AN ASSESSMENT OF PRE-SERVICE TEACHER EDUCATION PROGRAM IN RELATION TO TECHNOLOGY TRAINING FOR FUTURE PRACTICE: A CASE OF PRIMARY SCHOOL TEACHER EDUCATION PROGRAM, BURDUR.

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ABSTRACT

AN ASSESSMENT OF PRE-SERVICE TEACHER EDUCATION PROGRAM IN RELATION TO TECHNOLOGY TRAINING FOR FUTURE PRACTICE: A CASE OF PRIMARY SCHOOL TEACHER EDUCATION PROGRAMME, BURDUR.

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The purpose of the study is to reveal pre-service teachers' technology competencies during their four-year teacher training program at Burdur School of Education, Süleyman Demirel University in Turkey. The sample size is 1086 students from Primary School Teacher Education department. 262 is 1st year, 269 is 2nd year, 288 is 3rd year, and 265 is 4th year students. 435 are males, and 644 are females. The research design is non-experimental survey. Technology Use Self-Competency scale (TUSS) was used for the study. Reliability of the instrument is .96. The study is indicated that most of the pre-service teachers felt themselves as intermediate technology user. The descriptive, correlation, regression and higher-way ANOVA are applied. Gender, years of computer use and computer ownership and having access to internet variables are associated with significantly to technology use self-competency scores. Also the most useful predictor of technology use self competency is years of computer use. Finally, there is significant difference among categories of computer ownership and internet access, gender, years of computer on technology use self-competency. The recommendations and directions to future researches are presented.

Keywords: Teacher Training, Technology Competency, Technology Proficiency, Preservice Teachers, Self-efficacy

ÖZ

ÖĞRETMEN YETİŞTİRME PROGRAMININ GELECEKTE Kİ TEKNOLOJİ KULLANIMI İÇİN TEKNOLOJİ EĞİTİMİ BAKIMINDAN DEĞERLENDİRİLMESİ: BURDUR, SINIF ÖĞRETMENLİĞİ BÖLÜMÜ DURUM ÇALIŞMASI

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Bu çalışmanın amacı Türkiye Cumhuriyeti Süleyman Demirel Üniversitesi, Burdur Eğitim Fakültesi, Sınıf Öğretmenliği Bölümünde bulunan hizmet öncesi öğretmenlerin eğitim fakültesinde aldıkları teknoloji eğitimi sırasında gösterdikleri evrimsel değişimi ortaya çıkarmaktır. Araştırmanın örneklemi 1086 katılımcıdan oluşmaktadır. Katılımcıların, 262'si 1 sınıf, 269'u 2. sınıf, 288'i 3. sınıf ve 288'i 4. sınıf öğrencilerinden oluşmaktadır. Ayrıca, katılımcıların 435'i erkek ve 644'ü de kızdır. Bu çalışmada betimsel araştırma yöntemi kullanılmıştır. Teknoloji Kullanımı Yeterlilik Anketi (TKYA) araştırmada veri toplama aracı olarak kullanılmıştır. Bu anketin güvenirlik katsayısı .96 bulunmuştur. Araştırmada, betimsel, ilgileşim, regresyon ve çok yönlü varyans analizleri kullanılmıştır. Araştırma sonuçlarına göre, hizmet öncesi öğretmenlerin büyük bir çoğunluğu kendini orta düzeyde teknoloji kullanıcısı olarak görmektedirler. Teknoloji kullanım yeterlilik sonuçları ile cinsiyet, bilgisayar kullanım yılı ve bilgisayar ve internet sahibi olma değişkenleri arasında anlamlı bir ilişki bulunmuştur. Aynı zamanda bilgisayar kullanım yılı teknoloji kullanım yeterliliğinin en önemli yordayıcısı olarak bulunmuştur. Son olarak

teknoloji kullanım yeterliliği sonuçlarında cinsiyet, bilgisayar ve internet sahibi olma değişkenlerinin anlamlı bir farklılık oluşturduğu ortaya çıkmıştır. Araştırma sonuçlarına göre tavsiyeler ve ileriye yönelik araştırma önerileri verilmektedir.

Anahtar Kelimeler: Öğretmen Yetiştirme, Teknoloji Yeterliliği, Teknoloji Uzmanlığı, Öğretmen Adayı, Öz-yeterlilik.

This work is dedicated to my family
whose love
and
support
I truly value.

