding educational technology over a period of one and a half semesters which were only a subset of the possible novice perceptions teachers might have. These novice perceptions were:

a) educational technology is about the use of only computers and computer programs;
b) the Internet should be used primarily for research;
c) it is ideal to have one computer for every student;
d) a good multimedia (PowerPoint) presentation is the one that attracts students' attention and keeps them focused using fancy transitions and flashy graphics;
e) state-of-the-art computers are most effectively used in high schools;
f) a file server is primarily used for printing and files;
g) computer hardware is the major portion of the computer expense;
h) students need a quiet place to work with technology effectively; and
i) the primary reason for using a word processor is to type papers and make them look neat. (p.97)

The study revealed that even after completing the educational technology courses, preservice teachers were only aware of a partial range of applications that educational technology could utilize.

Nanasy (2001) examined the educational technology experiences, attitudes, and expectations of preservice teachers preparing to teach at the middle and high school levels. The study found the majority of preservice teachers (90%) believed educational technology will advance the quality of their students' education, felt comfortable using computers with students (75%), and planned to use technology in the classroom (70%) when they initiate teaching. Half of the preservice teachers shared the same opinion that their teacher training courses were providing enough information about how to integrate educational technology into the classroom. On the other hand, almost a third of the preservice teachers reported they were not being provided with enough information and the remaining was unsure. The data described the preservice teachers' positive and negative experiences using educational technology. Rising arguments for the positive experiences were: (a) using the Internet for research purposes, (b) increased student interest and pleasure in school, (c) instructional software, and (d) record keeping programs. There were also arguments with the negative experiences: (a) lack of access to reliable computers, (b) lack of access to the Internet, and (c) problems monitoring

students. The majority of preservice teachers reported receiving some kind of technology training, but where, when, and what type of training seemed to vary.

Doering et al. (2003) wanted to understand how a group of preservice teachers, prior and subsequent to participating in an innovative educational technology part of a teacher preparation program, envisioned the use of technology within their prospective classroom. The study observed that preservice teachers were often unwilling to think about the worth of acquiring technology knowledge, less than integrating the technology within their subjects. Thus, Doering et al. recommended that preservice teachers need to be educated through models that put emphasis on learning with technology, rather than learning from technology. As a second result of the study, preservice teachers believed that use of computers was too time consuming. Preservice teachers agreed that they would only prefer using the computer if it enhanced the learning process or speed up some activity. Even though preservice teachers successfully completed the requirements of educational technology course, they could only give instances that were discussed within their courses. Since they did not propose any ideas of technology integration that were not already demonstrated in class, Doering et al. claimed that it was complicated to decide whether the preservice teachers really comprehended the distinction between learning with and from technology.

Ennis (1992) designed a dissertation study on the factors affecting preservice teacher's decisions to utilize microcomputer technology in instruction. The teacher training that Ennis surveyed all preservice teachers were required to complete an educational technology course in which they learned to teach with technology, including the microcomputer. Some of the preservice teachers (seniors) had completed the course while others (freshmen) had not. In addition, all preservice teachers completed a personal computing course (three credit-hours) in the computer science department. This was normally elected in the freshmen and sophomore year. Due to differences from enrolled courses between seniors and freshmen, it would seem that the two groups should have

made different estimates regarding microcomputer use in student teaching. Nevertheless, their perceptions were found as identical. Thus, Ennis proposed that computing course in that particular teacher education program did not relate to the students' perceptions of their use for teaching. The perceptions of the subjects showed that computing course was perceived as strongly linked the processes of microcomputer mechanical operation, applications of general software, and education and training for teaching with a microcomputer.

Teacher Educators

Teacher educators spend much of their time being a part of professional development of teachers. In preservice teacher education, they prepare student teachers for professional development by giving them tools for reflection and for continuous learning. Many teacher educators are also involved with inservice teacher education. Even though the importance of teacher educators for teacher training program of a country, we know very little on the professional development of teacher educators. While many teacher educators have worked as teachers, there are also many who have a strong academic background, but little or no preparation for teaching. Furthermore, those who are educated as teachers possibly have no training in working with adults. It is the responsibility of teacher educators to guarantee quality teacher education. To accomplish this duty, teacher educators need to be involved in sustainable professional development which means they need to become more knowledgeable professionals than they were a year ago (Smith, 2003).

Teacher educators are the most imperative aspect of a teacher training program that their success or failure in teaching methods and their ways of technology integration will definitely affect their preservice teachers. Definitely the integration of technology into curriculum is a requirement in the classroom in order to offer an affluent environment for the sustained success of students. In order to attain this goal, teacher educators should provide their preservice teachers with a high-quality education. Therefore, the perceptions of teacher

educators concerning effective methods for learning technology integration skills play a vital role in teacher training program. McDonald (2002) revealed that the most effective training methods were technical support in the university setting or in a school, peer support, and credit courses. The least effective training methods were online help, printed documentation, workshops, and computer labs which are current and widely used methods. Thus, according to the findings of this study, it was recommended that teacher training programs should include and utilize the methods that the teacher educators themselves asserted as effective for learning technology integration skills.

A study that represents how teacher educators' encouragement develops favorable perception was illustrated by McHaney (1998). The results of the ANOVA indicated that students who believed their teachers supported and encouraged the use of technology had significantly higher attitudinal scores. The most appealing statement appeared from Altun's (1996) saying that developing IT teaching and learning skills and positive attitudes towards the utilization of these new technologies in preservice teachers needs teacher educators to be well aware of educational issues engaged in IT innovation. Thus, in order to follow the innovations of IT, educators should be offered effective training in recent IT advances and be provided with self-development opportunities by several means: workshops, conferences, and telecommunications network. The role of educators' attitudes towards IT is important to the successful implementation of IT in teacher education programs. Van Den Dool and Kirschner (2003) also appended that teacher trainers must master the educational use of ICT, as well as other educational instruments and tools, in their own teaching. A connotation from McKenzie, Kirby and Mims (1996) emphasized how a teacher educator is irreplaceably important for a teacher training institutions of any country:

> College and university professors are important role models for students, teachers, and other educational practitioners. As part of a routine work day, professors have the opportunity to integrate and model

> the effective use of technology in the curriculum; to encourage students to develop problem solving skills by using various types of technology-supported teaching strategies that foster more active and personal forms of learning; or to stimulate students' critical thinking skills through the use of computers or other emerging technologies. College and university educators can also serve as change agents by disseminating up to date technology information to students and key school decisions makers, as well as serving as visionaries in planning and guiding the diffusion of technology throughout the teaching-learning process. (p. 83)

Additionally, to some extent, the achievement level of the technology related courses depends on the instructor's helpfulness and courtesy during training sessions. The research of Masters and Yelland (2002) on teacher scaffolding, they attempted to form categories of scaffolding with computers. They consider three main types of scaffolding as; (a) cognitive scaffolding where a teacher can support children when constructing understanding, (b) affective scaffolding, with the teacher supporting the children emotionally, and strategic, in which the teacher can provide task management support, and lastly (c) technical scaffolding where the teacher facilitates the operation of both the hardware and the software, in order for the students to focus on the learning aspects implicated. Therefore, generalizing the categories of Masters and Yelland to the entire teacher education, so as to prepare preservice teachers to their professional life, instructors of technology related courses should scaffold them cognitively, affectively, and technically. Additionally, teacher educators must be responsive to differences in students' attitudes and needs (Hunt & Bohlin, 1993).

Instructor not using ICT themselves could not anticipate students to utilize it in their teaching and nor would such a department insist on computer accessibility for their classes. Cuckle et al. (2000) executed a study that students were asked how much they saw instructors using ICT in subject areas. More uses were noted amongst IT, music, chemistry, and physics students (between 70-80% students saw staff using ICT), compared to other subject specializations, where only fifty percent of students reported seeing teachers

using ICT. Likewise, instructors' suggestions of possible ways to use IT were found to be influential on student practice. For instance; the data from study of Duran (2000) revealed that teachers educators use of and attitudes towards IT in their courses might strongly influence the implementation of the technology by preservice teachers. However, some preservice teachers clearly uttered about not having a chance to observe appropriate models of technology practice in the classroom throughout their methods courses, even though all preservice teachers had enrolled their methods courses when the focus group interviews were conducted with them. Thus, the need for observing technology-using faculty in their methods courses was realized as a common topic.

If the statement of "*we teach as we are taught*" is generally accepted, then education faculties must think about this connotation. Even though most of the teacher training programs all over world have required computer literacy courses, most of the faculty staff still hold up the whole class, stick to methods of teaching they have been using for years; actually the methods they know work (Bruder, 1989). Even methods courses of education faculties seemed to be particularly tough to integrate technology into. Designing and providing appropriate technology experiences indicates that the faculty itself must develop comfort with and an awareness of the technology that is currently being used in schools. More importantly, it means that education faculties must model the use of the educational software in their own teaching programs (Norton & Sprague, 1996; Baki, 2000). Bruder (1989) asserted that if teacher educators opposed technology integration, it would be a panic of the unknown or career stagnation. However, one teacher's positive modeling could sometimes do more to adjust other teachers' attitudes than a year of inservice training (Ritchie & Rodriguez, 1996; Altan, 1998; Duran, 2000). Therefore, the panic of teacher educators, whatever the source is, is not an excuse avoiding them from using technology during their own instruction.

Additionally, Fisher (2000) acknowledged that in the contemporary classrooms, teachers and students are allowed to watch and learn

cooperatively. Thus, students require rich learning environments that are supported by well-designed resources. At that point, teachers will require training in how to develop and utilize these resources to meet the student needs. Teacher educators must be challenged to use the computer technologies to make an interconnected set of educational services, the primary focus being the idea that it is the teacher who is the most important in creating learning environments appropriate for exploiting student learning with the technology.

With a scope enhancement, administrators of teacher training programs have also a responsibility within technology related courses debate. Administrators influence technology usage through a diversity of methods, including providing and selling the vision to the community and faculty, obtaining resources such as time, staff, knowledge, materials, and facilities, and providing encouragement and recognition for successfully making the transition (Ritchie & Rodriguez, 1996).

There are a number of advantages of using IT in teacher education, but the process of implementation in educational institutions would require a great deal of time and effort. Teacher educators should be supported and offered opportunities to comprehend the potential of IT for promoting the quality of education through workshops, talks, inservice days, access to equipments, technical support, and also tutorials should be arranged for the lecturers who need further support (Altun, 1996).

Technology Infrastructure

Merriam-Webster's Collegiate Dictionary defines infrastructure as the resources (as personnel, buildings, or equipment) required for an activity. By the same token, high quality career and technical teacher education programs require personnel (e.g., faculty, staff, students), productivity tools (e.g., curriculum, technology, professional development opportunities, supplies, and telecommunication technology), and physical facilities (e.g., buildings, libraries, classrooms, and laboratories). Unfortunately, higher education, for the most part of the world, has failed to invest in career and technical education personnel,

productivity tools, and physical facilities to support quality teacher education programs (McCaslin & Parks, 2002). Providing resources for the necessary hardware and software as well as resources for professional development activities is a continuing issue for both school principals and deans of education (Laferriére & Breuleux, 2002). Not only was the incorporation of information technology resources into the college curriculum increasing, but also a growing number of preservice teachers expected a technology component in their classes to use educational technology with their students (Nanasy, 2001; Sanders D. W. & Morrison-Shetlar, 2001).

Hardware, software, and network capabilities are constantly changing and improving. A school that funded major technology purchases five years ago may today find its equipment out of date (Ritchie & Rodriguez, 1996). Nonetheless, almost all schools of developed countries, investment in computers, software, video equipment, etc. is very underprivileged in comparison with an investment made in those same items in the world of commerce and industry. Sometimes, it turned out to be a nonsense discussion about new technologies where the students do not even have books, papers, and pencils, especially the least developed countries (Bergen, 2003).

The term “access” must also be defined. Access is much more than possessing a computer, or simply connecting to the Internet. The term access also includes being convenient and affordable. If a technology is characterized as accessible, then it should be located where the learner is, and be available whenever the learner requires. Accessibility of a technology also includes a broad geographical distances, for instance; access may take place in the school or college, in the library or after school center, in the community center or workplace, or in the home (The Power of the Internet for learning: Moving from Promise to Practice, 2000; Murphy and Greenwood, 1998). In the research of Ellis (2003), most elementary school teachers (n = 116, 81.7%) had access to computer-based technology in at least one location. Only twenty-eight percent of the teachers had access to computers at home that were used for instructional

purposes. The classroom (72%) and the computer laboratory (65%) were the most common place of access to computers.

Even though with the advancement of new technology infrastructure, surveys of equipment in the schools revealed that by 1994 computers had become the most numerous item of instructional equipment in elementary and secondary schools. Surveys also confirmed a continued confidence on traditional media. The most frequently inventoried piece of equipment after the computer was the VH5 videotape recorder/player, followed by the overhead projector and television monitor. In addition, it was found that about half of the school districts used CD-ROM drives in 1991; that number grew to about three-quarters in 1993 (Heinich et al., 1996).

In Brush et al.'s research study (2003), participants (*n*=93) mostly agreed with the statement that in order for technology integration to be successful, teachers should have more access to computer labs (93%). On the other hand, participants (*n*=46) disagreed that a successful lesson that infuses technology could be achieved with one computer in the classroom (46%). As perceived by the teachers, the lack of funding was the number one reason that could drive them from teaching with technology (Wright & Custer, 1998; Doering, Hughes, & Huffman, 2003). Both teacher and children educators require the necessary tools to improve learning in the 21st century. Providing adequate hardware creates the basic infrastructure necessary in order to build a digital learning environment. (Education Technology Must Be Included in Comprehensive Education Legislation, 2001). On the other hand, institutions spend millions of dollars setting up computer training rooms. They obtain the latest computers, projectors, and software. Yet they appear to give little thought or money to the physical factors that could affect learning. Some of these include poor lighting, uncomfortable temperatures, ambient noise, and the arrangement of the furniture in the room itself. When the physical space of the training room is not designed well, it could virtually sabotage any training session that occurs in the room (McDermott, 1998). A facility's physical limitations, as well as the usage

restrictions, may negatively impact the overall use of educational technologies (Ritchie & Rodriguez, 1996).

Up to this point, one issue should be kept in mind more than anything concerning with technology infrastructure of teacher training programs. The technology changes rapidly and often unpredictably, with the result that schools must re-equip more frequently than in other subjects and forward planning is more difficult. Moreover, IT teachers cannot assume that sufficient modern IT resources will be consistently available, and the provision of these can vary dramatically from school to school (Crawford, 2000). Altun (1996) proclaimed that computers are often locked in rooms waiting for professional users or trainees. New IT, which is relatively quite expensive for developing countries, will be quickly out of date, and replacing it with newer systems will not be easy with limited financial resources. Altun also reported that budget and technical support were dominantly mentioned by the participants of the study. Participants did believe that there was a shortage both in technical support and funding for hardware and software.

A significant body of research exists in the issue of the effects of lack of technology infrastructure. Mumtaz (2000) stated that limited resources within schools are a great barrier to the beginning of ICT. Lack of computers and software in the classroom can seriously limit what teachers are able to do with ICT. Williams et al. (2000) admitted that the challenges are not simply related to the need for larger numbers of computers. Managing resources effectively was an issue at school level and in the classroom, with teachers expressing major concerns about how best to keep all staff informed of what was available, and how to provide fair and equal access to hardware and software. Cuckle et al. (2000) focused more on preservice teachers' perception that lack of access to equipment in schools, particularly for those preservice teachers in the less numeric subject specialists, also had an influence. In some departments, ICT was seen to be used by staff more than in other departments. That point of view is shared by Altun (1996) that none of the participants reported that the

availability of sufficient hardware and software was unimportant; a combined total of eighty-nine percent of participants indicated the importance of these aspects in employing and keeping skilled staff at higher education institutions. Brush et al. (2003) stated that another area of concern expressed by some preservice teachers was the lack of modeling and technology support provided by some placement teachers and methods faculty.

When ICT for inservice teachers are investigated, Fisher (1996) reported that it is also a challenge for school districts to provide adequate technology access. Almost forty-one percent of respondents said that when they chose not to use technology in instruction it was because it was too great a hassle. Teachers indicated that they could not get into the computer labs because of scheduling. In the free-response section of the survey, twenty-six people said there were not enough materials to share among the faculty and students. Nanjappa (2003) affirmed that although computers were present in laboratories in every school, teachers did not have sufficient access, or lacked sufficient time to plan and evaluate integration lessons. As Ritchie and Rodriguez (1996) proposed scheduling to uphold full use throughout the school day, and allowing access either before or after school helps ensure that the technologies are being used to their potential. That view is also supported by Murphy and Greenwood (1998) for the preservice teachers' scene. Having as much as necessary computer labs and their utilization time are the most necessary sections of technology infrastructure. Students, particularly those who are novice level computer users, require regular and adequate time to practice the new skills which they have been taught. Without this, many will become disaffected and even avoid using computers at all. Dawson (2000), made a notable offer that responsibilities for technology-based reform proposals often fall to local districts because national efforts tend to be insufficient both in terms of financial allocations and in terms of implementation management.

With a general recognition, the teacher is no longer limited to the limits of the classroom. An entire school, through its media center, and the community

might also serve as an extensive resource in the learning process. Therefore, to be able to say that teacher education programs have fully equipped with adequate technology infrastructure, the entire environment that preservice teachers have in touch with for learning, should be considered cautiously. Maybe assumed to be utopia of Murphy and Greenwood (1998), especially for under-developed or developing countries, asserted that institutions should work towards equipping all teacher educators, with an office computer which enables email and Intranet/Internet access. In addition to maximizing computer condition for preservice teachers in initial teacher training institutions, preservice teachers could be encouraged to purchase a portable computer (with modem) prior to or at the start of their course. For a recommendation from Murphy and Greenwood that teacher training institutions could also establish a bank of portable machines for student use (giving priority to novice users who require more practice).

In the report of Secretary's Conference on Educational Technology 2000: Measuring the Impacts and Shaping the Future (2000) significant barriers to effective uses of technology were identified. These are:

1. The age of: (a) equipment, (b) wiring, (c) facilities, and (d) attitudes;

2. The lack of: (a) ongoing support, (b) communication, (c) training for technical skill and implementation, (d) active leadership, (e) accountability/benchmarks, (f) vision and clear goals, (g) equipment, (h) funding, (i) clear expectations (j) creative, alternative curricular solutions, and (k) new certification requirement;

3. The school culture: (a) isolation, (b) reluctance to change, and (c) time/scheduling inflexibility;

4. Voters and Policymakers: (a) public resistance and fear, (b) lack of knowledge, (c) resistance to funding measures, (d) lack of accountability, and (e) expectation of short-term returns.

This section of the literature review illustrated the term “technology related courses” in a teacher training program and related considerations. It is

clear that preservice teachers must be technology literate individuals with respect to ICT in general and in their area of specializations. This definite requirement encompasses both the need of a computer literacy course and an educational technology course for technology integration. The needs of these two courses are clear, but the content, structure, the semester and even grading are ambiguous. Some researches also showed that there is a gap between the needs of preservice teachers and the provided training. What all scholars and preservice teachers are in consensus is that the course should be full of real-life experiences demonstrating the possible benefits and drawbacks of technology integration. It is also uttered that this will help preservice teachers develop their self-confidence levels and favorable perception. Some guidelines and recommendations from researchers were prepared for the designing of technology related courses. Some researches conducted for identifying the needs of preservice teachers about the issues that encourage and discourage of technology integration. These are found to be identical that teacher educators including technology literacy and the school experience courses and the technology infrastructure of teacher training institutions and the schools. Thus, it is recommended that they should also be focused for effective teacher training.