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TABLE OF CONTENTS

LIST OF TABLES

TABLES

CHAPTER 1

INTRODUCTION

1.1 Statement of Problem

Technology is a tremendous force in 21st century because it influences every fields of life. One cannot do daily routine jobs without technology. It is obvious that technology have a daily routine tool of all people's life. Technology enforces all people to change. As a contemporary person, each individual have to adapt themselves in accordance with technological innovations.

Technological innovations created a new social description namely communication society. Chauve (2003) stated required new skills for citizens in this society:

> In the communication society, it is vital to be able to search for, sift, select and process information, in all forms, including that available from multimedia sources. It is therefore essential to be able to read and interpret "images". However, we also need to know how to produce information. As communication cannot be reduced to the production of the written word, an understanding of basis means of communicating via the media is essential. However, we must not neglect other forms of expression such as painting, theatre, dance and music, because ICTs [Information and Communication Technologies] alone will not suffice to foster, express and share the richness and diversity of human creativity. (p. 22)

Chauve (2003) also mentioned team work and its key elements such as discussion, negotiation and sharing in group as required skills for communication society. He advised that people in the society should be aware of continuous development to integrate into constantly evolving changes. Finally, he stated that the most important skill, which all people should acquire in this new society, is learning how to learn.

Digital literacy is part of new skills of communication society. It defined as abilities and skills required to able to use ICT in daily life and job conditions. Digital literacy altered responsibilities of schools. Schools have to

be made students and other members of the society as digitally literate. Prospective economy of the world will be the digital economy so education systems have to train ICT skilled persons. As a result, it is responsibility of all national systems to train digitally literate teachers (Paun, 2003).

Also Davis (1997) states that teachers had a vital role to apply information and communication technologies so that all persons acquired required skills and knowledge of communication society. She continues that the development of teachers in IT and suitable pedagogical skills are critical. On the other hand, Martinson (1998) points out that teachers are required to not only guarantee their students' understanding of the new communication technologies to improve their lives but also indicate negative consequences of new technologies from both individual and societal circumstances. He also mentions that what teachers needed to know about communication technologies and proposes that "teaching about the new media technologies requires that the teachers know something more than nuts and bolts of the process…" (p. 152).

Similarly, Rowe (1998) illustrated that some students quite frequently were more competent computer user than teachers and this condition affected teacher negatively. He added that if teachers were not well trained about technology and its utilizations, they behaved computers as scary monsters. This illustrative case is another superior evidence for the importance of teacher training programs.

The 1997 report of National Council for Accreditation of Teacher Education's (NCATE) stated that today's teacher training institutions must close the discrepancy between current and desired conditions, which are requirements of communication society, in teaching and learning technology. Also the report pointed out another obligation of teacher training institutions that they must train their students to teach in future classrooms.

It was easy to see that communication society enforces not only society but also its all part such as education systems. Especially, the new skills mentioned earlier are the origin of enforcements. They mean new efforts for education systems and these efforts pressures institutions to make reforms on their traditional structures. Especially, schools are the first places to start

reformation. Potolea (2003) mentioned that modern society is developing new culture and civilization influencing in both schools and teacher training institutions. Moreover, he explained that reform in schools cannot be successful if teacher training cannot support this reform. But, two types of reform cannot be occurred simultaneously.

Taking into account the communication society's demands and enforcements, many countries restructure their education systems. Practitioners and government officials are defining new goals and executing new pedagogical methods to rearrange the usefulness of changing technologies (Dooley, 1999). Turkey is one of these countries. In 1997, The Grand National Assembly enacted 8-year compulsory education law. After this important law, Ministry of National Education started Basic Education Project. The aim of this project was acquiring universal accessibility and standards for education. 2802 information technology classrooms were established in primary schools for this project. Total budget of the IT classrooms was 11.2 million dollars. Furthermore, MONE defined goals to integrate information technologies into Basic Education Project. These goals were:

1. improvement of collaboration among society, school, teachers and students by using IT tools,
2. improvement of quality of education by providing educational environments with educational software, electronic references, application software and educational games,
3. integration of information technology into educational environments from first year to eight year,
4. gaining access for all students to information technology tools,
5. teaching skills using appropriate information technology tools in appropriate time and place to students,
6. teaching how to use information technology in their daily life and problem solving, accessing, processing and presenting information with aid of information technology tools to students,
7. providing active self-learning environments rather than passive,

8. providing teachers to use computer for writing lesson plans, implementing lessons, developing measurement and evaluation tools, grading, preparing instructional materials and improving themselves professionally,
9. making schools administration's duties easy and effective by using databases, word processors, demonstration programs such kind of information technologies,
10. establishment of information management systems to provide province administrations of MONE with information technology. (Akçadağ, 2003).