Variables Associated with Perception Studies in Teacher Education and Technology

Loveless (2003) divided the perception of ICT into three groups; (a) perceptions of ICT in society, (b) perceptions of ICT capability, and (c) perceptions of ICT in schools. Most of the time, the teachers' perceptions of ICT were wide ranging and ambiguous. Teachers recognize the effects of ICT on their lives both inside and outside of the schools. Loveless portrayed that teachers' perceptions of the impact and priority of ICT in society interact with their own identity as teachers in an information society; the vision for ICT within

the school improvement and development plan; their constructions of the subject area knowledge supporting the learning objectives for ICT in the schools. Additionally; their perceptions of ICT capability interact with their constructions of subject area knowledge of ICT as a separate subject, tool or capability; their repertoire of representations of the concepts, knowledge and skills for children; their pedagogic knowledge of learning goals, organizing and managing learning environments, planning for children's learning and developing teaching methods. Moreover, their perceptions of ICT in schools interact with their subject and pedagogic knowledge; and their understanding of ICT as a new area, relating closely to their developing practices with ICT in their professional lives and in their wider social, economic and cultural experiences.

Concerns about the importance of technology in education could be drawn in several researches related to students' – from early childhood to adulthood - and teachers' – both preservice and inservice - attitudes, perceptions, or awareness. As the technology evolves and the issue of integrating technology into education has gained its momentum, the number of these types of researches from all over the world increased. Even though these studies differentiate with respect to their research designs, sample and context, they are all managed with the purpose of at least getting information on the current perception or attitude and awareness toward technology. Most of the time, results were used in adapting current curriculum or developing a new curriculum (Yasin, 1998).

Our perceptions play an important role in guiding and predicting our future actions. Our past experiences are summarized into perceptions which serve in many ways to predict or influence future actions. The attitudes, values or perceptions preservice teachers have about technology, whether received through parents, peers (Ellis, 2003), schooling, or one's daily life experience, play an important role in their ability to participate actively in their current and future technological world (Volk, 1999).

Sadera (1997) noted that in order to support preservice teachers in developing and altering their beliefs about teaching and learning, it is essential to be aware of their (pre)current conceptions about computer utilization in the classroom. Afterward, we will have a chance to turn their perceptions into practices (Norton & Sprague, 1996).

Based on the data from Whetstone and Carr-Chellman (2001), the underestimation of difficulties appeared to be present in preservice teachers' perceptions of computers. Because they were not aware of the pedagogy of implementing computers into their subject areas, preservice teachers did not realize the training that is necessary. Moreover, some preservice teachers may be less confident when they go into school practice; they may come across with a lack of interest among teacher educators and may have negligible opportunity to use ICT in their classrooms. When they finally turn into teachers they may not make use of their skills, attitudes may become established and the situation may be achieved with the next generation of pupils and preservice teachers (Cuckle et al., 2000).

While the discussion of teacher training and technology receives wider acceptance in education, technology perception maintained to be a demanding concern. As a general acceptance, preservice teachers require necessary teacher training and support to integrate technology into their prospective classrooms. Needless to say that preservice teachers should first and foremost perceive technology in education positive before their graduation.

McHaney (1998) investigated the factors that could influence students' attitudes toward technology. The factors identified in the literature on attitudes toward computers were examined to recognize their effect on the broader area of technology. These factors included: age, gender; grade level, existence of a computer at home; encouragement from parents, teachers and friends; and current year enrollment in a technology literacy course.

Among the studies that have investigated teachers' attitudes towards computers, the most numerous are those that focus on gender differences.

Gender may influence computer attitudes somewhat; yet, it is not thought to be a significant influence. What the studies have indicated, however, is that gender significantly influences measures of other attributes related to computers (Woodrow, 1992; Duckett, 2001).

Wahab (2003) studied with middle school and high school teachers (N=77) in Chicago, on the correlations between the factors including teacher attitudes, emotions, beliefs, and outside influences and teachers' use of computers in the classroom. The study found that the greater amount of computer experience, the more positive attitudes towards computers teachers have, and the more willing to integrate technology (as found in Nanjappa, 2003). Teachers with greater years of computer experience were more comfortable with computers (r=.48, p<.001). Further, results of the multiple regression analyses showed that even after controlling for all other variables, computer experience and comfort with computers were strongly associated. This advocated that teachers who spent more time with computers felt more comfortable with computers. The study also found that usefulness of computers was correlated with grade level taught, teaching experience and classroom use. Also computer liking was found to be correlated with grade level taught and teaching experience. The results of the multiple regression analyses in this investigation showed a negative correlation between grade levels taught and comfort with computers. That meant, middle school teachers were more comfortable with computers than their high school counterparts. The data indicated that teachers who used computers for a greater amount of time in the classroom, believed the computer has greater value for instructional use (r=.35, p<.01). The multiple-regression showed that even after controlling for all other variables, hours of classroom use was associated with instructional use.

A significant body of research exists in the area of technology perception and teacher training. Each research attempts to correlate technology perception to different variables. For example, some studies have examined the relationship between technology perception and computer experience while

others have examined its relationship to several demographic variables, such as age, gender, possession of home computer, and so on. Although each study revealed different facts and provided different conclusions, it is still possible to draw some generalization from the existing body of literature.

Age

Since the entire sample was in similar ages, the age was not considered as an important factor in this study. However, in literature age supposed to be an important factor for inservice teacher. For instance, in the study of Russell G. et al. (2000), it was noted that teachers' possession of skills appeared to be related to their age, as younger teachers had more skills than older teachers.

Small but significant differences by age were found for programming, recreation, and word-processing in the study of Hunt and Bohlin (1993). Also, age had significant correlations to computer anxiety, confidence, and usefulness. Students exhibiting high anxiety toward computer use were older.

Wahab (2003) studied with middle school and high school teachers (*N*=77) where fifty-seven percent of the teachers participating in the study were between the ages of forty one and fifty five. The study was mainly focusing on the correlations between the factors including teacher attitudes, emotions, beliefs, and outside influences and teachers' use of computers in the classroom. The research revealed that older adults had more positive attitudes towards computers than their younger counterparts.

Nanasy (2001) illustrated an inverse significant relationship that the older preservice teachers tended to disagree that their students will know more about computers than they will once they begin teaching. Another inverse significant relationship indicated in the study that the older preservice teachers were less comfortable working with students and computers than the younger preservice teachers.

In the Science and Engineering Indicators report of National Science Board (2002), it was stated that although the vast majority of teachers had

computers at home, there was a strong generational difference associated with how teachers make use of these computers and the Internet. Among teachers with computers available at home, teachers with the fewest years of experience were more likely than teachers with the most years of experience to use computers or the Internet at home to gather information for planning lessons (76% compared with 63 %) and creating instructional materials (91% compared with 82%). Less experienced teachers were also generally more likely than more experienced teachers to use these technologies to access model lesson plans at school and at home.

Gender

Researchers, who are pointing the sex differences or similarities, mostly concentrate on a continuum starting by nature or biologically-oriented causes or ending with nurture or environmentally-oriented causes (Halpern, 2002). Most of the time researchers would like to distinguish between the terms sex and gender. Generally, for biologically mediated differences the term sex is used, on the other hand, for socially mediated differences the term gender is preferred (Pauline & Alan, 1996; Halpern, 2002). Some of the academics like Halpern believed that biological and social influences often are not separable. However, there is a significant body of research attempting to define differences between genders with respect to their ability, attitude, perception, developmental stages, and intelligence.

Santrock (1996) uttered that gender has a sociocultural dimension of being female or male. Santrock exemplified two major terms relating with gender; gender identity and gender role. Gender identity defined as the sense of being female or male, which most children acquire when they are three years old. On the other hand, a gender role is a set of expectations that sets how females and males should think, act and feel. Gottfredson (2002) explained that the most popular difference that behavior genetic research illustrates is between the genetic and environmental (non-genetic) sources of ability differences.

Besides, genetic variability is assumed to be important in educational contexts because it makes students differentially responsive to instruction in schools. Thus, boys differentiate relative to girls who are especially sensitive or insensitive to instruction in specific kinds of skills. Then by equalizing instruction in schools could do little to eliminate gender differences. Gottfredson acknowledged that people do not vary in cognitive ability simply because society treated them differently, and treating them the same would not level their differences in ability.

Halpern and LaMay (2000) stated that even though there was no sex difference in general intelligence, reliable differences were observed on some tests of cognitive abilities. For males, the tasks assessing the ability to manipulate visual images in working memory confirmed an advantage; on the other hand, many of the tasks involving retrieval from long-term memory and the acquisition and use of verbal information demonstrated a female benefit.

Additionally, Halpern (2002) discussed the gender differences with respect to intelligence. The study was focused on which gender is smarter and concluded that we had only information about average differences, which sometimes favor females and sometimes favor males. Likewise, most of the study demonstrating group difference and similarities were always derived from group averages. However, no one is average. Thus, the results cannot be applied to any individual because there is a great deal of overlap in all of the distributions of abilities. Halpern made a great closure by stating that as we focused on effective educational practices for genders, the data from different studies might change, but the major goal of educating all children will not.

The nature and existence of a gender gap in computer usage, especially subsequent to IT innovations in various workplace, and computer-related attitudes, perceptions and values have been extensively studied in psychology, education, and educational computing literature over the last two decades. For instances; Altun (1996) applied a study on lecturers' attitudes and expertise with reference to Turkish teacher education by considering IT. At the end of his

study, it was recommended that the age and gender differences might be important factors, which should be investigated in prospective studies.

It was anticipated that the challenge of increasing girls' interest in and skills with computers has serious social and economic consequences if left unaddressed The gender gap in technology has become so deep that it covers everything from the number of female computer science majors to differences in each gender's conceptualizations of their computer ability (Miller, Chaika, & Groppe, 1996).

The research literature over the past decade has definitely documented that women have overwhelmingly less positive attitudes toward computers than men do. The existence of such a significant gender gap allows little optimism that women's participation in computing may change dramatically in the near future (Shashaani, 1994). Female avoidance of the sciences and technical subjects has frequently been attributed to the effects of sex-stereotyping and the hidden curriculum within schools (Pauline & Alan, 1996). Bergen (2003) discussed the gender calling as feminization of the teaching profession. Bergen asserted that there are differences between countries, yet in most cases the majority of teachers are female, and the profession is becoming more feminized around the world.

Under the light of the feminization of teaching concept, technology and the perception of females have considered as a more important research issue than earlier years. Wilkes (2001) conducted a study for investigating the effects of computer literacy on the self-esteem of female educators, from different disciplines and ages between twenty and sixty-five (N=100). Research illustrated that the educator could raise the self-esteem of their students through role modeling. Female educators who are computer literate across the curriculum become the models for female students to imitate. Study revealed that most of the hundred female educators in study were found to be computer literate and held a high sense of self-esteem. An ANOVA was used to test for differences and most of the hundred female educators scored relatively high in

self-esteem, global self-worth, perceived job competency, and perceived intelligence. An intermediate level of computer literacy did impact the perceived intelligence level of female educators, which leads to higher self-esteem.

Durndell, Siann, and Glissov (1990) conducted a study on a sample of freshmen students (*N*=387) who had just entered higher education. The students were asked why they had made their course choices, and what their views were of the situation where low numbers of females were going through computing and technological areas. Even as males were more instrumental in their course choices than females, computing students of both gender appeared pay attention by extrinsic awards perceived to accept computing, and were inclined to refute that they were especially matched to study in their area. By the problems associated to un-femininity representation of technology and the prospect of harassment in primarily male groups postponed potential female students of computing. Even though females accepted having the ability to study on computers, school teachers were widely criticized for preventing school-girls from technology related subjects.

As a parallel study, Durndell (1990) researched on business and natural science freshmen students (*N*=210). The major purpose of the study was their choice of course and why they chose not to study computing. With a contradictory perspective to twenty-first century, the results of both qualitative and quantitative data indicated that computing had a very bad image problem as a future occupation or subject to study. The most important perceived problem was that students of both sexes, but particularly females, wished to work with humans, not machines. Thus, computing was perceived to involve sitting at a computer terminal most of the time. Students wanted contact with people, not machines, and in accordance with gender stereotyping females found this on average even more important than males.

Clearly the imprints of many societal messages are well-embedded by the teenage years. Jarvis and Rennie (1998) pointed that age is the main factor influencing the children’s developing perceptions of technology, but for rate of

development, gender was also discussed as another inter-related factor of technology perception. As another point of argument, they asserted that children's way of defining technology mainly affected from the occupation of their parents. In the study of Volk (1999), ANOVA revealed that boys and girls who had experiences with technical toys and/or had a working space at home, a statistically significant interaction occurred with their interest in technology.

In 1997, one study has been published announcing the closing or narrowing of the gender gap. A Gallup poll co-sponsored by CNN, USA Today, and the National Science Foundation (NSF) proclaimed that there was a relatively small difference between girls and boys in terms of their general orientation toward technology (U.S. Teens and Technology, 1997). Furthermore, teenage boys and girls reported equal levels of computer usage, similar levels of use of various electronics and expressed equal levels of confidence in their computer skills. The report found two major differences that boys played video games more than girls and spent significantly more time on Internet than girls. The study (Miller, Chaika, & Groppe, 1996) tended to strengthen the perception that computers were "boy's toys." Characteristics of gaming strategies for computers almost always matched to the characteristics desired by boys. Mumtaz (2001) tried to expose how children perceive and enjoy computer use in school and at home. A gender difference was found that boys spent more time playing computer games whereas girls spent more time on the Internet emailing friends.

One of the major studies on gender and technology debate was implemented by Gilley (2002). Gilley surveyed twenty teacher education programs in USA to see whether gender and technology awareness training was being included in required coursework to struggle with gender inequity in fluency with information technology. Gilley asserted that such a study is primarily significant particularly the majority of preservice teachers, especially those going into primary schools, are female. This situation is profoundly vital since; these preservice teachers themselves are more likely to carry negative attitudes of

technology and a disinclination to hold it in their teaching into their future careers, where it would likely be perpetuated in their female students.

Attempts to narrow the gender gap in computing at higher levels should focus most particularly on interesting and attracting girls in the middle and latter years of secondary school (Durndell, Glissov, & Siann, 1995). By the same token, Gilley (2002) identified that the gender gap in computing is not overtly obvious in the primary grades, but becomes extremely marked by high school. Accordingly, when preservice teachers are considered, in the study of Sadera (1997), a t-test was computed to compare differences in preservice teachers on computer competence with respect to gender. The t-test demonstrated that males tended to rate themselves significantly higher than the females in terms of their competence with computer based instruction programs (p=.037), telecommunication software (p=.036), and other computer related technologies (i.e., programming software, HTML, computer hardware) (p=.034). Additionally, males were significantly more favorable towards computer use than were the female respondents (p=.012).

Gilley (2002) also proposed that even tough females seemed to be as capable with computer and related technologies as males, yet there is still a gap between genders with respect to confidence and interest. Thus, Gilley recommended that females need to be encouraged. Gilley continued that for encouraging female preservice teachers on IT, at the first place, their educators must be confident themselves. McHaney (1998) indicated that males had a significantly higher personal affect for technology and computers than females while they did not have significantly different attitudes toward the importance of technology and computers. Gilley (2002) also portrayed a sorrowful circumstance that even tough teacher educators close the gap today for future teachers including gender and technology awareness into teacher training, this will be just reaching a small amount of children from primary and secondary schools, since most of the inservice teachers will still stay in the education system.

Lynch (2001) was conducted a study to provide evidence of factor scale validity and reliability for an instrument measuring constructs to demonstrate motivation to use technology in learning and future teaching among preservice teachers. Analysis on gender revealed that females had higher value-beliefs for technology and less technology skill self-efficacy than males. Males were found to have higher technology skill self-efficacy and lower value-beliefs.

Holden (1997) designed the qualitative dissertation study concentrating on the relations between gender, voice, and technology as reflected in writing about technology in several introductory graduate computer courses for both practicing and preservice teachers. The problem under study derived from the notion that gender mediates all activity, including the processes of writing and using technology, and that this mediation has a profound effect on how voice emerges. The results of the study specified that: (a) gender makes a difference; (b) there was a relationship between gender, voice, and technology; (c) not all females were uncomfortable with technology, and also not all males were computer competent; (d) females wrote more about bothered efforts to connect with technology while males wrote more about bothered efforts to achieve with technology; (e) females were most talented on word-processing programs; (f) technology use in schools is responsible for gender bias; (g) technology is a source of power not recognized by teachers; and (h) technology has the power to both make quiet and amplify voice.

Pawloski (2003) asked whether there was a significant difference between male and female students' ratings of the preparation to teach with technology provided by their institution. A statistical t test revealed that female students gave significantly higher scores of the preparation to teach with technology provided by their institution (M=2.66, SD=.95) when compared to the scores provided by their male classmates (M=2.19, SD=.90).

A questionnaire about experience of, and attitudes to computers and their use was applied to five Scottish secondary schools students (N=429) by Durndell, Glissov and Siann (1995). Statistically significant differences between

the genders were found in a number of issues. Generally girls reported less experience of using computers at school, even though there were no gender differences in the use of computers for playing games. Boys were significantly more likely than girls to possess computers and also reported using computers more frequently outside of school, although there were no significant gender differences in the use of computers outside of school for word-processing. Further analyses carried out on a sub-sample of one hundred ninety-six students indicated significant gender differences on two attitudinal scales: positive orientation to computers (boys scored more) and the tendency to support sex-stereotypical views (boys were more likely to do this). The results of this study confirmed the continuing gender differences in computing. Even in the school situation boys made more largely use of computers than girls. A surprising exception to this general finding was that there was no significant gender difference in the use of computers at schools for games.

Shashaani (1994) conducted a study examining the effect of family socioeconomic status (SES) and parental sex-typed views and behaviors on children's attitudes toward computers. The study consisted of male and female high school students from grades nine and twelve (*N*=1730). The results indicated that SES, including the parents' occupations and education, had significant effects on students' attitudes toward computers. Commonly, gender-differential attitudes were more obvious in the lower socioeconomic group. Additionally, SES was found to be a stronger effect on girls than boys. Both girls and boys perceived the gender stereotypes about computing apprehended by their parents and such attitudes inversely affected the female students' own attitudes. Additional consideration showed that parental encouragement positively influenced boys' and girls' attitudes. Then, step-wise regression illustrated that parental encouragement had the strongest effect on children's attitudes, parental sex-typed views ranked next, and SES had the weakest effects. The MANOVA results of the study illustrated that male students are more interested than female students in computing, have more confidence in

their ability to learn about and use computers, and tend to see the computer as a masculine technology. The data analysis revealed distinctive perceived parental attitudes concerning their sons' and daughters' involvement in computing. Both boys and girls expressed the belief that their parents agreed sex-differentiated beliefs about computer users. The mean scores for boys and girls regarding their perceptions of their parents' beliefs that the computer is more appropriate for males than for females fell in the upper portion of the attitude scale (*M* = 3.6 for mothers and *M* = 3.8 for fathers). Boys, in contrast to girls, were in more agreement that their parents encourage them to learn about computers (*M* = 3.9 for boys and *M* = 2.9 for girls.). The study illustrated that only twenty-two percent of the parents of female students recommended a computer science course as an important subject for their daughters to enroll, whereas sixty-seven percent of the parents of male students perceived computer science as an important subject for their sons. These findings indicated that the issue of gender differences in computing and lack of female participation in this field will continue to be as challenging as in previous years.

Novick (2003) investigated the factors of influence for female in a teacher training program with respect to the relationship between computer technology self-efficacy and intentions to integrate computer technology in the classroom. Female preservice teachers reported a high level of computer technology self-efficacy where the highest levels were seen in e-mail and Internet use. These high levels of computer technology self-efficacy were revealed to have a significant positive relationship to intended computer technology integration in the K-12 classroom. Nonetheless, female preservice teachers' visions of computer technology integration in the classroom were significantly more teacher-centered than student-centered. Female preservice teachers were not influenced by negative societal messages that might imply women are not good at computer technologies.

Hunt and Bohlin (1993) did not find any significant differences in attitudes toward computers with respect to gender variable for their study. Furthermore,

they paralleled their study findings with Koohang (1989, as cited in Hunt & Bohlin, 1993). Using the same instrument with male and female undergraduate college students who were enrolled in computer-based education courses, Koohang also found no significant difference in a Multiple Analysis of Variance (MANOVA) analysis by gender. Woodrow (1992) detected that there was no indication of any gender effect either in the entry-level attitudes toward computers or in the attitude gains in the programming-oriented computer training course.

Wahab (2003) was found no significant correlation between gender and the five factors of the computer attitude scale (comfort with computers, usefulness of computers, instructional computer use, computer liking and outside influences). Even after controlling for all other variables, the multiple-regression did not reveal any significant correlations between gender and the computer attitude scales' factors. Nanasy (2001) investigated the possible correlations between gender and the following statements which concerning technology integration into education: (a) my teacher preparation courses are providing enough information about using technology in the classroom, (b) I feel comfortable using a computer with students in the classroom, and (c) my students will know more about computers than I will . However, gender did not appear to have any relationship with the previously mentioned statements.

Alghazo (1999) designed a study of the technology competencies of preservice secondary mathematics teachers (*N*=28) who were enrolled in two courses of the teacher training program where there were equal numbers of males and female. The results expressed no significant gender differences in technology competencies. The overall analysis showed a slightly higher mean score for females, yet not significant. The separate analyses of the competencies showed that females reported slightly higher scores in computer skills, multimedia, presentations, and graphing calculators with no significant differences, while the males reported slightly higher scores in word-processing, spreadsheets, communications, and web pages development with no significant

differences. Furthermore, the lack of significant gender differences was supported by the results of students' interviews and instructors' interview. In most of the competencies females reported lower mean scores than males in the pre-academic year. However, they reported mean scores as well as those of males in the post-academic year. As indicated by the instructor, female students were encouraged by the instructor to perform well in technology and content area. Male and female students were given equal opportunities to learn about technology and the use of technology in their major field but female students were encouraged more.

Jorge, C. M. H., Jorge M. C. A., Gutiérrez, Garcia, and Diaz (2003) conducted a research on the usage of the ICT and the perception of e-learning among university students from different subject areas such as social sciences, law and human sciences (*N*=730). The aim of the study was to discover if there were differences in the use of ICT and in the perceived advantages and disadvantages of e-learning between men and women, and between first and second-year students. The results showed that there were no significant differences between men and women in the use of technologies such as mobile telephones or computers. Differences were only found in Internet use, which was used more by men than by women (t (725) =4.105 p<.001). However, there appeared to be no significant differences in the use of ICT between first and second-year students. The study showed significant differences in the knowledge of various types of software in accordance with the gender: operating systems (t (706)= -5.083 p<.001), word processors (t (703)= -3.039 p<.001), spreadsheets (t (666)= -3.142 p<.001), presentations (t (679)=-2.984 p<.01), Internet (t (679)=-7.176 p<.001) and educational software (t (617)=-4.110 p<.001). In all cases, men had greater knowledge of software than women. However, there were no differences as a result of the students' year. Additionally, women used the computer more for study activities (t (695) =3.764 p<.001); while men used it for work (t (532) =-3.147 p<.001) and as a hobby or for leisure (t (504) =-5.592 p<.001). As a last point, they focused on the

differences between men and women in terms of Internet use. Men used it the most for playing games (t (452) =4.293 p<.001); while women used in most for e-mail (t (476) =-2610 p<.01). When students' year group was concerned, first-year students used Internet mostly for "playing" (t (422) = -2.387 p<.05) and chat-rooms (t (428) = -2.305 p<.05), while second-year students used it mostly for e-mail (t (446) =2.822 p<.01).

Volk (1999) articulated that policies and practices must be challenged, argued and altered so that they could not exclude girls from participating and being included in technical classes. Volk went one step further and recommended that by the removal of such obstacles, differences within gender factor would minimize and girls' prospective opportunities would expand.

Subject Areas

ICT could and should be utilized as tools for teaching and learning in all subject areas, in the education, in the arts, the humanities, and the social sciences, as well as in mathematics, science, and technical subjects. ICT could aid students to develop their capacity for logical and critical thinking (Bergen, 2003). Barton (1996) stated that even though the preservice teachers varied IT backgrounds, they are almost naïve to use IT within their teaching subjects. The application of ICT within the different areas of specialization was extremely miscellaneous (Van Den Dool & Kirschner, 2003). Therefore, the crucial goal of information technology education to use computers in each school for topics of almost all subjects is very ambitious and might be attained sometime in the future (Lang, 2000). Davis (2003) pointed that to make preservice teachers feel well prepared and confident to integrate technology in teacher training, preparation with respect to their grades and subject areas is an essential point. Furthermore, teachers' perceptions of any subject area may influence their teaching of that subject (McRobbie et al, 2000). Therefore, a teacher is ought to be the most important one, if the contemporary technology curriculum is to be put into practice effectively. In that perspective, it is indispensable that teachers'

accepting of design and technology be altered so that they agree with the aims of new technology supported curricula.

The Whetstone and Carr-Chellman's study (2001) yielded that traditional disciplines boundaries seemed to be altered so that computers were recognized as more important in the technical disciplines. In order to find out the perceptions of preservice teachers about future implications of computers, they were asked to check which applications they felt prepared to use in their future classrooms. The results were: ninety-four percent felt prepared to use word-processing, seventy-five percent felt prepared to use e-mail, sixty-five percent of preservice teachers perceived themselves as able to use content area software in their future classrooms, fifty-nine percent felt able to use graphics, fifty-seven percent felt prepared to use a spreadsheet, forty-one percent felt prepared to implement Internet in the future, thirty-three percent to use databases and sixteen percent to use statistics in their future classrooms. Distributions of these responses did not fluctuate substantially across subject areas, with one exception. Social studies preservice teachers represented fully half of those who felt prepared to utilize databases in their prospective classrooms.

Cuckle et al. (2000) applied a multi-discipliner study of preservice teachers' ICT skills and their use during their undergraduate programs. They pointed out that the most significant factor in influencing whether students used ICT in classroom teaching was their subject areas. They also remarked that ICT use might not be so obvious. In some subject areas, preservice teachers might only learned the use of one or two computer applications; while they might then use these applications frequently, they might not have a wide repertoire of ICT use. Supporting the ideas of Cuckle et al., IT should be introduced as a curriculum tool which has the potential to make a major contribution to the teaching of the student's subject area (Barton, 1996). By implementing one or two major curriculum applications in the classroom, this would be achieved. Barton gave some examples that; science preservice teachers would focus on how to use data-logging with students during practical work at the same time as

mathematics preservice teachers concentrated on the ways in which spreadsheets could be used for mathematical modeling with students.

In the study of Lang (2000), it was observed that the needs of computer training on different subject areas discriminate with respect to specialization. For instance, teachers from computer science, mathematics and science were grateful with an adequate offer about programming and problem analysis in training courses. On the other hand, language teachers (German, in the study) desire issues about word-processing. Lang also stated that problems of hardware and software, data-base, spread-sheet, general and technical applications and educational aspects were labeled less commonly in teacher training programs.

By accepting the needs differentiation in specialization, Lang (2000) added a remark that all topics existing in teacher training were not adequate for the broad variety of different applications in different specializations. Lang questioned about whether the topics in teacher inservice training added something to the application in the different specializations. There was diversity within responds, for instance; fifty-three percent of the mathematics or physics teachers benefited from the topics about application in their areas, while foreign-languages teachers' only twenty-six percent, chemistry teachers twenty-eight percent, biology teachers twenty-nine percent and thirty-one percent with German profited from the proposed applications in inservice training. In closure, Lang stated that this disappointing depiction of teacher training for different subjects regarding isolated courses and unrelated topics found in the German study could not be solved straightforwardly.

Kotrlik, Harrison and Redmann (2000) maintained a study within Louisiana's secondary vocational teachers on the comparison of IT training sources. They noted that even though the Louisiana Department of Education and professional associations should set a high precedence on raising the information technology knowledge and skills of inservice teachers, specified that no significant differences existed by subject area in how teachers valued

information technology, and given that significant differences did exist by subject area in their general and software knowledge and skill. This proposed that teachers from different subject areas might not be getting the same amount and excellence of pre and/or inservice training on information technology. Additionally, the data from the study revealed that teachers placed a high value on information technology by strongly agreeing that teachers should know how to use computers (*M*=4.69) and that teachers (*M*=4.70) and students (*M*=4.64) should have computers available for instruction.

Kotrlik et al. (2000) attempted to explain the differences among subject areas by the varying availability of information technology by subject area, and as an expected result variances in the quality of the instruction delivered to students occurred. Hence, supplementary information technology training and equipment is necessary. Grant (1996) remarked that “teachers’ participation as learners in subject area study groups has often deepened their understanding of content and fueled their practice, supporting their students’ efforts to make sense of the subject they are exploring” (p.117). For this reason, to provide effective technology integration into education among specializations, the first task of national or organizational authorities should be an arrangement of real-life experiences to preservice teachers so that they should see the possible advantages and obstacles of technology within a classroom environment. By recognizing the benefits or hindrances of technology within their specialization, the preservice teachers would have a chance to prepare themselves earlier than graduation ceremony.

When examining in individual disciplines in the study of Whetstone and Carr-Chellman (2001), science preservice teachers had the most computer experience and appeared to evaluate computer integration more than preservice teachers in the other disciplines. Math preservice teachers had the next-highest computer usage and showed the highest levels of confidence with computers (82%); on the other hand, they revealed little critical thinking about computer usage or the implementation of computers. English preservice teachers’ primary

applications for computers were word-processing, e-mail, and the Internet; although only sixty-seven percent of English preservice teachers felt partially comfortable or comfortable with computers. Social studies preservice teachers had little formal experiences as their major way to learn about computers; on the contrary, they demonstrated willingness to extend application uses by using databases. Other noteworthy point of their study was that preservice teachers from all disciplines demonstrated little anxiety toward computers. As a whole, the preservice teachers from all disciplines do not show much hesitation in infusing into classrooms applications that they did not use on an ordinary base. More to the point, when preservice teachers asked to rank computer importance in the disciplines, preservice teachers separated the technical courses form the humanities.

Dawson (2000) cautiously recommended that content-specific utilization of technology was encouraged in order that opportunities should be managed by discipline rather than by technology. That view is shared by Cuckle et al. (2000) and their study yielded that utilization of ICT in the classroom by students with different subjects was significantly different. According to the results of their study; the amount of classroom use of ICT differed between subject experts, although there was no study of different amounts of ICT used across a wide range of subjects. In the same study, analysis of variance showed that the main factor influencing classroom use of ICT was preservice teachers' subject specialists. The results of the study showing which subject specialists had high, medium and low use of ICT are illustrated in the Table 1.

Table 1. *Use of ICT according to PreserviceTeachers' Subject Specialization*

Lowest Use	Medium Use	Highest Use
English	Music	Information Technology
German	Chemistry	Design and Technology
French	Geography	Physics
History	Biology	Math
Religious Education		Social Science
Spanish		

In another place, Cuckle et al. (2000) explained that access to ICT equipment also had a small effect on the use of ICT in classroom teaching. Degree of access showed diversity between subject specializations, but for students across all subject areas on average access was fairly easy to hard. On the contrary, it was easier for students to access ICT for their own study and for preparing classroom materials.

Possession of Home Computer

In the study of Sadera (1997), it was recommended that the rate of preservice teachers' access to computers should be increased. The results of Sadera's work designated that participants with computers at home and those with computer experience, had higher levels of computer competence and could conceptualize more sophisticated ways of using the computer in the classroom in contrast to less computer experienced. The evidence from Gurbuz et al.'s study (2001) gives support to previous findings of Sadera. Gurbuz et. al observed that possessing a home computer amplified teachers' access to computers and willingness to learn more about computers. Wilkes (2001) proposed that supplying the educators with the opportunity to use district computers and other technological equipment at their homes might increase the use and integration of technology into classroom. Possession of home computer will offer the educators to learn about technology, software, installing software, troubleshooting, and the Internet on their own time and at their own pace. While the computer competency and confidence level of educators will increase, simultaneously, the use of the computer may be integrated into every classroom at every grade level and subject areas. Novick (2003) characterized access to and use of a home computer as the mastery experience that the most extensive contribution to abilities of female preservice teachers to use computer technologies.

Mumtaz (2001) sought to examine the nature and experiences of children's computer use at home and in the school using a sample of year three

and five students in three primary schools. The results demonstrated that children make more use of the computer at home than at school. The most popular activity on the home computer was playing games. The most frequent activity at the school computer was word-processing which pupils considered boring. Then, it was recommended that schools should care what happens at home and enable children to work on activities they find valuable, motivational and worthwhile. The positive effect of access to a home computer on students' attitudes was undeniable; children had more favorable attitudes to using the computer at home than at school and were equally confident about using computers in both the home and school environments.

In their research of Simpson et al. (1998); while fifty percent of preservice teachers believed having access to a computer at home as an indispensable necessity for teachers, this proportion increased to seventy-eight by the end of the computer course as the exiting students anticipate the inevitability of homework in their specialized lives. In School Technology and Readiness report of CEO Forum (2000), it was established a link between possessing a computer and boundaries in education, such that:

> In addition to the inequities in school, inequities continue in the home. Disparity in home computer ownership could increasingly intensify barriers in opportunity. Especially as technology fosters communication and collaboration among parents, teachers and students; and anytime, anywhere learning breaks down traditional boundaries in education. (p. 266)

Kirschner and Davis (2003), more radically declared that possession and usage of computers at home is extremely important for developing digital skills than availability of computers in the school. McHaney (1998) indicated that the existence of a computer at home was related to students' current affect for technology and computers and to their perception of the importance of technology and computers on the future and their careers.

Contrary to the ideas of others, in Science & Engineering Indicators report (2002) remarked that albeit computers were widespread in United States'

schools, many teachers felt unprepared to incorporate technology into the subjects they teach. Additionally, Nanasy (2001) asserted that even though, all of preservice teachers had a home computer, actual hours per week spent using the computer seemed relatively low.

Perceived Computer Competency Level

Teacher proficiency is a key. With an increase of confidence level, it is more expected that preservice teachers will be more willing to test new technology-based tools and to develop new technology skills. With an increase of skills and a positive attitude toward technology-based instructional tools, preservice teachers will have a better knowledge of how to integrate technology in the classroom (Jao, 2001). With recent years, educators are realizing that preparing teachers as proficient will benefit for extending children's intellectual capacity through the use of current tools. This is the teacher who will create the influential learning conditions where technology can improve and extend the experience of students (The Secretary's Conference on Educational Technology 2000: Measuring the Impacts and Shaping the Future, 2000). With technological advances in all areas has come the increased need for higher competencies in the area of IT (Kotrlik, Harrison, & Redmann, 2000). According to Williams (1996) there is an extensive variation in teachers' competence with IT.

Meanwhile, as technology becomes a part of the structure of our society, computer skills are a more significant factor in the economic deprivation or advancement of large segments of society (Miller, Chaika, & Groppe, 1996). Therefore, the competency level of technology, especially computers, gains more and more significance in every segments of society. For education, equipping the students -even with a generalization to preservice teachers- with necessary computing skills is essential. Eisenberg (2003) illustrated the framework of being technology or computer literate in such a way that:

> It’s clear and unambiguous: today’s students need to be proficient computer users. Students need to be “computer literate” or even better,

> "computer fluent." Furthermore, there is a growing awareness that being computer literate (or fluent) is more than simply being able to operate a computer, know a particular set of commands or understand hardware and software. Students need to be able to use technology for a purpose, flexibly and creatively. We want students to be able to size up a task, recognize how technology might help them to fulfill that task, and then use the technology to do so. (p. 13)

Cuckle et al. (2000) found that beginning competence with computers was strongly related to personal use of ICT during the course, yet, was not strongly related to use ICT in classroom teaching. Regardless of their perceived level of existing computer skills, most preservice teachers hold a positive view and were able to affirm a target or plan for developing their ICT competence in relation to teaching their specialist subject.

In the study of Whetstone and Carr-Chellman (2001), preservice teachers' perceived comfort levels with computers were determined. It was observed that seventy-three percent of participants felt themselves to be somewhat or very comfortable with computers of which sixty-seven percent of preservice teachers in English, eighty-two of math preservice teachers, eighty percent of science preservice teachers, seventy-three percent of social studies preservice teachers, and fifty percent of second language preservice teachers.

Two major implications of International ICT Literacy Panel (2002) should be added related with ICT competencies of teachers. Firstly, teaching technology applications as isolated competencies, independent of traditional disciplines, does not offer such kind of understanding that ICT literacy is to have a transformative effect on people's lives and it must be understood as a broad set of tools that can be infused across a range of contexts. Secondly, there assumed to be a misconception that as technology evolves, becoming simpler and more transparent, one might argue that the need to develop ICT literacy would lessen. However, simpler interfaces may broaden access to technology, but they cannot make people ICT literate. In order to take full advantage of the opportunities such technology presents, individuals still need critical cognitive and technical skills.

The literature on technology perception and the correlating factors illustrates that age, gender, area of specialization, existence of a home computer and perceived computer competency level are someway related to preservice teachers' technology perception. If we agree that our perceptions turn into practices, then teacher training programs should overwhelmingly concentrate on the factors that affect preservice teachers' technology perception.

Summary

The literature review demonstrated that everything has changed with Sputnik, and the world emerged into information era. Education systems were also entered in an adaptation phase in accordance with technological innovations. Teacher training institutions have a difficult task that they must prepare teachers for the prospective schools of the 21st century and in accordance with their requirements. Prospective teachers will be working in technology rich environments. Thus, it is vital for current preservice teachers to enter the profession with the necessary background to effectively use and integrate computer-related technologies to enhance teaching and learning in schools.

Literature review revealed that the way preservice teachers are being trained is not adequate to struggle with the challenges of information ages. A large body of researches pointed that neither preservice nor inservice teachers feel prepared to use new ICTs in their classrooms. It is obvious that a lack of qualified teachers in teacher training institutions has a negative effect on the quality of education (Altan, 1998). More than possessing necessary competencies, it is how teachers integrate technologies into the classroom environment to foster learning and achieve educational outcomes is important (Ritchie & Rodriguez, 1996). Most research data proclaimed that teachers could not utilize computers into their classrooms with all possible advantages.

Moreover, researches delineated more dramatic scenarios for the teacher training for developing and under-developed countries. Since these countries have not even fulfilled the essential needs of human life, the problems of system of education as well as teacher training will overcome more straightforwardly than other countries. As an improvement effort, Turkey has started a project about the re-designing of the teacher education programs at the faculties of education in Turkish universities. Nonetheless, as a conclusion from most of the researches about Turkey illustrated that the problems on lack of technology competencies and their integration into education are still ongoing.

Despite the many apparent problems today with teachers' technology training, it's still an extremely important and necessary step in the education of future teachers. Change is necessary on two fronts: in the preparatory education of preservice teachers, and in the inservice education. Both groups need assistance and support in using the best tools technology offers to meet teaching goals and challenges (The Power of the Internet for learning: Moving from Promise to Practice, 2000). Teacher educators, technology infrastructure, quality of technology related courses, attitudes, values, and perception of self will come together to serve for this vital purpose of change.