While Basic Education Project was progressing, teacher training programs in faculties of education were also restructured by Higher Education Council. One of the major goals of the restructuring was development of computer literacy, development of utilization of computers and internet to access and diffuse information, and finally development of production and preparation of instructional materials by information technologies. Modern instructional technologies acknowledged as part of pedagogical skills of pre-service teachers (YÖK, 1998). In the light of this goal, teacher training programs supported by two compulsory courses; computer literacy, instructional technology and materials preparation.

The content of computer literacy course were defined as (a) basic keyboard skills, (b) word processor, (c) desktop publishing, (d) spreadsheet, (e) database, (f) basic programming application in the circumstances of curriculum, (g) evaluation of educational software, and (h) working with computers in classroom. This course is provided in fall semester of second year. It is a three-credit and four-hour course. Two hours are theoretical and other two hours are practical. (Sınıf Öğretmenliği Lisans Programı, YÖK, retrieved from http://www.yok.gov.tr/egitim/ogretmen/ogretmen_yetistirm_lisans/sinifog.pdf.).

The content of instructional technology and material preparation course were defined as (a) properties of variety of instructional technologies, (b) their roles and applications in instructional process, (c) preparation of instructional materials (work sheet, slides, video, computer based instructional materials,

over head projector transparency, i.e.) considering instructional technology principles. . This course is provided in fall semester of third year. It is a three-credit and four-hour course. Two hours are theoretical and other two hours are practical (Sınıf Öğretmenliği Lisans Programı, YÖK, retrieved from http://www.yok.gov.tr/egitim/ogretmen/ogretmen_yetistirm_lisans/sinifog.pdf.).

Furthermore, technological resources of faculties of education were supported by one computer laboratory with 20 multimedia supported computers and electronic class with one projector. Also two scanners, two printers, one photograph machine with lenses, one camera, and one portable projector, application and educational software were given to faculties.

Recently Basic Education Project is carried on. Faculties of education have been graduating a number of pre-service teachers trained in restructured curriculum for seven years to provide Basic Education Project. It can be said that technological innovations were diffusing in education system of Turkey with these projects. Technological innovations will make each person's work easier and more effective in field of education. However, they were coming into operation with not only advantages but also disadvantages. All people saw just the disadvantages. The disadvantages of technological change in education system caused a number of new questions waiting to be answered.

1.2. The Purpose of the Study

The restructuring of teacher training institutions in Turkey occurred in two dimensions supporting hardware and adding new courses to curriculum. However, Chen (2004) stated that making technology available and assuming a number of required technology courses changing pre-service teachers' anxiety, confidence and attitudes were a significant mistake.

A report published by Milken Exchange on Educational Technology (1999) proposed that stand-alone IT courses were not associated well with technology skills and technology integration abilities. Also technology specific courses could not advance characteristics of technology use in education.

Another report by NCATE (1997) mentioned that adding special technology courses into teacher training curriculum was common mistake of universities because these kinds of courses train only well computer literate pre-service teachers. But, the integration and usage of technological innovations in educational environments was more critical than being well computer literate person. NCATE report also pointed out that adding courses were not enough unless a new faculty member competent with technology was employed.

In the light of these literatures, especially adding separate courses into teachers training programs are the source of problems. Moreover, other potential problem is about economical condition of Turkey. Altun (1996) summarized this problem in his article. He stated that:

> What are the particular obstacles for developing nations to adopting new information technologies into their systems? These countries may be able to purchase necessary hardware and associated technologies, but this is only one aspect of such a fundamental process of change. Without trained personnel they will not be able to use these technologies effectively. It has already found that computers are often locked in rooms waiting for professional users and trainees. New information technology, which is relatively quite expensive for developing states, will be quickly out of date, and replacing it with newer systems will not be easy with limited financial resource. . . (p. 187).

Today teacher training institutions' technological infrastructures are so out of dated that they may be no longer available for usage unless they are upgraded frequently. Such as; In Burdur Faculty of Education, the computers provided by government for Basic Education Project were wasted in January, 2004. They were not upgraded and had not been used for two years. New computers had to be purchased.