Faculty recognizes the need for, and importance of, teaching preservice teachers to learn to handle with uncontrollably change and technological modernization. On the other hand, before faculty can impart these skills to preservice teachers, they are required to be comfortable with their own technological abilities (McKenzie, Kirby & Mims, 1996). Teachers need to be provided with adequate facilities and training to be able to use those facilities in order to progress in a technology-rich context (Mumtaz, 2000). Preservice teachers must have experiences throughout their preparation program that prepare them to use computer-related technology for teaching and learning in K-12 classrooms. As a result, teacher training programs must begin developing and planning for the effective and efficient uses of computer-related technologies by teacher education faculty and students. Time, training and

access to equipment were listed by preservice teachers as their major barriers to utilizing and integrating ICT. Furthermore, preservice teachers have competency using word-processors but have made little improvement toward learning about other computer productivity tools or instructional software (Schmidt, 1995). Most factors for implementing IT in educational institutions are highly identified to be either important or very important. More staff development initiatives and funding for IT, as well as technical support, would greatly help to improve the implementation of IT in higher education institutions (Altun, 1996). It is clear that preservice teachers must be technology literate. Technology literacy for preservice teachers covers both the need of a computer literacy course and an educational technology course for technology integration. Literature illustrated the needs of these two courses. However, there is no agreement on both the content and the structure. A lot of models and syllabus were developed with respect to the needs of education and technology integration. Each researcher often established the content of such courses based on their view of perceiving the term computer literacy resulting in confusion and lack of agreement. But the gap between the needs of preservice teachers and the provided training is still enduring. The courses filling with real-life experiences will facilitate preservice teachers' development of self-confidence and favorable perception. The needs of preservice teachers were observed that teacher educators including technology literacy and the school experience courses and the technology infrastructure of teacher training institutions and the schools.

The factors affecting the technology perception of students from early years to adulthood were investigated. With a more focus on the factors affecting technology perception and its utilization were identified as age, gender, area of specialization, existence of a home computer and perceived computer competency level. Under the light of fact that our perceptions turn into practices, teacher training programs are overpoweringly recommended to focus on the

factors that affect preservice teachers' technology perception for better educational outcomes.

Chapter 3 discusses the procedures used in this study, Chapter 4 reports the findings, and Chapter 5 presents the conclusions and recommendations.

CHAPTER 3

METHOD

Introduction

The research design and procedures used in this study are presented in this chapter. This chapter is divided into six major sections. The first section describes the subjects and settings for the study. The second part describes the instrument development phase of this study. The third part describes the pilot study and analysis of pilot study data. The fourth part explains the overall design and variables of the study. The fifth part describes collection of data and finally the sixth part describes the analyses of data.

The purpose of this study was to explore the factors that affect a pre-service teacher's perception of technology in selected subject matters.

The proposed study looked at the following questions:

1.1. What are the descriptive characteristics associated with the following scales: (a) Technology Perception Scale (TPS) and sub-scales, and (b) Computer Competency Scale (CCS)?

1.2. Is there a relationship between pre-service teachers' perception scores, and the following demographics: (a) gender, (b) subject area, (c) possession of home computer, and (d) perceived computer competency level?

1.3. How accurately can a technology perception score be predicted from a linear combination of the following demographics: (a) gender, (b) possession of home computer with or without Internet access, (c) perceived computer competency level (novice, intermediate and competent) and (d) different subject matters?

1.4. Is there any significant difference between the technology perception of pre-service teachers from different subject matters and the following demographics: (a) gender, (b) possession of home computer with or without Internet access, and (c) perceived computer competency level (novice, intermediate and competent)?

1.5. Is there any difference between the subject matter areas and preservice teachers' perceptions of technology?

Participants

Since the study aims to assess the preservice teachers' technology perception in relation to their subject areas, the actual population is the whole students in all subject areas of Burdur Faculty of Education, Süleyman Demirel University in Turkey in 2003-2004 Spring semester. However, it is exigent to reach such an enormous number of students for the research. Hence, a convenience sampling method preferred for the study. As Fraenkel and Wallen (2000) advised when it is unfeasible to select either a random or a systematic nonrandom sample, a researcher should use convenience sampling method, that is, the sample available for the researcher at first hand.

This study focused on preservice teachers from eight different subject areas of Burdur Faculty of Education, Süleyman Demirel University in Turkey in 2003-2004 Spring semester. The underlying reason why the study concentrated on senior year students is that of fulfilling all the technology based courses at second semester of their undergraduate programs. Since the study was kept on the very end of the second semester, it is assumed that preservice teachers shaped their technology perception within their teaching training program. The subject matter areas are namely as,

1. Department of Elementary Education:
    a. Early Childhood Education (ECE),
    b. Classroom Teaching (CT),

c. Social Studies Teaching (SST),

d. Science Education (SE)

programs;

2. Department of Fine-Arts Education:

a. Arts Education (AE)

b. Music Education (ME)

programs;

3. Department of Physical Education and Sports (PES),

and

4. Department of Turkish Education (TE).

Among eight subject areas, only four subject areas have their second programs: (a) early childhood education, (b) classroom teaching, (c) social studies teaching, and (d) Turkish education. The subject areas, program type and their gender distributions can be seen in Table 2 (at the top of the page 124).

Table 2. *Subject Areas, Program Type and Gender Distributions of Participants*

	Gender					
	Male		Female		Total	
	n	%	*n*	%	*n*	%
Subject Areas						
ECE – First program	11	92	24	89	35	90
ECE – Second program	9	82	30	100	39	95
CT - First program	58	68	94	80	152	75
CT - Second program	36	69	63	79	100*	76
SST - First program	49	78	27	75	76	79
SST - Second program	47	75	32	89	80*	81
TE - First program	19	100	34	100	53	100
TE - Second program	14	88	28	97	43*	96
SE - First program	10	77	18	100	28	93
AE - First program	4	100	26	100	30	100
ME - First program	11	73	18	90	29	83
PES - First program	20	65	11	50	31	58
TOTAL	288	75	405	85	696	81

Note. (*N*=696), * 1 missing data

The study entirely included 696 (405 female, 288 male, and 3 not stated) preservice teachers from eight different subject matter areas and two different types of program of Burdur Faculty of Education, Süleyman Demirel University in Turkey in 2003-2004 Spring semester. The total number of participants from first program was 434 (252 female, 182 male) and the total number of participants from second program was 259 (153 female, 106 male).

Independent samples *t*-tests were performed on study measure for perception of the groups from the same subject area but different type of program to test homogeneity of the groups. The *t*-test results revealed that the among groups (Early Childhood Education first and second programs, Classroom Teaching first and second programs, Social Studies Teaching first and second programs, Turkish Education first and second programs) come from the same population and there were no significant differences between the mean scores of the groups on the perception measure. Also, Levene's test for equality of variances indicates variances for first and second programs do not differ significantly from each other. If variances do not differ significantly, then

the equal-variance estimate may be used instead of the unequal-variance estimate as given in Table 3.

Table 3. *Homogeneity Test of Subject Areas with respect to Program Types*

		n	*M*	*SD*	*df*	*t*	*Levene's Test for Equality of Variances* *F*	*p*
ECE								
	First program	35	3,95	,71	72	1,234*	,272	,604
	Second program	39	3,77	,59				
CT								
	First program	152	3,94	,44	250	-,435*	2,801	,095
	Second program	100	3,97	,51				
SST								
	First program	76	3,88	,48	154	,329*	,011	,917
	Second program	80	3,86	,47				
TE								
	First program	53	3,67	,48	94	,039*	,076	,784
	Second program	43	3,67	,51				

*p=.05

Majority of the preservice teachers do not possess a home computer (80%, male=33%, female=47%). Preservice teachers possessing a home computer with Internet access is 13% (male=5%, female=8%) and without Internet access is 7% (male=3%, female=4%).

Minority of the preservice teachers perceive themselves competent (17%, male=8%, female=9%). Preservice teachers perceiving themselves as intermediate is 43% (male=19%, female=24%) and as novice is 40% (male=15%, female=25%).

Table 4 (at the top of the page 126) shows the number of pre-service teachers from different subject areas and gender in the possession of home computer categories and in the perceived computer competency levels.

Table 4. *Participant Characteristics in the Possession of Home Computer Categories and in the Perceived Computer Competency Levels*

	Possession of Home Computer			Perceived Computer Competency Level *		
	No	With Internet access	Without Internet access	Novice	Intermediate	Competent
Subject Areas						
ECE	65	6	3	40	26	8
CT	193	47	12	59	119	74
SST	130	15	11	63	73	18
TE	81	5	10	56	30	5
SE	19	5	4	11	14	3
AE	25	5	0	13	14	3
ME	21	4	4	14	13	2
PES	21	7	3	17	10	4
Gender						
Male	228	37	23	101	132	52
Female	325	56	24	171	166	64
Total	555	94	47	273	299	117

Note. (*N*=696), * 7 missing data

Instrumentation

During the literature review period of the study, previously developed instruments about technology perception, technology preferences, or technology use in education were analyzed. Throughout the analysis of the other researches, no exact instrument for using in this case was found. Therefore, researcher decided to develop a new instrument by evaluating the implemented instruments and their research results. The problems and the factors affecting the technology perception and use were intimately investigated in the articles and the resolved items were collected in an item pool. By informal speeches, ideas of the instructors and students from different subject areas were accumulated.

Subsequent to the necessary translations from English to Turkish, 311 items (including 25 demographic questions) were determined. From the item pool, the unrelated and overlapping items were dismissed. Remaining items were analyzed by Turkish language experts on the issues of grammar rules, coherency, and expression properties.

After the proofreading of items, colleagues, technology related course instructors (computer, fundamentals of information technology and educational material development courses) and experts from different subject areas (instructional technology, counseling psychology, educational administration, curriculum and instruction, early childhood education, Turkish language education, Classroom Teaching) examined the items for the content validity of the instrument.

After items were checked for content validity, the next step was to decide on the type of perception scale. There are several types of attitude and personality inventories in use; agree-disagree format, the Thurstone format which is an alternative form of agree-disagree format; the Likert format, and the bipolar adjective checklist.

The Likert-type scales look like questionnaires, but more sophisticated techniques of item selection improve the instrument. The respondent indicates his/her reaction to each statement; generally on a five-point scale from strongly disagree to strongly agree. Then, a positive attitude is shown in a high score (Cronbach, 1949).

When two scales; Thurstone and Likert; compared, it matters very little which method is used. Time required constructing a Thurstone–type scale is much more than Likert-type scale. Another superiority of Likert-type scale is being more diagnostic than Thurstone method; since every respondent completes every item, so that item analysis gives a depiction of reactions to specific issues. In fact, what is the most distinguishing part between the Thurstone-type scale and Likert-type; is the use of item analysis in the Likert

method (Cronbach, 1949; Krech, Crutchfield & Ballachey, 1962; Crocker & Algina, 1986).

At the end of the content validity process, the item pool including sixty-nine items (6 demographics, 61 five-point Likert type questions and 2 open-ended questions), was geared up for the pilot study.

The demographic questions took account of preservice teachers' gender, subject area, program type, possessing an own computer with two levels on having an Internet access and lastly a Computer Competency Scale.

A Computer Competency Scale (CCS) was developed by the researcher to assess preservice teachers' competency on the computer that were delineated in the literature as the minimum computer competencies of a teacher should have. The computer competencies what the Computer Competency Scale assessed were:

1. Basic Concepts
2. Hardware
3. Operating System
4. Word Processor
5. Spreadsheets
6. Demonstration Programs
7. Databases
8. Web Page Development
9. Internet
10. E-mail

The scale has ten items and the items are rated on a Likert-type scale with 1 equaling *not familiar* to 3 equaling *proficient.* Based on the data collected, the preservice teachers were divided into three levels of competency: (1) novice, (2) intermediate, (3) competent. What should be carefully declared here is that this scale did not assess their current competencies, yet, assess how they did perceive themselves on these competencies.

Two open-ended questions were asking whether they think of any factor(s) that affect their technology use and whether they think of any question that it ought to be asked yet not in the questionnaire.

Pilot Study

Following the instrument development, the pilot study was put into practice. The simple convenience sampling method was administered for the pilot study. As the Fraenkel and Wallen (2000) suggested, the larger a pilot study sample is in size, the more likely it is to represent the population. A day in the sixth week of the second semester was chosen for the pilot study. Table 5 (at the top of the page 130) shows a summary of descriptive characteristics of the pilot study participants.

Table 5. *Subject Areas, Program Type and Gender Distributions of Pilot Study Participants*

	n	%
Gender		
Men	110	44.5
Women	137	55.5
Subject Areas		
Classroom Teaching	66	26,7
Science Education	21	8,5
Early Childhood Education	35	14,2
Physical and Sport Education	29	11,7
Turkish Education	45	18,2
Social Studies Teaching	48	19,4
Music Education	3	1,2
Program Type		
First	127	51,4
Second	120	48,6
Total	247	100

Note. N=247

The data, characterizing by seventy four variables, were cautiously inputted into the SPSS for Windows program for further analyses. The items 2,8,10,46,48,55 and 56 were reverse-scaled before going through the analyses steps. Moreover, the two open-ended questions were analyzed by finding the common points.

Through the pilot study, it was also determined that the questionnaire would take about 40 minutes.

Two internal consistency estimates were computed for Technology Perception Scale: Cronbach alpha coefficient (α) and a split-half coefficient. For the split-half coefficient, the scale was split into two halves. As a drawback of using the split-half procedure, it is noted that there are many potential ways of separating an instrument into halves and each producing different coefficients.

Most of the researchers such as Cronbach (1949), Krathwohl (1998), and Green et al. (2000) recommended that the formation of halves should be based

on the odd items versus even items procedure. However, even for that situation, Krathwohl (1998) makes a remark that since the split-half method stratifies the halves so that each properly represents the groups, these reliability measures will be higher than random splits.

For the split-half coefficient, the scale was split into two halves such that the two halves would be as equivalent as possible. The value of Cronbach alpha coefficient was calculated as .73 and split-half coefficient was .78 each indicating satisfactory reliability.

For pilot phase of the study, two analyses were selected for statistical analyses: the exploratory factor analysis and item analysis.

Factor analysis is a technique used to identify factors that statistically explain the variation and covariation among measures. Factor analysis is also an evidence of construct validity corresponding to what the test was intended to gauge. Besides, factor analysis is a data reduction technique, since it reduces a large number of overlapping measured variables to a much smaller set of factors. As Green, Salkind and Akey (2000) pointed out if a study is acceptably designed in order that unlike sets of measures reveal different dimensions of a broader conceptual structure, factor analyses can yield factors that correspond to these dimensions.

Considering the importance of the factor analysis, the gathered data primarily checked whether data were appropriate for factor analysis by implementing Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy test and Bartlett's test of sphericity. George and Mallery (2001) explained that a Kaiser-Meyer-Olkin (KMO) measure tests whether the distribution of values is sufficient for conducting a factor analysis or not. Both George and Mallery and Büyüköztürk (2003) stated the KMO coefficient ought to be greater than .60. George and Mallery also clarify the Bartlett's test of sphericity as a measure of the multivariate normality of the set of distributions and the test must be statistically significant. It was observed that the KMO coefficient was found .79 and the approximate X^2 (1830, N=247) is equal to 6094.530, p<.001. Since the

results of tests were straightforward, the data were decided to examine by factor analysis.

The dimensionality of the sixty one items from the preservice teachers' technology perception measure was analyzed using principal component exploratory factor analysis. Four criteria were used to determine the number of factors to rotate: the a priori hypothesis that the measure was unidimensional, the Cattell scree test, the variance explained and the interpretability of the factor solution. The scree pilot indicated that our initial hypothesis of unidimensionality was incorrect and there were three breaking points. Therefore, three factors were rotated using a Varimax rotation procedure. After some of the items were reduced by using factor loadings and eigenvalues and when the interpretability criteria and total variance explained criteria were taken into consideration, two factors were rotated using a Varimax rotation procedure. The rotated solution, as shown in Table 6 (at the page 134), yielded two interpretable factors, belief of the positive effect of technology in education and effects of undergraduate program.

Afterwards, the results of the pilot study were investigated by using ITEMAN program for item analysis. As Henerson, Morris and Fitz-Gibbon (1987) explained the reliability of an instrument is affected by the effectiveness of each individual item in discriminating among respondents; therefore, the purpose of an item analysis is to indicate items that tend to decrease the scores of respondents who attain high scores or to increase the scores of respondents who score low.

First of all the items clustered around Factor 1 and 2 were checked for their item-scale correlations with respect to Ebel's criteria as proposed by Crocker and Algina (1986). Only two items (Item 34 (.321) and Item 35 (.258)) seemed to make a revision. Subsequently the items that were not bunched around factors were investigated and found that their item-scale correlations were also lower. The exceptional items were re-factor analyzed one-by-one deciding whether they had a place in any of the factors. It was found that the

items 36 (into the Factor 1), 37 (into the Factor 2) and 58 (into the Factor 2) could be replaced into the factors.

At the end of the piloting, the inter-reliability of the each factor was calculated. The Cronbach alpha of the Factor 1 (belief of the positive effect of technology in education) is .89 and the Cronbach alpha of the Factor 2 (effects of undergraduate program) is .81.

The belief of the positive effect of technology in education factor accounted for 26% of the item variance, and the effects of undergraduate program factor accounted for 13% of the item variance. Hence, these two factors were totally explained the total variance with a 39%.

Only one item (Item 6) loaded on both factors. However, in accordance with the interpretability criteria, it was placed in Factor 2 (effects of undergraduate program). At the end, the Technology Perception Scale was reduced to twenty-eight items.

Table 6. *Principal-Components Analysis with Varimax Rotation and Coefficient Alphas for Technology Perception Scale*

	Factor loading	
Item	Belief of the Positive Effect of Technology in Education (α = .89)	Effects of Undergraduate Program (α = .81)
Per14	,824	
Per15	,818	
Per13	,788	
Per16	,735	
Per19	,719	
Per21	,691	
Per20	,685	
Per12	,637	
Per18	,618	
Per36	,547	
Per23	,545	
Per29	,519	
Per22	,502	
Per40	,498	
Per52	,465	
Per17	,425	
Per54		,641
Per61		,635
Per60		,617
Per5		,615
Per59		,605
Per4		,596
Per7		,581
Per34		,543
Per58		,538
Per37		,518
Per35		,437
Per6	,356	,364

Two internal consistency estimates were re-computed for Technology Perception Scale after factor and item analyses. The value of Cronbach alpha coefficient was calculated as .86 and split-half coefficient was .91 each indicating a more pleasing reliability.

At the end of the pilot study, the preservice teachers' computer competency scale was analyzed. The scale was a three-point competency scale (Not Competent , Average, Competent) inquiring in which position preservice teacher feels him/herself as competent in his or her forthcoming years. The Cronbach alpha coefficient was calculated as .87 denoting a satisfactory

reliability. Subsequently, a factor analyses was applied to the scale whether the items measure only one factor – preservice teachers' computer competency. One factor was rotated using a Varimax rotation procedure. The rotated solution, as shown in Table 7 yielded one interpretable factor, preservice teachers' computer competency.

Table 7. *Principal-Components Analysis with Varimax Rotation and Coefficient Alphas for Computer Competency Scale*

	Factor loading
Item	preservice teachers' computer competency (α = .87)
Operating System	,801
Word Processor	,776
Spreadsheets	,767
Basic Concepts	,741
Demonstration Programs	,716
E-mail	,649
Hardware	,628
Internet	,614
Databases	,570
Web Page Development	,538

The preservice teachers' computer competency scale factor accounted for 47% of the item variance.

Overall Design

Since the study aims to obtain data to determine specific characteristics of a group, a none-experimental survey research design was employed. However, as Fraenkel and Wallen (2000) discussed, it should be addressed that there are three major difficulties when employing survey type of research design: (1) questions in the survey must be obvious; (2) respondents' honesty on answers; and (3) gathering a sufficient number of replies to obtain statistically meaningful analyses.

For the first problem; the expert opinions on linguistic issues, the content validity and pilot study were utilized. For the second problematic-issue, it is assumed that responses were profoundly thoughtful and honest. The total, within groups, and between groups numbers of the participants are clearly enough to make statistical analyses for the survey. When a discrepancy was attained on a statistical analysis due to the number of participant in a specific group, it was noted and carefully explained on making comments.

The survey included four independent variables (IVs) and one dependent variable (DV).

Dependent Variable:

1. *Perception:* It is the total of two sub-scales (belief on positive effect of technology in education, and effects of undergraduate program) and is a continuous variable. The higher the score on the perception scale the more pre-service teachers have positive perception toward technology in education.

Independent Variables:

1. *Gender:* It is a categorical variable with two levels: (1 = male and 2 = female.)

2. *Subject Area:* It is a categorical variable with eight levels: (1= Physical Education and Sports, 2= Science Education, 3= Music Education, 4= Early Childhood Education, 5= Arts Education, 6= Classroom Teaching, 7= Social Studies Teaching, and 8= Turkish Education.)

3. *Possession of Home Computer:* It is a categorical variable with three levels: (1=No Computer, 2= Computer with Internet access and 3=Computer without Internet access).

4. *Perceived Computer Competency Level:* It is a continuous variable with three levels: (1=Novice, 2=Intermediate, and 3= Competent). The higher the score on the Computer Competency Scale the more competent the preservice teachers feel themselves.

Procedure

Before administrating the questionnaire to whole group, an official permission was taken from the Deanship of Burdur Faculty of Education. The permission document can be seen at the Appendix A.

Subsequent to permission, the course schedules of all subject areas were taken into consideration, the suitable time-table was arranged accordingly. The instructors were informed about study and asked whether a part of their course could be used for study.

During different courses, attending preservice teachers volunteered to complete the questionnaire. After a brief introduction to the class by the instructor, the researcher was introduced to the students. First of all, the purpose of study was explained. The preservice teachers were asked to participate in the study and were given time to complete the questionnaire. Preservice teachers were also informed that participation was voluntary. It is profoundly declared that all their responses would be kept completely confidential and would only be used for the study. Finally, preservice teachers were informed that if they refused to participate they would not incur any negative consequences or questionnaire would not affect their grades positively or negatively. The total response rate was eighty-one percent (N=696).

Analysis of Data

The demographic information obtained was analyzed by using frequency distribution. Based on this information, an insight to the data was provided.

Based on the data the following statistical analyses were performed: reliability, correlation, multiple linear regression, univariate analysis of variances and multiple comparison post-hoc tests.

Two internal consistency estimates were computed both for Technology Perception Scale and its subscales (opinion on the technology in education and

the effects of undergraduate program) and for Computer Competency Scale: coefficient alpha and a split-half coefficient expressed as a Sperman-Brown corrected correlation.

Pearson Correlation was performed between the perception mean scores and the following variables: gender, subject area, possession of home computer and perceived computer competency level. These analyses examined if there were relationships between independent variables and the perception scores of the sample.

Another Pearson Correlation was performed between the perception mean scores and the factors (opinion on the technology in education and the effects of undergraduate program) whether there is high a correlation among dependent variables or not for redundancy effect of dependent variable on analysis of variances.

A multiple linear regression analysis was conducted to evaluate how well the demographics predicted perception score of a preservice teacher.

By using Univariate Analysis of Variances, the effects of the independent variables on a single dependent variable were examined (Nicol & Pexman, 1999). Therefore, Univariate Analysis of Variance (ANOVA) was performed on perception measured at different subject areas, different levels of competency, and different levels of possession of home computer and gender to examine if there were differences between preservice teachers' levels of technology perception.

Afterwards, post-hoc tests were performed to see which group(s) differs within the whole group. A post-hoc analysis is used to compare specific group means in studies whose nominal independent variables have more than two levels (Nicol & Pexman, 1999).

CHAPTER 4

RESULTS

Introduction

The results of statistical analyses are presented in this chapter. First of all reliability analysis of the measures used in this study will be presented, and then the rest of the chapter is organized that each research question is associated with a result and a short explanation.

Internal Consistency Reliability Measures

Two internal consistency estimates were computed for Technology Perception Scale: Cronbach alpha coefficient (α) and a split-half coefficient.

Cronbach (1949) cautiously declared that the split-half method might give confusing results unless the two half-tests are just as equivalent as parallel forms of the identical test would be. Cronbach (1949) mentions about two underlying assumptions of split-half method: (a) the halves must have almost equal standard deviations and (b) the halves must be alike in content. Before computing split-half internal consistency reliability measure, two assumptions were checked. It was found that the two halves had similar standard deviations (*SD* for first half= .53 and *SD* for second half=.55) and since the instrument was directly focuses on the technology perception issues, it was assumed that the two halves are identical with respect to content.

The Cronbach alpha (α), as Crocker and Algina (1986) stated, could be thought as the mean of all possible split-half coefficients and is generally

applicable to any situation where the reliability of a composite is estimated. Since the perception score is gathered from two factors (belief on positive effect of technology in education and effects of undergraduate program), it is more suitable to use Cronbach alpha as an internal consistency reliability measure.

Both the Cronbach alpha (α) and split-half coefficients are presented in Table 8 (at the top of the page 141). Henerson et al. (1987) discusses on the adequate level of reliability coefficients and asserted that while reliability coefficients of above 0.70 are definitely pleasing where attitude type of measurements are exist, lower coefficients are also tolerated.

The overall reliability (α) for the Technology Perception Scale (TPS) was 0.90 which indicated that at least 90% of the variance of the total perception scores was reliable, and 10% was due to measurement error.

As Cronbach (1949) states a test may offer reliable measures at one level of ability, and unreliable measures at a different level. Therefore, the sub-scales of Technology Perception Scale were also analyzed. The sub-scale reliability for the Technology Perception Scale all had high reliability (belief on positive effect of technology in education = .90 and effects of undergraduate program = .90). Correspondingly, the reliability for the Computer Competency Scale (CCS) was high (α = 0.87).

Table 8. *Reliability Measures: Technology Perception Scale (TPS) and Computer Competency Scale (CCS)*

Measure	α	Split-half coefficient
Technology Perception Scale		
Entire Scale	.90	.95
Belief on Positive Effect of Technology in Education	.90	.93
Effects of Undergraduate Program	.90	.93
Computer Competency Scale		
Entire Scale	.87	.91

Question 1: What are the descriptive characteristics associated with the following scales: (a) Technology Perception Scale (TPS) and sub-scales, and (b) Computer Competency Scale (CCS)?

This section of the chapter shows the summary statistics of observed variables. First, results will be focused on the TPS scale and the related sub-scales, and then will be concentrated on CCS.

Technology Perception Scale (TPS)

Means and standard deviations of the scales and sub-scales for the preservice teachers are presented in Table 9 (at the top of the page 142). Basically, it was examined that the entire Technology Perception Scale had a lower mean score (*M*=3.85) than factor 1 (belief on positive effect of technology in education; *M*= 4.31), yet, had a higher mean score than factor 2 (effects of undergraduate program; *M*=3.23).

Table 9. *Mean Scores of Technology Perception Scale (TPS) and Computer Competency Scale (CCS)*

		Technology Perception Scale					
		Total		Factor 1[a]		Factor 2[a]	
Subject Areas [b]	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
ECE	74	3.85	.65	4.31	.67	3.23	.90
CT	252	3.95	.47	4.35	.45	3.43	.75
SST	156	3.87	.47	4.36	.42	3.21	.83
TE	96	3.67	.50	4.20	.60	2.95	.66
SE	28	3.65	.50	4.29	.53	2.79	.86
AE	30	3.54	.67	3.95	.69	2.99	.91
ME	29	4.01	.55	4.57	.43	3.27	.95
PES	31	3.70	.56	4.07	.62	3.20	.78
Gender [c]							
Male	288	3.94	.51	4.34	.51	3.41	.79
Female	405	3.78	.53	4.28	.54	3.11	.81
Home Computer							
No	555	3.85	.52	4.31	.50	3.23	.82
With Internet	94	3.87	.53	4.32	.60	3.27	.78
Without Internet	47	3.73	.60	4.18	.66	3.13	.87
Competency							
Novice	273	3.67	.54	4.22	.57	2.93	.81
Intermediate	299	3.91	.49	4.33	.50	3.34	.73
Competent	117	4.13	.43	4.46	.40	3.68	.74
Total	696	3.85	.53	4.31	.53	3.23	.81

Note. For the Technology Perception Scale, the possible highest score is 5.00.
a: Factor 1= belief on positive effect of technology in education; Factor 2= effects of undergraduate program.
b: ECE = Early Childhood Education; CT = Classroom Teaching; SST= Social Studies Teaching; TE= Turkish Education; SE= Science Education; AE= Arts Education ; ME= Music Education; PES= Physical Education and Sports.
c: 3 missing data

For both the entire Technology Perception Scale and factor 1 (belief on positive effect of technology in education), the highest mean score (*M*=4.01 *and M*=4.57 respectively*)* was observed in music education and the lowest mean score (*M*=3.54 *and M*=3.95 respectively*)* was observed in arts education. On the other hand, for the factor 2 (effects of undergraduate program), the highest

mean score (*M*=3.43) was observed in Classroom Teaching and the lowest mean score (*M*=2.79) was observed in science education.

From gender perspective, it was observed that male had higher mean scores for the entire scale (*M*=3.94), the factor 1 (*M*=4.34) and the factor 2 (*M*=3.41) than female.

In the light of the possession of home computer variable, it was found that preservice teachers with a home computer and Internet access had higher mean scores for both the entire scale (*M*=3.87), the factor 1 (*M*=4.32) and the factor 2 (*M*=3.27). Nevertheless, preservice teachers with a home computer but without an access to Internet, had the lowest mean scores for both entire scales and two sub-scales (*M*= 3.73, 4.32, and 3.27 respectively).

Additionally, for the perceived competency category, preservice teachers who perceived themselves as competent had the highest mean scores for both entire scales and two sub-scales (*M*= 4.13, 4.46, and 3.68 respectively). On the other hand, novice preservice teachers had the lowest mean scores for both entire scales and two sub-scales (*M*= 3.67, 4.22, and 2.93 respectively).

For an insightful analysis of items, the mean scores and standard deviations are illustrated in Table 10 (at the top of the page 144). The Items between 1 and 16 belonged to factor 1 and the remaining items (17-28) belonged to factor 2. Item descriptions can be found in Appendix B.

Table 10. *Summary Statistics of Items in Technology Perception Scale (TPS)*

Item	*M*	*SD*
per1	4.67	.68
per2	4.52	.73
per3	4.52	.72
per4	4.42	.76
per5	4.49	.76
per6	3.72	1.10
per7	4.17	.82
per8	4.25	.77
per9	4.10	.90
per10	4.45	.80
per11	3.97	.84
per12	4.37	.83
per13	4,29	.83
per14	4.35	.84
per15	4.20	.90
per16	4.39	.84
per17	3.50	1.05
per18	3.19	1.22
per19	3.57	1.23
per20	2.86	1.22
per21	2.74	1.13
per22	2.84	1.16
per23	3.42	1.28
per24	3.44	1.29
per25	3.95	1.07
per26	3.25	1.16
per27	2.91	1.20
per28	3.10	1.27
Entire Scale	3.85	.53

For entire scale the highest mean score (*M*=4.67) was for Item 1, and the lowest mean score (*M*=2.74) was for Item 21. Within the factor 1, Item 1 has the highest mean score (*M*=4.67*)* and Item 6 has the lowest mean score (*M*=3.72). Within the factor 2, Item 25 has the highest mean score (*M*=3.95*)* and Item 21 has the lowest mean score (*M*=2.74).

Equally important with mean scores, standard deviations should also be considered. Items representing the factor 1 had standard deviations lower 1.00 , yet, items forming the factor 2 had standard deviations higher than 1.00. Therefore, it should be concluded that factor 2 deviated more than factor 1.

There is an exceptional item in factor 1 (item 6) having a standard deviation higher than 1.00 (*SD* =1.10).

Computer Competency Scale (CCS)

Means of the computer skills represented in the Computer Competency Scale (CCS) for the preservice teachers are presented in Table 11 (At the top of the page 146).

Table 11. *Summary Statistics of Computer Competency Scale (CCS) Items.*

		Computer Skills [a]										
		1	2	3	4	5	6	7	8	9	10	Entire Scale
	n	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*M*	*M*
Subject Areas [b]												
ECE	74	2.12	1.46	1.82	1.76	1.46	1.85	1.16	1.16	1.91	2.14	1.68
CT	252	2.43	1.83	2.20	2.29	2.01	2.05	1.29	1.46	2.43	2.51	2.05
SST	156	2.10	1.53	1.88	1.95	1.53	1.55	1.15	1.19	2.40	2.26	1.75
TE	96	1.90	1.40	1.56	1.67	1.40	1.39	1.02	1.04	1.98	2.07	1.54
SE	28	2.18	1.36	2.00	2.04	1.54	1.82	1.07	1.18	2.29	2.32	1.78
AE	30	1.93	1.73	1.93	1.80	1.70	1.50	1.10	1.20	2.30	2.23	1.74
ME	29	2.14	1.76	2.07	1.72	1.59	1.31	1.03	1.21	2.31	2.38	1.75
PES	31	1.94	1.45	1.71	1.71	1.71	1.52	1.23	1.35	2.06	2.13	1.68
Gender [c]												
Male	288	2.22	1.64	1.98	2.03	1.69	1.74	1.16	1.34	2.39	2.36	1.86
Female	405	2.17	1.60	1.93	1.96	1.70	1.73	1.18	1.22	2.19	2.28	1.80
Home Computer												
No [d]	548	2.15	1.55	1.88	1.93	1.66	1.70	1.17	1.25	2.25	2.26	1.76
With Internet	94	2.39	1.97	2.37	2.36	1.95	1.98	1.31	1.50	2.54	2.65	2.10
Without Internet	47	2.40	1.89	2.21	2.21	1.83	1.89	1.13	1.30	2.26	2.47	1.96
Competency												
Novice	273	1.68	1.18	1.34	1.35	1.18	1.27	1.02	1.05	1.72	1.76	1.36
Intermediate	299	2.40	1.77	2.19	2.24	1.81	1.82	1.18	1.28	2.57	2.62	1.99
Competent	117	2.90	2.35	2.85	2.93	2.68	2.68	1.60	1.84	2.91	2.91	2.57
Total	696	2.19	1.62	1.95	1.99	1.69	1.74	1.18	1.27	2.27	2.31	1.82[e]

Note. For the Computer Competency Scale the achievable highest score is 3.00.
a: 1=Basic Concepts; 2= Hardware; 3=Operating System; 4=Word Processor; 5=Spreadsheets; 6=Demonstration Programs; 7=Databases; 8=Web Page Development; 9=Internet; 10=E-mail.
b: ECE = Early Childhood Education; CT = Classroom Teaching; SST= Social Studies Teaching; TE= Turkish Education; SE= Science Education; AE= Arts Education ; ME= Music Education; PES= Physical Education and Sports.
c: 3 missing data.
d: 7 missing data.
e: *N*=696 ; *SD*=.50; *Min*=.20; *Max*=2.90.

For the CCS, when the whole sample was considered at the first place, it could be noticed that E-mail had the highest mean score (*M*=2.31) and Databases had the lowest mean score (*M*=1.18).

Secondly, when the subject areas were considered, Classroom Teaching possessed the highest mean score (*M*=2.05), and Turkish education held the

lowest mean score (*M*=1.54*)*. As a supplementary circumstances, Classroom Teaching had the highest mean scores for all items in the CCS (*M*=2.43; 1.83; 2.20; 2.29; 2.01; 2.05; 1.29; 1.46; 2.43; 2.51 respectively). Additionally Turkish education had the lowest mean scores for all items in the CCS (Item 1; *M*=1.90, Item 3; *M*=1.56, Item 4; *M*=1.67, Item 5; *M*=1.40, Item 7; *M*=1.02, Item 8; *M*=1.04, Item 10; *M*=2.07), except three of the items. For the item 2 (Hardware), science education had the lowest mean score (*M*=1.36), for the item 6 (Demonstration Programs) music education had the lowest mean score (*M*=1.31), and for the item 9 (Internet), early childhood education had the lowest mean score (*M*=1.91).

Thirdly, it was observed that males had higher mean score (*M*=1.86) than females on the total perceived computer competency measure. On the contrary, when the items of the CCS were investigated intensely, it could be admitted that males and females had approximately equal mean scores on three of the items; (a) Spreadsheets (female; *M*=1.70, male; *M*=1.69), (b) Demonstration Programs (male; *M*=1.74, female; *M*=1.73), and (c) Databases (female; *M*=1.18, male; *M*=1.16).

As a fourth point, it was observed that preservice teachers with a home computer and Internet access had the highest total mean score (*M*=2.10) within the possession of a home computer category. With only one exception (Item 1 (Basic Concepts); *M*=2.40 for a home computer without an Internet access), it was also acceptable for all items in the CCS that preservice teachers with a home computer and Internet access had the highest mean scores (*M*=1.97; 2.37; 2.36; 1.95; 1.98; 1.31; 1.50; 2.54; 2.65 respectively starting with Item 2)

As an addition to fourth point, it was found that preservice teachers without having a home computer had the lowest mean scores for both entire scale (*M*=1.76) and the items (Item 1; *M*=2.15, Item 2; *M*=1.55, Item 3; *M*=1.88, Item 4; *M*=1.93, Item 5; *M*=1.66, Item 6; *M*=1.70, Item 8; *M*=1.25, Item 9; *M*=2.25 , Item 10; *M*=2.26 *)*, with an exception (Item 7; *M*=1.13 for possessing a home computer without Internet access).

Question 2: Is there a relationship between preservice teachers' technology perception scores, and the following demographics: (a) gender, (b) subject area, (c) possession of home computer, and (d) perceived computer competency level?

For this research question, correlation analyses were implemented. This section presents the results of correlation analysis between independent variables and perception score and besides correlation analysis of total perception score with the factors' scores.

The results of the correlation analysis in Table 12 show that two variables significantly related to perception scores which were the preservice teachers' gender, and perceived computer competency level. There was also a significant correlation between perceived computer competency level and possession of home computer.

Table 12. *Correlation Matrix; Independent Variables and Perception Scores*

	Gender	Subject Area	Home Computer	Competency Level	Perception
Gender	1.00	-.045	-.028	-.063	-.135*
Subject Area		1.00	-.062	-.014	.012
Home Computer			1.00	.198*	-.040
Competency Level				1.00	.332*
Perception					1.00

**p<.01*

N=696

The results of the correlation analysis in Table 13 (at the page 149) illustrated that two factors significantly related to entire perception scale scores which were belief on positive effect of technology in education and effects of undergraduate program. There was also a significant correlation between factor

1 (belief on positive effect of technology in education) and factor 2 (effects of undergraduate program).

Table 13. *Correlation Matrix among Dependent Variables*

	Entire Scale	Factor 1	Factor 2	*M*	*SD*
Entire Scale	1.00	.78*	.84*	3.85	.53
Factor 1 [a]		1.00	.32*	4.31	.53
Factor 2 [a]			1.00	3.23	.81

*$p<.01$, two tailed.

N=696

When correlations among factors were considered, it was found that factors were highly correlated with entire scale (about .80). This highly correlation produced an important statistical problem called as *multicollinearity*. Statisticians, such as Stevens (1996) and Tabachnick and Fidell (1989) were discussing the issue of multicollinearity as a threat to multivariate statistic techniques.

For instance; Tabachnick and Fidell (1989) warned the researchers on the effects of multicollinearity:

> When correlations among DVs [dependent variables] are high, one DV is a near-linear combination of other DVs; the DV provides information that is redundant to the information available in one or more of the other DVs. It is both statistically and logically suspect to include all the DVs in analysis and the usual solution is deletion of the redundant DV. (p. 380)

Stevens (1996) changed the multicollinearity debate on the issue of multiple linear regression techniques used for several dependent variables, and noted that multicollinearity severely limits the size of *R.*

Stevens (1996) also discussed the ways of struggling multicollinearity effect. The first recommendation is to combine the variables that are highly correlated to form a single measure.

Presently, it should be pointed out that against the multicollinearity effect of the dependent variables; the researcher did not focus on the factors (belief on positive effect of technology in education and effects of undergraduate program) of Technology Perception Scale as dependent variables for this study.

Question 3: How accurately can a technology perception score be predicted from a linear combination of the following demographics: (a) gender, (b) possession of home computer with or without Internet access, (c) perceived computer competency level (novice, intermediate and competent) and (d) different subject areas?

For research question three, a multiple regression analysis was conducted to evaluate how well the demographics predicted perception score of a preservice teacher. The predictors were four demographic characteristics of a preservice teacher, while the criterion variable was the perception score. The linear combination of demographic characteristics was significantly related to perception score, F (4, 684) = 24.29, p=. 001. The sample multiple correlation coefficient (R) was .35, indicating that approximately 12.4 % of the variance of the perception score in the sample can be accounted for by the linear combination of demographic characteristics of preservice teachers.

As illustrated in Table14 (at the page 151), two of the bivariate correlations between the demographic characteristics and perception score are negative, and two of the four demographics were statistically significant ($p<.01$). Except the subject area, the partial correlation between demographic characteristics and perception score were significant. On the basis of these correlation analyses, it is tempting to conclude that the useful predictors are gender, possession of home computer and perceived computer competency level accounting totally 12.1% of variances of the perception score. The best predictor could be assumed as the perceived computer competency level by accounting 10.24% of the variances of the perception score by itself. Besides,

gender accounted for 1.69 % and possession of home computer accounted for 0.16% of the variances of the perception score, while subject areas contribute only an additional .3%.

Table 14. *The Bivariate and Partial Correlations of the Predictors with Perception Score*

Predictors	Correlation between each predictor and perception score	Correlation between each predictor and the perception score controlling for all other predictors
Home Computer	-.04	-.11*
Competency Level	.32*	.33**
Subject Area	.02	.01
Gender	-.13*	-.12*

Note. N=689, *p<.01, **p<.001

Question 4: Is there any significant difference between the technology perception of preservice teachers from different subject matters, gender, possession of home computer and perceived computer competency level?

For the research questions four and five, a more complicated analysis; Univariate Analysis of Variance (ANOVA) was used. Univariate ANOVA includes three or more independent variables and one dependent variable. The purpose of Univariate ANOVA is to investigate not only the main effects of independent variables on dependent variable but also interaction effects of independent variables on dependent variable. Depending on significance of main and interaction effects, follow-up tests might be conducted to control for Type I error across the pairwise comparisons (Green et al., 2000).

For this study, Univariate ANOVA was used to find out whether or not there was a significant difference between preservice teachers' levels of technology perception and their different subject areas, their different levels of

perceived computer competency, their different levels of possession of home computer and their gender. By using Univariate ANOVA, it was also tested whether both there was a mixed effect of independent variables on the perception scores of preservice teachers. For the groups that differ significantly, follow-up (post-hoc) tests were performed to see which level(s) differs within the group.

The results of Univariate ANOVA were illustrated in Table 15 (at the top of the page 153). It could be stated that two independent variables (gender and perceived computer competency level) differ significantly on perception scores of preservice teachers. It was asserted that there was no significant interaction effect of independent variables on perception score.

It should be figured out that the Partial η^2 (eta-squared) in Table 15 (at the top of the page 153) is interpreted as the proportion of variance of the dependent variable that is related to a particular main or interaction source, excluding the other main and interaction sources (Green et al., 2000).

Table 15. *Univariate Analyses of Variance (ANOVA) of Main and Interaction Effects of Independent Variables on Perception Scores of Preservice Teachers*

Source	*df*	*F*	Partial η^2
Gender (G)	2	3.21*	.01
Subject Areas (SA)	7	1.76	.02
Competency Level (CL)	2	4.97**	.02
Home Computer (HC)	2	.72	---
G X SA	7	.85	.01
G X CL	2	.34	---
SA X CL	14	1.31	.03
G X SA X CL	11	1.24	.02
G X HC	2	.33	---
SA X HC	13	1.20	.03
G X SA X HC	9	.87	.01
CL X HC	4	.75	.01
G X CL X HC	4	1.11	.01
SA X CL X HC	12	.68	.01
G X SA X CL X HC	2	1.68	.01
S within-group error	591	(.23)	

Note. Value enclosed in parenthesis represents mean square errors. *S*=subjects. Dashes indicate that cell values are less than .005.
* $p<.05$, ** $p<.01$.

Gender

The Univariate ANOVA results in Table 15 (at the top of the page 153) indicated that there was a significant effect of gender on technology perception scores of preservice teachers, F (2,591) = 3.21, $p<.05$. 1% of the variance in technology perception score was accounted by gender. When the means on Table 16 considered, it could be concluded that males perceived technology more favorable than females.

Table 16. *Means and Standard Deviations of Participants Concerning Gender*

Gender	*n*	*M*	*SD*
Male	288	3.94	.51
Female	405	3.78	.53

Perceived Computer Competency Level

As the Univariate ANOVA results in Table 15 (at the top of the page 153) indicated , there was a significant effect of perceived computer competency level on technology perception scores of preservice teachers, F (2,591) = 4.97, p<.01. 2% of the variance in technology perception score was accounted by perceived computer competency level.

Follow-up tests were performed on the main effect of three levels of perceived computer competency (novice, intermediate and competent) on perception scores to find out which level(s) differs significantly among the group.

Results of the Levene's test of equality of error variances was significant, F (97,591) =1.77, p<.001. It could be concluded that group variances of the dependent variable were not homogeneous. Hence, by assuming unequal variances among groups, Dunnett's C test was used for follow-up testing as illustrated in Table 17. It could be pointed out that there were significant differences among all levels of competency. It could be interpreted that the more a preservice teacher perceives him/herself as competent, the more a preservice teacher perceives technology favorable.

As expected, the highest mean score (M=4.13*)* was observed in competent level and the lowest mean score (M=3.67*)* was viewed in novice level.

Table 17. *Differences among Groups in Perceived Computer Competency Level*

Competency	*n*	*M*	*SD*	1	2	3
1.Novice	273	3.67	.54	---		
2.Intermediate	299	3.91	.49	*	---	
3.Competent	117	4.13	.43	*	*	---

Note. Dashes indicate that cell value was zero. NS = non-significant differences between pairs of means, while an asterisks (*) =significance using the Dunnett's C procedure.

Possession of Home Computer

As the Univariate ANOVA results in Table 15 (at the top of the page 153) indicated, there was a non-significant effect of possession of home computer on technology perception scores of preservice teachers where *F* (2,591) =.72 and *p*=.05.

Question 5: Is there any difference between the subject matter areas and preservice teachers' perceptions of technology?

When the Univariate ANOVA results in Table 15 (at the top of the page 153) indicated , it could be pointed out that there was a non-significant effect of subject areas on technology perception scores of preservice teachers, *F* (7,591) = 1.76, *p*=.05. In the mean time, 2% of the variance in technology perception score was accounted by subject areas.

Follow-up tests were performed to the main effect of eight different subject areas on perception scores to check which subject area(s) differs significantly within the group to control for Type I error across the pairwise comparisons.

Results of the Levene's test of equality of error variances was significant, *F* (97,591) =1.77, *p*<.001. It could be concluded that group variances of the dependent variable were not homogeneous. Hence, by assuming unequal variances among groups, Dunnett's C test was used for follow-up testing as illustrated in Table 18 (at the top of the page 156). In the light of follow-up tests, two significant differences were obtained among groups. Firstly, Turkish education significantly differs from Classroom Teaching. As a second point, Arts education also significantly differs from Classroom Teaching.

For the Technology Perception Scale the highest mean score (*M*=4.01*)* was observed in Music education and the lowest mean score (*M*=3.54*)* was viewed in Arts education.

Table 18. *Differences among Groups in Subject Areas*

Groups [a]	*n*	*M*	*SD*	1	2	3	4	5	6	7	8
1.ECE	74	3.85	.65	---							
2.CT	252	3.95	.47	NS	---						
3.SST	156	3.87	.47	NS	NS	---					
4.TE	96	3.67	.50	NS	*	NS	---				
5.SE	28	3.65	.50	NS	NS	NS	NS	---			
6.AE	30	3.54	.67	NS	*	NS	NS	NS	---		
7.ME	29	4.01	.55	NS	NS	NS	NS	NS	NS	---	
8.PES	31	3.70	.56	NS	NS	NS	NS	NS	NS	NS	---

Note. Dashes indicate that cell value was zero. NS = non-significant differences between pairs of means, while an asterisks (*) =significance using the Dunnett's C procedure.
a: ECE = Early Childhood Education; CT = Classroom Teaching; SST= Social Studies Teaching; TE= Turkish Education; SE= Science Education; AE= Arts Education ; ME= Music Education; PES= Physical Education and Sports.

CHAPTER 5

CONCLUSIONS AND IMPLICATIONS

This chapter provides a summary of the study, major findings from the study, discussions and implications and recommendations. Major findings and discussions will be organized that each research question is associated with a finding and a latter discussion.

Summary

Information and communication technologies (ICTs) are getting a critical part of the education. Preservice teachers must be aware of the advantages and disadvantages of ICTs in education, be competent users of ICTs and their integration into education. Otherwise, our prospective teachers as well as our education system will not struggle with the challenges of modern information era. This study was undertaken to explore the factors affecting a preservice teacher's perception of technology regarding different subject areas becomes a critical issue in the field of teacher education and technology.

The Purpose of the Study

Because of the changing and advancing nature of technology, the variety of innovations will probably continue to expand with the availability of new technologies (Kjetsaa, 2002). The uncontrollable development in computer technologies over last decades has also influenced the teaching profession. So, it is expected that professional organizations, university academics, and community policy makers have recognized an imperative and pressing need to integrate technology in all levels of educational efforts. While the efforts on effective use of technology in instruction increase, educators are dealing more

with offering adequate preservice teacher education to prepare new teachers to teach in the information age (Irving, 2003).

Without hesitation, today's contemporary teachers are expected to be competent users of technology and be the experts of technology integration. As being a necessity, teachers must primarily master ICTs in order to be able to integrate them into their teaching. As Yasin (1998) stated only the persons having technologically literate and capable citizens can contribute to a country's development. This concentrates the teacher training programs as being a matter of concern and interest internationally as well as in Turkey development policy. The high expectations and demands associated with education, at all levels, in the context of ICTs must be handled by adequate efforts in the development of teachers' competence and perception. The need to train preservice teachers about technology is an enduring issue. Over the past decades, teacher training institutions have begun to deal with the task of teaching teachers about technology (Doering, Hughes, & Huffman, 2003).

Professional development of teachers is a dynamic framework and it will only be updated in accordance with new research, educational theories, and responses from preservice and inservice teachers and teacher educators (Teachers as Innovators, 2000). Similarly, the success of any new educational program depends strongly upon the support and position of the teachers involved in the system (Woodrow, 1992). Accepting our preservice teachers as our prospective teachers, the ideas of them will make a great contribution to understand the current teacher training programs and more generally our present educational system.

Technology training and integration in preservice teacher education is a current research concern. It is believed that by exploring the perceptions of preservice teachers regarding technology integration experiences toward their professional development can provide essential knowledge for preservice teacher education curriculum designers (Elwood-Salinas, 2001). Kjetsaa (2002) also claimed that considering the increase in the number of research concerning

technology education, the pace of innovative diffusion into teacher training has increased. As further research is performed in the area of teacher training and technology, better utilization and investment could be planned which will lead to increased teacher computer competencies and favorable teacher perception towards computer and related technologies.

Teachers with favorable perception of technology will believe that ICTs make their teaching more pleasant and interesting for both the teacher and their students. They will be more willing to overcome barriers relating to deficiencies of resources, technical problems and a lack of technical support. They will be eager to spend personal time for developing their competencies and their integration into classrooms. Moreover, they will be interested in helping their colleagues to develop their competencies as well.

The purpose of this study was to explore the factors affecting a preservice teacher's perception of technology relating with their subject areas.

Major Findings and Discussions

Question 1: What are the descriptive characteristics associated with the following scales: (a) Technology Perception Scale (TPS) and sub-scales, and (b) Computer Competency Scale (CCS)?

Other than the rest of the research questions, question one will be discussed thoroughly, since it includes a significant body of data itself. First the data related with Technology Perception Scale (TPS) will be discussed than the major findings of Computer Competency Scale (CCS) will be focused.

Technology Perception Scale (TPS)

This study found that the entire Technology Perception Scale had a lower mean score (M=3.85) than factor 1 (belief on positive effect of technology in education; M= 4.31), on the other hand, had a higher mean score than factor 2 (effects of undergraduate program; M=3.68). This implies that preservice

teachers were graduated from their institutions by perceiving technology in education favorably, but not very favorably. The mean scores of subscales showed the positive effects of technology in education valued more than the effects of teacher training program by preservice teachers. This might be implied that even though preservice teachers agreed that technology integration would provide for them a lot of advantages, they were not satisfied with their teacher training program.

With the re-designing of the teacher education programs at the faculties of education in Turkish universities in 1998, the subject areas music education and arts education were gathered under the same program ; fine-arts. The report stated that these two subject areas should work together, since they have a common background (Report on re-designing the teacher education programs at the faculties of education in Turkish universities, 1998). Surprisingly, for both the entire Technology Perception Scale and factor 1 (belief on positive effect of technology in education), the highest mean score (*M*=4.01 and *M*=4.57 respectively*)* was observed in music education and the lowest mean score (*M*=3.54 and *M*=3.95 respectively*)* was viewed in arts education. This was a contradictory expectation with the Council of Higher Education in Turkey. If they had a common background with respect to technology, it was expected that their mean scores of perceiving technology would show some similar results. The results also shows that preservice music teachers believed that technology will favor for them more than any other subject area, including art education.

When the teacher training program is considered, data demonstrated that the highest mean score (*M*=3.43) was observed in classroom teaching and the lowest mean score (*M*=2.79) was observed in science education. Classroom teaching curriculum has included a lot of courses from other subject areas except early childhood education. These courses lead preservice teachers of classroom teaching more interact with other subject areas. Classroom teaching curriculum may be perceived as composite study of other subject areas, thus, it may funnel them perceive technology more positively than any other subject

area. Preservice teachers of classroom teaching have participated to only a few of the courses relating with other subject areas, therefore, they do not have a chance to understand the deficiencies concerning other subject areas. On the other hand, the science education subject area may be the only subject area that requires a huge amount of equipment and laboratories including for both the technology related and area specialization. Therefore, it is expected that they concerned more about the teacher training program.

There are a number of researches which indicates there is a significant relationship between gender and technology perception (Shashaani, 1994; Sadera, 1997; McHaney, 1998; Gilley, 2002). The finding of this study supports the previous researchers' findings that male had higher mean scores than female for both the entire scale (*M*=3.94), the factor 1 (*M*=4.34) and the factor 2 (*M*=3.41). On the other hand, the data was contradictory to the findings of some other studies such as Woodrow (1992), Hunt and Bohlin (1993), Lynch (2001), Nanasy (2001) and Wahab (2003).

This contradiction might be explained by what Holden (1997) and Halpern (2002) proposed. According the results of Holden's study, it was claimed that not all females were uncomfortable with technology, and also not all males were computer competent. Additionally, Halpern argued most of the study demonstrating group difference and similarities were always derived from group averages. With no doubt, no one is average. Thus, the results cannot be applied to any individual because there is a great deal of overlap in all of the distributions of abilities. By summing up these two studies, it may be stated that the contradiction comes from the nature of gender, and should not be defined with strict boundaries that female less favorably perceive technology than males.

Of course, there found to be a gender difference from the study data. Gilley (2002) identified that the gender gap in computing is not overly obvious in the primary grades, but becomes extremely marked by high school. Thus, this differentiation might be stemmed from years of early grades in the education. For example, Shashaani (1994) conducted a study examining the effect of family

socioeconomic status (SES) and parental sex-typed views and behaviors on children's attitudes toward computers. SES was found to be a stronger effect on girls than boys. Both girls and boys perceived the gender stereotypes about computing apprehended by their parents and such attitudes inversely affected the female students' own attitudes. Needless to say, Turkey has still problems related with the socio-economic status of its citizens. It is anticipated that the findings of Shashaani could be generalized to Turkey and concluded that Turkish females were misguided by their parents about their technology orientation. If so, this may create another problem that the goal of preservice teacher training programs was not achieved about the gender equalities. Even though, females had entered the teacher training programs with a less positive perception than males, this deficiency should be decreased the instruction in teacher training institutions.

It is explored that female preservice teachers scored less than male in the second factor about the effects of undergraduate education on developing favorable perception of technology. Females were concerned more about their training program. This challenged with Pawloski (2003); found that female preservice teachers gave significantly higher scores of the preparation to teach with technology provided by their institution (*M*=2.66, *SD*=.95) when compared to the scores provided by males (*M*=2.19, *SD*=.90) in the study.

Second surprising result is that preservice teachers possessing both a home computer and Internet access had higher mean scores for both the entire scale and its factors (*M*=3.87*, M*=4.32*,* and *M*=3.27*,* respectively). On the other hand, preservice teachers with a home computer but with no Internet access had the lowest mean scores for both entire scales and two sub-scales (*M*= 3.73, 4.18, and 3.13 respectively). Thus, it may imply that possessing an Internet connection did not make any difference on technology perception. Even though, some of preservice teachers had a home computer, actual hours per week spent using the computer may be relatively low (Nanasy, 2001). Additionally, Mumtaz (2001) noted that the positive effect of access to a home computer on students'

attitudes was irrefutable; children had more favorable attitudes to using the computer at home than at school and were equally confident about using computers in both the home and school environments. Thus, preservice teachers may develop self-confidence about using computers at home, but the problems may be stemmed from the technology integration aspect of the teacher training program.

Focusing on perceived computer competency category, an anticipated result occurred that competent preservice teachers had the highest mean scores for both entire scales and two sub-scales (*M*= 4.13, 4.46, and 3.68 respectively). On the other hand, novice preservice teachers had the lowest mean scores for both entire scales and two sub-scales (*M*= 3.67, 4.22, and 2.93 respectively). With the increase of the perceived computer competency level, computer anxiety decreases (Namlu & Ceyhan, 2002) and computer confidence increases (Yildirim, 2000 ; Wilkes, 2001). These two factors might increase the level of technology perception relating with computer competency. By the same token, Cuckle et al. (2000) asserted that no matter the perceived level of existing computer skills, most preservice teachers hold a positive view and were able to state a plan for developing their ICT competence in relation to teaching their specialist subject.

In order to make a depth discussion of the study, an insightful analysis of items will be executed. As a recall, the items between 1 and 16 belonged to factor 1 (belief on positive effect of technology in education) and the remaining items (17-28) belonged to factor 2 (effects of undergraduate program). Item descriptions can be found in Appendix B.

For entire scale the highest mean score (*M*=4.67) was for Item 1, and the lowest mean score (*M*=2.74) was for Item 21. Preservice teachers strongly agreed that computers should be utilized in education, on the other hand, they mostly disagreed that their teacher educators did utilize technology within their own instruction. The clear need of using computers in education was declared one more time with this study. Data emphasized that integrating technology in

education is a necessity, not a luxury (Kortecamp & Croninger, 1996). On the other hand, the data were not cheerful concerning teacher educators. The items about teacher educators (Item 20, 21, and 22) had the lowest mean scores within the entire scale (2.86, 2.74 and 2.84, respectively). These three items included the three important facets of teacher educators; providing preservice teachers with necessary information about technology integration, applying technology into their own instructions as being a model for preservice teachers, and informing preservice teachers about the possible benefits of using technology in education on the society. These findings may produce a dramatic conclusion for a teacher training program that Williams et al. (2000) defined under-qualified teacher educators as contributing to poor training. Moreover, McHaney (1998) indicated that students who believed their teachers supported and encouraged the use of technology had significantly higher attitudinal scores. Altun (1996) also stated that developing IT teaching and learning skills and positive attitudes towards the utilization of these new technologies for preservice teachers need teacher educators to be well aware of educational issues engaged in IT innovation. Cuckle et al. (2000) also acknowledged that instructor not using ICT themselves could not anticipate students to utilize it in their teaching and nor would such a department insist on computer accessibility for their classes.

Likewise, instructors' suggestions of possible ways to use IT were found to be influential on student practice. For instance; the data from study of Duran (2000) revealed that teachers educators use of and attitudes towards IT in their courses might strongly influence the implementation of the technology by preservice teachers. It is also clear that teacher educators may not break the chain of "we teach as we are taught" phenomenon. Item 21 which hold the lowest mean score in the entire scales, supported the idea of Bruder (1989) that although most of the teacher training programs encompass required computer literacy courses, most of the teacher educators just hold up the whole class, stick to methods of teaching they have been using for years; actually the

methods they know work . These findings also contradict with the idea that education faculties must model the use of the educational software in their own teaching programs (Norton & Sprague, 1996; Baki, 2000).

In order to disseminate technology in education, sometimes, one teacher's positive modeling could do more to adjust other teachers' attitudes than a year of inservice training (Ritchie & Rodriguez, 1996; Altan, 1998; Duran, 2000). Even though technology has also a society dimension (McRobbie, Ginns & Stein, 2000; Digital transformation: A framework for ICT literacy, 2002; Loveless, 2003), item 22 showed that this dimension was not addressed by the teacher educators in their own courses. This unaddressed dimension of technology may construct that our preservice teachers could not struggle with the challenges of information-based society desiring knowledge of computer technologies to succeed both personally and professionally (Sanders D. W. & Morrison-Shetlar, 2001; Digital transformation: A framework for ICT literacy, 2002).

Within the factor 1, Item 6 has the lowest mean score (*M*=3.72*, SD* =1.10). This item questioned the argument about the learner-centered versus teacher-centered instruction relating with technology. Item 6 demonstrated that preservice teachers slightly agreed upon the phenomenon of learner-centered instruction, and there is a more variation between preservice teachers according to standard deviation. This result was also shared with Cifuentes (1997) who was focused on the preservice teachers in the introduction to educational technology course. The study compared the teaching methods employed by inservice master teachers with the methods envisioned by the preservice teachers both before and after implementation of the model for professional development development in the educational technology course. Prior to taking the course, preservice teachers predominantly saw themselves as implementing teacher-centered methods whereas inservice teachers preferred more student-centered methods. After taking the educational technology course, preservice

teachers changed their privileged methodology from teacher-centered to more student-centered.

The three items (7, 8, and 9) in factor 1 concentrated on the three phases of instruction; planning, implementation, and evaluation. Preservice teachers firstly agree that technology in education will help the implementation of classroom activities, then, planning of classroom activities, and at the end evaluation of educational outcomes. Since, the preservice teachers dominantly exposed to the implementation of their learning, they may be more familiar with related the technologies. On the other hand, when the curriculum of all subject areas are investigated, it is obviously found that the evaluation phase of instruction is mostly missing. Thus, it is anticipated that teachers favor less the technologies related with evaluation of instruction.

Item 13 in factor 1 asked whether or not bringing ICT up-to-date play an important role for preservice teachers to use them in their prospective classrooms. Mean score of item 13 (M=4.29) showed keeping technology up-to-date was found to be an important factor for the perception of preservice teachers as written in the Teachers as Innovators (2000) report. Besides, according to Hoffman (1996), even a best 20-week course in using classroom technology would be of little value when the preservice teacher found her or himself in a classroom with out of date, out of use, or nonexistent computer hardware and software.

Item 16 of factor 1 questioned whether or not preservice teachers believed that technology integration into education is a must for current teachers. Study findings revealed that preservice teachers agreed with that statement (M=4.39) which the re-designing project of Turkish universities demanded and researchers supported (Nanasy, 2001; Nanjappa, 2003).

Within the factor 2, three important items are considered primarily; items 23, 24, and 25. These entire items were focusing on increasing the quality of teaching profession with respect to technology facet concerning three important technology related courses. The mean score of Item 23, dealing with Computer

course was 3.42, mean score for Item 24, dealing with Fundamentals of Information Technology course was 3.44 and the mean score of Item 25, about Educational Technology and Material Preparation course was found 3.95. Since their syllabus show lots of overlapping course content, it is anticipated that the approximate mean scores between Computer and Fundamentals of Information Technology courses would be found. But, it is fulfilling that the Educational Technology and Material Preparation course was found to be an impressive course on the behalf of the quality of teacher professionalism. These two results might be concluded that preservice teachers appreciated more the integrating technology into instruction than being technology competent.

However, when item 26 is considered, there occurred a contradictory result with the items 23, 24, and 25. Item 26 raise the discussion whether or not they feel that they could implement teaching with technology in their prospective classroom with the help of the technology related courses asked in the items 23, 24, and 25. The mean score of item 26 (M=3.25) was found less than these three items. These may express that albeit preservice teachers were fulfilling about technology related courses, they need more courses that they can feel well-prepared for the technology integration in their prospective classrooms.

When the items 27 (expressing whether or not preservice teachers spend times on computers for their courses in university, M=2.91) and 28 (expressing whether or not preservice teachers spend times on computers excluding their courses in university, M=3.10) were compared, it was found that computer use for out of course activities was more appreciated with preservice teachers. This could be entailed that preservice teachers were less guided to use computers for their classroom homework or curricular activities.

Once item 19 is taken into consideration, the mean score (M=3.57) illustrated that technology related courses developed to some extent favorable perception towards technology. Most of the scholars noted that technology related courses developed positive attitudinal scores toward technology

(Woodrow, 1992; Cuckle et al., 2000; Yildirim, 2000; Elwood-Salinas, 2001; Gurbuz et al., 2001; Jao, 2001).

As a last item from Technology Perception Scale (TPS), item 18 asking preservice teachers whether or not they were trained in accordance with the current technology standards, must be considered. The mean score (*M*=3.19) depicted that they were slightly, but not completely, agreed with this statement. Thus, a question comes into mind that if they did not feel that they were trained in accordance with the requirements of modern information era, how they could dare deal with the challenges of third millennium.

Computer Competency Scale (CCS)

For the Computer Competency Scale, the general mean score was obtained 1.82 (*SD*=.50). This demonstrated that preservice teachers were graduated with a less than moderate level competency. Thus, it is a little bit hard to expect that these preservice teachers could infuse technology into their courses successfully. It was also obtained that preservice teachers perceived the most competency in e-mail (*M*=2.31) and least competency in databases (*M*=1.18). Duran (2000), Nanasy (2001), Whetstone and Carr-Chellman (2001) and Novick (2003) also obtained that the highest level of preservice teachers' computer competency seemed to be in email, and the Internet.

The study report "Commonness and Usage of IT" (January, 2001) of Information Technology and Electronics Research Institute of Scientific and Technical Research Council (TÜBİTAK) of Turkey found that using Internet and e-mail (37%) were the most popular reasons of buying a home computer in Turkish citizens. Thus, it is an anticipated result that e-mail ranked as the number one. The finding is also satisfactory in accordance with the work of Lea (1999). Lea formed a list of technological skills and knowledge which were both the panel of experts and the professors of education agreed upon their extreme importance: using a word-processor; using a CD-ROM; accessing and sending e-mail; research via the Internet; knowledge of ethical use of computers,

especially the Internet; and integrating computer technology into existing curriculum. When the mean score of word-processors (*M*=1.99) was added into discussion, it leads a moderately pleasing result.

Even though most of the studies (New Jersey Core Curriculum Content Standards for Technological Literacy, 2001; Goudy, 2002) recommended that databases should be placed in the syllabus of computer literacy course, databases and their management are most neglected concepts of computer literacy courses as found in this study. The finding of this study supports the previous researchers' findings (Hunt & Bohlin, 1993; Altun, 1996; Alghazo, 1999; Whetstone & Carr-Chellman, 2001). Altun proposed that the limited use of database programs might be connected to unavailability of such programs.

When the subject areas were considered, Classroom Teaching possessed the highest mean score (*M*=2.05), and Turkish education held the lowest mean score (*M*=1.54*)*. It might be a result the interdisciplinary structure of the Classroom Teaching subject area. For the Turkish education subject area, it could be a reason of the course structures. In the study of Lang (2000), language teachers (German, in the study) desired issues about word-processing in computer training. Additionally, Whetstone and Carr-Chellman (2001) found that language (English, in the study) preservice teachers' primary applications for computers were word-processing, e-mail, and the Internet. Most of the instruction in Turkish education subject area also depended on the research in Internet, e-mailing and word-processing. When, the mean scores for these three concepts (*M*=1.98, *M*=2.07, and *M*=1.67 respectively) were investigated, it obtained that preservice Turkish teachers had higher mean scores than their average mean score (*M*=1.54).

Classroom Teaching had the highest mean scores for all items in the CCS (*M*=2.43; 1.83; 2.20; 2.29; 2.01; 2.05; 1.29; 1.46; 2.43; 2.51 respectively). Additionally Turkish education had the lowest mean scores for all items in the CCS (Item 1; *M*=1.90, Item 3; *M*=1.56, Item 4; *M*=1.67, Item 5; *M*=1.40, Item 7; *M*=1.02, Item 8; *M*=1.04, Item 10; *M*=2.07*)*, except three of the items. For the

item 2 (Hardware), science education had the lowest mean score (*M*=1.36), for the item 6 (Demonstration Programs) music education had the lowest mean score (*M*=1.31), and for the item 9 (Internet), early childhood education had the lowest mean score (*M*=1.91).

Thirdly, it was observed that males had higher mean score (*M*=1.86) than females on the total perceived computer competency measure. On the contrary, when the items of the CCS were investigated intensely, it could be acknowledged that males and females had approximately equal mean scores on three of the items; (a) Spreadsheets (female; *M*=1.70, male; *M*=1.69), (b) Demonstration Programs (male; *M*=1.74, female; *M*=1.73), and (c) Databases (female; *M*=1.18, male; *M*=1.16). Some similar results were obtained from other studies that Sadera (1997) was computed a t-test to compare differences in preservice teachers on computer competence regarding gender. The t-test demonstrated that males tended to rate themselves significantly higher than the females in terms of their competence with computer based instruction programs (*p*=.037), telecommunication software (*p*=.036), and other computer related technologies (i.e., programming software, HTML, computer hardware) (*p*=.034). Additionally, males were significantly more favorable towards computer use than were the female respondents (*p*=.012).

On the other hand, Holden (1997) found females were most talented on word-processing programs. This study found that mean score for word-processors was found approximately equal for each gender (M=2.03 for male; M=1.96 for female). Moreover, Alghazo (1999) expressed no significant gender differences in technology competencies. The overall analysis showed a slightly higher mean score for females, but not significant. The separate analyses of the competencies showed that females reported slightly higher scores in computer skills, multimedia, presentations, and graphing calculators with no significant differences, while the males reported slightly higher scores in word-processing, spreadsheets, communications, and web pages development with no significant differences. Jorge, C. M. H., Jorge M. C. A., Gutiérrez, Garcia, and Diaz (2003)

found that there were no significant differences between men and women in the use of technologies such as mobile telephones or computers. Differences were only found in Internet use, which was used more by men than by women (t (725) =4.105 p<.001). The study showed significant differences in the knowledge of various types of software in accordance with the gender: operating systems (t (706)= -5.083 p<.001), word processors (t (703)= -3.039 p<.001), spreadsheets (t (666)= -3.142 p<.001), presentations (t (679)=-2.984 p<.01), Internet (t (679)=-7.176 p<.001) and educational software (t (617)=-4.110 p<.001). In all cases, men had greater knowledge of software than women.

As an expected result, it was observed that preservice teachers with a home computer and Internet access had the highest total mean score (M=2.10) within the possession of a home computer category. With only one exception (Item 1 (Basic Concepts); M=2.40 for a home computer without an Internet access), it was also acceptable for all items in the CCS that preservice teachers with a home computer and Internet access had the highest mean scores (M=1.97; 2.37; 2.36; 1.95; 1.98; 1.31; 1.50; 2.54; 2.65 respectively starting with Item 2). It was also found that preservice teachers without having a home computer had the lowest mean scores for both entire scale (M=1.76) and the items (Item 1; M=2.15, Item 2; M=1.55, Item 3; M=1.88, Item 4; M=1.93, Item 5; M=1.66, Item 6; M=1.70, Item 8; M=1.25, Item 9; M=2.25 , Item 10; M=2.26), with an exception (Item 7; M=1.13 for possessing a home computer without Internet access). This finding was supported by the researches of Sadera (1997), Gurbuz et al. (2001) and Wilkes (2001). All declared that possessing a home computer allow preservice teachers to make more rehearsal on computer application, thus, develop their competency level.

Question 2: Is there a relationship between preservice teachers' technology perception scores, and the following demographics: (a) gender, (b) subject area, (c) possession of home computer, and (d) perceived computer competency level?

The findings of this study suggested that there were no significant relationships between preservice teachers' total perception scores toward technology and their subject areas (r=.012, p=.01) and possession of home computer (r=-.040, p=.01). On the other hand, there obtained two significant relationships between preservice teachers' total perception scores toward technology. Gender was inversely correlated with total perception score (r=-.135, p<.01) and correlated with perceived computer competency level (r=.332, p<.01).

This finding of the study supports the idea that perceived computer competency level affects the preservice teachers' perception toward technology (Cuckle et al., 2000; Elwood-Salinas, 2001; Jao, 2001; Wilkes, 2001; Wahab, 2003). Jao (2001) found that after enrolling an educational technology course, preservice teachers favored more about technology. Additionally, preservice teachers' confidence level increased in performing the surveyed skills and in teaching them at the grade levels they planned to teach. It was found that the development of a favorable view and an increase of confidence level toward the use of technology were related to the positive curriculum design and implementation. Thus, with a favorable view, it is expected that the preservice teachers will adopt and incorporate technology-based instruction into their classrooms (Nanjappa, 2003).

There is huge number of research which indicated that there is a significant relation between gender and technology perception. The research literature over the past decade has definitely documented that women have overwhelmingly less favorable perspective toward computers than men do (Shashaani, 1994). Gender may influence technology perception, but, it is not thought to be a significant influence. What the studies have indicated, however, is that gender significantly influences measures of other attributes related to computers (Woodrow, 1992; Duckett, 2001). However, Gilley (2002) asserted that female preservice teachers themselves are more likely to carry negative attitudes about technology and a disinclination to hold it in their teaching into

their future careers, where it would likely be perpetuated in their female students.

There was also a significant correlation between perceived computer competency level and possession of home computer (r=.198, p<.01). This finding was supported the previous researchers' findings. The results of Sadera's study (1997) illustrated that participants with computers at home and those with computer experience, had higher levels of computer competence and could conceptualize more sophisticated ways of using the computer in the classroom in contrast to less computer experienced. Gurbuz et al. (2001) supported the previous findings of Sadera that possessing a home computer improved teachers' access to computers and willingness to learn more about computers. Wilkes (2001) attempted to explain the relationship between having a computer and perceived computer competency level. Possession of home computer may tender the teachers to learn about technology on their own time and at their own pace. Novick (2003) defined the use of a home computer as the mastery experience that the most extensive contribution to abilities of female preservice teachers to use computer technologies. McHaney (1998) indicated that the possession of a computer at home was related to students' current affect for technology and computers and to their perception of the importance of technology and computers on the future and their careers.

Question 3: How accurately can a technology perception score be predicted from a linear combination of the following demographics: (a) gender, (b) possession of home computer with or without Internet access, (c) perceived computer competency level (novice, intermediate and competent) and (d) different subject areas?

It was calculated that the linear combination of demographic characteristics was significantly related to perception score, F (4, 684) = 24.29, p=. 001. The sample multiple correlation coefficient was .35, indicating that approximately 12.4 % of the variance of the perception score in the sample can

be accounted for by the linear combination of demographic characteristics of preservice teachers; gender, possession of home computer, (c) perceived computer competency level and subject areas.

Except the subject areas of preservice teachers (r=.01, p=.05), the partial correlation between all demographic characteristics and perception score were significant (gender; r=-.12, p<.01; perceived computer competency level; r=.33, p<.001; possession of home computer; r=- .11, p<.01). These findings revealed that the useful predictors for technology perception are gender, possession of home computer and perceived computer competency level accounting totally 12.1% of variances of the perception score. The best predictor could be assumed as the perceived computer competency level by accounting 10.24% of the variances of the perception score by itself. Besides, gender accounted for 1.69 % and possession of home computer accounted for 0.16% of the variances of the perception score, while subject areas contribute only an additional .3%.

Further, results of the multiple regression analyses showed that even after controlling for all other demographic characteristics, perceived computer competency level and technology perception were strongly associated. This advocated that teachers who felt more competent with computers perceived more favorable about computers. This finding was also illustrated in the study of some other researchers such as Cuckle et al. (2000), Elwood-Salinas (2001), Jao (2001), Wilkes (2001), Wahab (2003).

Results of the multiple regression analyses showed that even after controlling for all other demographic characteristics, gender and technology perception were associated. This finding was also found its place in literature (Shashaani, 1994; Sadera, 1997; McHaney, 1998; Gilley, 2002).

Also possession of home computer was found to be correlated with technology perception. In research question two, there obtained also a significant correlation between perceived computer competency level and possession of home computer (r=.198, p<.01). This finding was supported by the previous researchers' findings (Sadera, 1997; McHaney, 1998; Gurbuz et

al., 2001; Wilkes, 2001; Novick, 2003). Therefore, by establishing an indirect association from possession of a home computer to perception technology score on perceived computer competency level, it is obvious that existence of a home computer will help preservice teachers develop favorable perception of technology. Besides, Mumtaz (2001) also stated that there is relation between possession of home computer and technology perception score.

As a last point for the research question three is that across a range of studies, a strong conclusion has emerged that most significant factor in influencing whether teachers used ICT in classroom teaching was their subject areas (Barton, 1996; Grant, 1996; Cuckle, Clarke, & Jenkins, 2000; Lang, 2000; McRobbie, Ginns, & Stein, 2000; Whetstone & Carr-Chellman, 2001; Cuckle & Clarke, 2002; Davis, 2003). These researches also pointed that subject areas of preservice teachers affect their technology view. On the other hand, it was illustrated that there is no significant correlation between subject areas of preservice teachers and their technology perception scores. This might anticipate with a lack of arrangement of courses in accordance with the needs of subject areas. From the researcher's informal observation of technology related courses, this standpoint was also true that these courses did not differentiate with respect to subject areas. Therefore, it was hard for the preservice teachers to establish a connection with the technology related courses and the requirements of their subject areas. For example; a third grade preservice music teacher stated:

> I do not know what I am doing in educational technology and material preparation course. Does my instructor expect me to make a violin from paper?

Question 4: Is there any significant difference between the technology perception of preservice teachers from different subject matters, gender, possession of home computer and perceived computer competency level?

For this question, a univariate analysis of variance (ANOVA) was used to find out whether there was a significant difference between preservice teachers' levels of technology perception and their different subject areas (arts education , early childhood education, music education, physical and sport education, Classroom Teaching, science education , Social Studies Teaching, and Turkish education), their different levels of competency (novice: group-1, intermediate: group-2, and competent: group-3), their different levels of possession of home computer (no computer: group-1, computer with Internet access: group-2, computer without Internet access: group-3) and their gender or not. By using univariate analysis of variance, it was also tested whether both there was a mixed effect of independent variables on the perception scores of preservice teachers. For the groups that differ significantly, follow-up (post-hoc) tests were performed to see which level(s) differs within the group.

The results of Univariate ANOVA demonstrated that two independent variables (gender and perceived computer competency level) differ significantly on perception scores of preservice teachers. It was also found that that there was no significant interaction effect of independent variables on perception score.

Gender

The Univariate ANOVA results indicated that there was a significant effect of gender on technology perception scores of preservice teachers, F (2,591) = 3.21, p<.05. 1% of the variance in technology perception score was accounted by gender. When the means scores for male and female (M=3.94 and M=3.78, respectively) were considered, it could be concluded that males had a more favorable perception than females.

This finding was shared with some research studies. Sadera (1997) declined that males were significantly more favorable towards computer use than were the female respondents (p=.012). Yet, McHaney (1998) indicated that males had a significantly higher personal affect for technology and computers

than females while they did not have significantly different attitudes toward the importance of technology and computers.

Woodrow (1992) and Duckett (2001) pointed that gender may influence computer attitudes somewhat; yet, it is not thought to be a significant influence. What the studies have indicated, however, is that gender significantly influences measures of other attributes related to computers.

Shashaani (1994) claimed that literature over the past decade has definitely explained that female have overwhelmingly less positive view toward computers than male do. Secondly, Namlu and Ceyhan (2002) were conducted a research on preservice teachers' computer anxiety level affecting negatively computer usage in education. This research was somehow related with the explanation of this study's finding. They observed that level of computer anxiety was higher for female (*M*=50.45) than male (*M*=45.30) which may lead a decrease in the technology perception. They proposed that this difference could be clarified by culture and cultural differences that in Turkish culture, females and their perception were less technologically supported than those males.

Shashaani (1994) indicated that socio-economic status (SES), including the parents' occupations and education, had significant effects on students' attitudes toward computers. Commonly, gender-differential attitudes were more obvious in the lower socioeconomic group. Additionally, SES was found to be a stronger effect on girls than boys. Both girls and boys perceived the gender stereotypes about computing apprehended by their parents and such attitudes inversely affected the female students' own attitudes. Additional consideration showed that parental encouragement positively influenced boys' and girls' attitudes. The mean scores for boys and girls regarding their perceptions of their parents' beliefs that the computer is more appropriate for males than for females fell in the upper portion of the attitude scale (*M* = 3.6 for mothers and *M* = 3.8 for fathers). Boys, in contrast to girls, were in more agreement that their parents encourage them to learn about computers (*M* = 3.9 for boys and *M* = 2.9 for girls.).

After the cultural and sociological explanations, the cognitive aspect of perception should also be debated. Halpern and LaMay (2000) stated that even though there was no sex difference in general intelligence, reliable differences were observed on some tests of cognitive abilities. For males, the tasks assessing the ability to manipulate visual images in working memory confirmed an advantage; on the other hand, many of the tasks involving retrieval from long-term memory and the acquisition and use of verbal information demonstrated a female benefit. If so, the bad experiences on technology and related phenomenon would be more remembered by female, thus, that might lead them reflect their past experiences of technology on filling the questionnaire.

On the other hand, Pauline and Alan (1996) proposed that female avoidance of the sciences and technical subjects could be attributed to the effects of sex-stereotyping and the hidden curriculum within schools. Maybe, female did not have the required level of encouragement and support from their male classmates or their educators. Gilley (2002) asserted that such a result is primarily significant particularly the majority of preservice teachers, especially those going into primary schools, are female. These female preservice teachers themselves are more likely to carry negative attitudes about technology and a disinclination to hold it in their teaching into their future careers, where it would likely be perpetuated in their female students.

Perceived Computer Competency Level

Univariate ANOVA results indicated that there was a significant effect of perceived computer competency level on technology perception scores of preservice teachers, F (2,591) = 4.97, p<.01. 2% of the variance in technology perception score was accounted by perceived computer competency level.

Follow-up Dunnett's C test was performed to the main effect of three levels of perceived computer competency levels (novice, intermediate and competent) on perception scores to find out which level(s) differs significantly within the group. It could be pointed out that there were significant differences

among all levels of competency. It could be interpreted that the more a preservice teacher perceives him/herself as competent, the more a preservice teacher perceives technology favorable. This finding was also illustrated in the study of some other researchers such as Cuckle et al. (2000), Elwood-Salinas (2001), Jao (2001), Wilkes (2001), Wahab (2003).

Possession of Home Computer

Although some studies showed that possession of home computer have direct (Mumtaz 2001) or indirect (Sadera, 1997; McHaney, 1998; Gurbuz et al., 2001; Wilkes, 2001; Novick, 2003) effect on attitudinal scores concerning technology, the ANOVA results indicated that there found a non-significant effect of possession of home computer on technology perception scores of preservice teachers.

The possible reasons such a result may be explained with the changing face of Turkey. “Commonness and Usage of IT” (January, 2001) report found that using Internet and e-mail (37%) were the most popular reasons of buying a home computer in Turkey. After the third millennium and with the building of Internet café concepts in Turkey, computers are wide-spread for every Turkish citizen. Sometimes having a computer at home and hiring a computer at Internet café are being used interchangeably.

Secondly, the purpose of using computers is important whether at home, or at Internet café, or in faculty labs. Realizing a computer as a toy or as a tool is vital for this study. Since the study mainly focuses on the technology perception of preservice teachers regarding its effects on education, the instructional use of computers, as a tool, is an important consideration. As Nanasy (2001) emphasized , perhaps the preservice teachers with a home computer spend very little time for instructional purposes, thus, it did not assist them to develop favorable view on technology in education concept. Thirdly, with no doubt teacher training institutions have a role on perceiving computers as a toy or as a tool by their preservice teachers. After computer literacy or educational

technology courses, preservice teachers must be facilitated and scaffold for using technology in their other courses.

Question 5: Is there any difference between the subject matter areas and preservice teachers' perceptions about technology?

When the Univariate ANOVA results investigated, it could be noted that there was a non-significant effect of subject areas on technology perception scores of preservice teachers, F (7,591) = 1.76, p=.05. Meanwhile, 2% of the variance in technology perception score was accounted by subject areas.

Follow-up Dunnett's C test was performed to the main effect of eight different subject areas on perception scores to check which subject area(s) differs significantly within the group to control for Type I error across the pairwise comparisons.

Follow-up test revealed that two significant differences were obtained among groups. Firstly, Turkish education significantly differs from Classroom Teaching. As a second point, Arts education also significantly differs from Classroom Teaching.

As discussed earlier, the most significant factor in influencing whether teachers used ICT in classroom teaching was their subject areas (Barton, 1996; Grant, 1996; Cuckle, Clarke, & Jenkins, 2000; Lang, 2000; McRobbie, Ginns, & Stein, 2000; Whetstone & Carr-Chellman, 2001; Cuckle & Clarke, 2002; Davis, 2003). These researches also pointed that subject areas of preservice teachers affect their technology view. Therefore, it is an appreciated effort to predict the possible reasons of differentiation within some subject areas.

Firstly, it was observed that for the Technology Perception Scale (M=3.54) and factor 1 (belief on positive effect of technology in education, M=3.95), arts education got the lowest mean scores, besides, the third lowest score for factor 2 (effects of undergraduate program; M=2.99). On the other hand, for the factor 2, the highest mean score (M=3.43) was observed in Classroom Teaching. Furthermore, Classroom Teaching had the second highest

mean score for Technology Perception Scale (M=3.95) and third highest mean score for factor 1 (M=4.35). Therefore, the differentiation between arts and Classroom Teaching subject areas could stem from their scores on Technology Perception Scale.

Second differentiation between Turkish education and Classroom Teaching could be explained by using their scores on Computer Competency Scale (CCS). As illustrated earlier, perceived computer competency level has a significant effect on technology perception of preservice teachers. Therefore, the mean score differences on CCS would help discuss the differentiation.

For CCS, Classroom Teaching possessed the highest mean score (*M*=2.05), and Turkish education held the lowest mean score (*M*=1.54*)*. As a supplementary circumstances, Classroom Teaching had the highest mean scores for all items in the CCS (*M*=2.43; 1.83; 2.20; 2.29; 2.01; 2.05; 1.29; 1.46; 2.43; 2.51 respectively). Additionally Turkish education had the lowest mean scores for all items in the CCS (Item 1; *M*=1.90, Item 3; *M*=1.56, Item 4; *M*=1.67, Item 5; *M*=1.40, Item 7; *M*=1.02, Item 8; *M*=1.04, Item 10; *M*=2.07), except three of the items. Therefore, the favorable level of technology perception of Classroom Teaching subject area could result from their competency level, while; the less favorable level of technology perception of preservice Turkish teachers could be stemmed from their lack of computer competencies.

Theoretical Implications

This study contributes to a better understanding of the factors affecting preservice teachers' technology relating perception and its differentiation with respect to their area of specializations. The data from the study indicated that the major factors affecting preservice teachers' technology perception are their genders and their perceived computer competency level. The existence of a home computer had also effect on having on developing the level of computer competency.

On the other hand, subject area factor was not depicted as a major factor for technology perception. Even though some differentiations concerning subject areas were established, these differentiations were assumed to be due to the perceived computer competency levels and due to factors combining in the TPS.

The results of this study maintained the standpoint that there is a significant relationship between gender and technology perception (Shashaani, 1994; Sadera, 1997; McHaney, 1998; Gilley, 2002). Furthermore, this study supported the idea that perceived computer competency level affects the preservice teachers' perception toward technology (Cuckle et al., 2000; Elwood-Salinas, 2001; Jao, 2001; Wilkes, 2001; Wahab, 2003).

This study indicated that computer competency level of preservice teachers should be developed in order for them to have a favorable technology perception for their educational work-life and female preservice teachers should be encouraged so that their current perception might increase.

Recommendations

Based on the findings and discussions, the following recommendations are offered for practitioners and teacher training institutions:

1. Policies and practices must be challenged, argued and changed for encouraging female preservice teachers.
2. Preservice teachers' computer competency level anticipates their future technology orientation, since it affects their technology perception. Therefore, more focus on the technology related courses which are designed according to the preservice teachers' subject area needs and their level of competency is needed.
3. Teacher training institutions should assess teachers' computer competency at the beginning and the end of their preservice undergraduate programs.

4. During undergraduate preservice training of teachers, new information about technological innovations should be provided periodically for the sustainable development of preservice teachers.
5. Computer competency skills like spreadsheets and databases should be emphasized so as to increase the level of their technology integration.
6. To increase the importance of technology related courses on behalf of the preservice teachers, Ministry of National Education should assess the level of computer competencies as well as their general background knowledge and their pedagogical knowledge.
7. Teacher educators demonstrate their competencies and willingness to use technology in teaching. They should be role models for prospective teachers in integrating technology into the classroom teaching.
8. Deficiencies of teacher educators should be overcome as soon as possible. Teacher educators are supported with educational technology experts both to increase their competency level and technology integration into their own instruction.
9. Teacher training institutions should provide technology training for preservice teachers in accordance with the needs their prospective schools. Therefore, teacher education institutions and schools should cooperate in designing technology training curriculums to meet teachers' specific technology needs. But the curriculum should be designed that must drive technology; technology should not dictate curriculum.
10. It is the task of technology teacher educators to provide experiences that will broaden preservice teachers' perceptions of technology and technology education. Hence, hands-on experiences, realistic classroom examples, and links to teaching experiences and instructors with both technical and curricular expertise should be advocated. These attributes may help develop teachers' beliefs that they are able to effectively integrate computers in instruction.

11. In order to keep the technology infrastructure up-to-date, better funding and support for technology education should be arranged.
12. Sometimes, although preservice teachers recognized the importance and role of the technology in their lives, they failed to associate technology with their profession. Therefore, in their preservice education, teacher educators in their teaching methods courses should demonstrate the importance and the role of technology in teaching as well. ICT training should be infused into all aspects of teacher training rather than presented in separate a stand-alone course.

Recommendations for Further Research

1. It is recommended that further research should be conducted to understand the changes in preservice teachers' perception through replication of the present study.
2. In future studies, qualitative research methods such as observations, interviews, and around table discussions should be used to better understand the dynamic of the change in preservice teachers' perception toward technology.
3. Future research could replicate this study with a larger sample size and broaden it to include the preservice teachers from other universities and subject areas.
4. Finally, since education includes people other than preservice teachers and affect each others mutually, this study should be replicated on the others, such as inservice teachers, teacher educators, principals, and so forth.

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APPENDICES

APPENDIX A

THE STUDY PERMISSION

APPENDIX B

THE QUESTIONARIE

AÇIKLAMA: Bilgi patlamasının gerçekleştiği günümüzde öğretmenliğe adım atmakta olan sayın öğretmen adayı! Çağımızın modern öğretmenlerinden beklentiler, gelişmekte olan toplumlarda farklılaşıyor. Günümüzün öğretmenlerinden beklenen önemli yeterliliklerden biri de bilgi teknolojisinin eğitimde kullanımına yönelik becerilere sahip olmaktır. Biraz sonra dolduracağınız anket sizin öğretim amaçlı teknoloji kullanımınıza yönelik algınızı ölçmeyi amaçlamaktadır. Elde edilen veriler akademik bilgi elde etmek amacıyla, yalnızca araştırmacı tarafından kullanılacak ve gizli tutulacaktır. Bilimsel bir çalışmaya yapacağınız katkılardan ve yanıtlarken göstereceğiniz duyarlılıktan dolayı şimdiden teşekkür ederim.

Araştırmacı Hasan TINMAZ

(1) Cinsiyetiniz: **a.** Erkek ☐ **b.** Kadın ☐

(2) Bölümünüz:

1.Beden Eğitimi	☐	5.Resim-İş	☐
2.Fen Bilgisi	☐	6.Sınıf Öğretmenliği	☐
3.Müzik	☐	7.Sosyal Bilgiler	☐
4.Okul Öncesi	☐	8.Türkçe	☐

(3) Öğretim Türü: 1. Öğretim ☐ 2. Öğretim ☐

(4) Kendinize ait bilgisayarınız var mı? Evet ☐ Hayır ☐

(5) Eğer 4. soruya evet cevabı vermişseniz, bilgisayarınız ile Internet'e bağlanabiliyor musunuz?
Evet ☐ Hayır ☐

(6)Aşağıda size verilen programların hangisinde gelecekteki mesleki yaşantınızda kullanmak üzere kendinizi yeterli hissediyorsunuz:

		Zayıf	Orta	İyi
a.	Bilgisayarla ilgili temel kavramlar	( )	( )	( )
b.	Bilgisayarın fiziksel parçaları (donanım)	( )	( )	( )
c.	İşletim Sistemi (Ör: Windows)	( )	( )	( )
d.	Kelime İşlemci Programlar (Ör: Word)	( )	( )	( )
e.	Hesaplama Tablosu Programları (Ör: Excel)	( )	( )	( )
f.	Sunum Programları (Ör: Powerpoint)	( )	( )	( )

		Zayıf	Orta	İyi
g.	Veritabanı Programları (Ör: Access)	**( )**	**( )**	**( )**
h.	Web Sayfası geliştirme (Ör: Frontpage, Dreamweaver)	**( )**	**( )**	**( )**
i.	Internet - World Wide Web (WWW) kullanımı	**( )**	**( )**	**( )**
j.	*E-posta (E-mail) kullanımı*	**( )**	**( )**	**( )**

Aşağıda siz öğretmen adaylarının teknolojiye yönelik algılarınızı içeren ifadeler bulunmaktadır. Lütfen okuduğunuz ifadeleri **öğretmen gözüyle değerlendirerek** ve **şu andaki teknoloji kullanımına ilişkin algı ve becerilerinizi dikkate alarak yanıtlayınız**. İfadeler hakkında aşağıdaki ölçeği göz önünde bulundurarak yanındaki kutucuğa 1 ile 5 arasında sizi en iyi tanımlayan değeri yazınız. 1 KESİNLİKLE KATILMADIĞINIZI ve 5 KESİNLİKLE KATILDIĞINIZI ifade etmektedir. Eğer kendinizi 1 ile 5 arasında bir yerde görüyorsanız 2, 3 ya da 4 sayılarından birini yazınız.

	1	2	3	4	5
	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Kararsızım**	**Katılıyorum**	**Kesinlikle Katılıyorum**
1. [____]	Bilgisayarların eğitimde kullanılması gerekir.				
2. [____]	Eğitimde teknoloji kullanımı öğrencilerin başarısını arttırır.				
3. [____]	Sınıfta teknoloji kullanımı eğitimin kalitesini arttırır.				
4. [____]	Sınıfta teknoloji kullanımı öğrenme düzeyini yükseltir.				
5. [____]	Teknoloji kullanımı sınıf ortamını çeşitlendirir.				
6. [____]	Sınıfta teknoloji kullanımı, öğretimi öğrenci merkezli yapar.				
7. [____]	Eğitimde teknoloji kullanımı, öğretmenlere sınıf içi etkinlerin *planlanmasında* yardımcı olur.				
8. [____]	Eğitimde teknoloji kullanımı, öğretmenlere sınıf içi etkinlerin *uygulanmasında* yardımcı olur.				
9. [____]	Eğitimde teknoloji kullanımı, öğretmenlere sınıf içi etkinlerin *değerlendirilmesinde* yardımcı olur.				
10. [____]	Teknoloji kullanılarak yapılan öğretim, geleneksel öğretimde olmayan fırsatlar sunar.				
11. [____]	Okulda teknoloji kullanımı, öğretim stratejilerinin yeniden gözden geçirilmesini sağlar.				
12. [____]	Eğitimde teknoloji kullanımı için ayrılan bütçe, geleceğe yapılan iyi bir yatırımdır.				
13. [____]	Okulda bulunan teknolojik araç-gerecin güncelliği, onları sınıfta kullanmamda rol oynar.				
14. [____]	Alanımda teknoloji kullanımı öğretimi eğlenceli bir hale getirir.				
15. [____]	Sınıfta teknoloji kullanımı, ders öğretim programlarını (müfredatları)				

	1	2	3	4	5
	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Kararsızım**	**Katılıyorum**	**Kesinlikle Katılıyorum**
	zenginleştirir.				
16. [____]	Günümüz öğretmeni, öğretim etkinlikleri ile teknolojiyi bütünleştirmek zorundadır.				
17. [____]	Alanımdaki her konuyu öğretim sırasında rahatlıkla teknoloji ile bütünleştirebilirim.				
18. [____]	Günümüz teknoloji standartlarına göre yetiştirilmiş bir öğretmen adayı olduğumu düşünüyorum.				
19. [____]	Aldığım teknoloji içerikli derslerin teknolojiye karşı olan tutumumu olumlu yönde değiştirdiğini düşünüyorum.				
20. [____]	Lisans eğitimim süresince öğretim elemanları tarafından teknolojinin sınıf içi ortamlara uygulanması konusunda bilgilendirildiğimi düşünüyorum.				
21. [____]	Lisans eğitimim süresince öğretim elemanları tarafından teknolojinin derslerde uygulandığını düşünüyorum.				
22. [____]	Eğitimde teknoloji kullanımının toplum üzerindeki etkileri konusunda öğretim elemanları tarafından yeterince bilgilendirildiğimi düşünüyorum.				
23. [____]	Lisans eğitimimde aldığım "Bilgisayar" dersi öğretmenlik niteliğimi yükseltir.				
24. [____]	Lisans eğitimimde aldığım "Temel Bilgi Teknolojileri" dersi öğretmenlik niteliğimi yükseltir.				
25. [____]	Lisans eğitimimde aldığım "Öğretim Teknolojileri ve Materyal Geliştirme" dersi öğretmenlik niteliğimi yükseltir.				
26. [____]	Lisans eğitimi boyunca aldığım teknoloji temelli derslerin yardımıyla, teknoloji destekli öğretim yapabilirim.				
27. [____]	**Üniversite içinde** derslerle ilgili bilgisayar kullanımına yeterince süre ayırırım.				
28. [____]	**Üniversite içinde** dersler dışında bilgisayar kullanımına belirli süre ayırırım.				

Anket Bitmiştir. Katkılarınızdan Dolayı Teşekkür Ederim.

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