The next potential problem of the restructuring process is nature of innovations. Latham (1988) states that an innovation initiates in enormous concerns and it will reach its zenith in a year and a half. After reaching its zenith, it starts to decline and it shall die in about four years. Another innovation requires in this point (As cited in Dooley, 1999).

The final potential problem about the restructuring process is human nature. Hope (1998) explained three problems of infusion of technology in schools and

teachers' practice. One is lack of equipments, other one is maintenance of equipments, like Altun (1996) stated. The last one is showing itself as teacher's fear of technology, lack of tendency to technology, and resistance to change because they are not willing to abandon their existing pedagogy, classroom activities and routines.

Willis and Mehlinger (1996) reviewed information technology in teacher education. In their review, they concluded overall literature about this topic in two sentences that:

> Most pre-service teachers know very little about effective use of technology in education and leaders believe there is a pressing need to increase substantially the amount and quality of instruction teachers receive about technology. The idea may be expressed aggressively, assertively, or in more subtle forms, but the virtually universal conclusion is that teacher education, particularly pre-service, is not preparing educators to work in a technology-enriched classroom (p .978).

Also Willis and Mehlinger (1996) proposed that a number of pre-service teachers took technology courses but the courses could not make connection to curriculum, methods, field experiences, or practice teaching. Large body of the literature shows that reformation is not only solution for infusing technology into education at desired level. The reformation movements in education are necessary but not efficient in the 21st century. Reforms are bringing new problems to education system as well. Therefore, Teacher training institutions in Turkey are facing new problems. To challenge these problems, institutions have to evaluate their current conditions about technology training programs.

Most of the teacher training institutions assumed that their graduates were well trained with respect to utilization technology in educational environments especially after restructuring process of Higher Education Council in 1997. Based on the assumption, this study assesses the current technology training program with respect to pre-service teachers perceived self-competency level at Burdur Faculty of Education, Süleyman Demirel University.

The purpose of this study is to reveal pre-service teachers' technology competencies during their four-year teacher training program at Burdur School of Education, Süleyman Demirel University in Turkey. Do pre-service teacher

candidates really feel being well prepared to use technology effectively at the end of the four-year technology training in teacher education program?

1.3. Significance of the study

Will New Teachers be Prepared to Teach in a Digital Age reported by Milken Exchange on Education Technology (1999) proposed several reasons for their national survey on information technology in teacher education. They are (a) increasing availability of information technologies in schools, (b) previous studies' results found that pre-service and in-service teacher could not adapt themselves to rapid technological changes in both quality and quantity of information technologies, and (c) expectation from teachers to practice rapid turnover in the next decade. All reasons proposed in the report are valid for restructuring process in Turkey. It should be needed studies having goals like this report.

According to Willis and Mehlinger (1996), pre-service teachers could not learn to use technology in their training programs. Unless the significant changes occurred, this carried on being the case. In the light of Willis and Mehlinger statement, a question should be investigated that whether restructuring process of teacher training programs can make significant differences on technology training or not. If the answer of this question is negative, institutions will continue to graduate pre-service teacher with lack of technology skills.

Another study stated that pre-service teachers cannot be well prepared in educational technologies (Doering et al, 2003). Furthermore, the authors mention necessities of research focusing pre-service teachers' thought on the subject of technology.

There is a recommendation for a replication study concerning pre-service teachers' change of attitudes and confidence level with respect to technology utilization in different teacher training institutions (Tao, 2001). Tao also suggested that a study should be carried out by using the new Educational Technology Standards of ISTE in 2000.

Altun (1996) suggested that age and gender factors were important to be competent information technology user and they should be examined. Another study

is recommended a research just concerning gender differences and computer usage for the benefits of both teacher training programs and classroom learning environment (Nanasy, 2001).

Furthermore, Altun (1996) mentioned the critical problems in teacher training in Turkey. One of the problems was lack of research activities on teacher training. With the restructuring process, teachers training institutions are needed to conduct more research activities.

Moreover, some authors propose a need for future research including age, computer experience, and developing technological infrastructure variables on computer self-efficacy of pre-service teachers (Karsten & Roth, 1998, Akkoyunlu & Orhan, 2003).

Finally, Haderlie (2001) conducted a research on the subject of perception on technology standards acquisition of pre-service teachers at Utah State University. One of goals of study is related to delineate teacher education students' feelings about preparedness to teach with technology and other one is to define their perceived level of technological competency achievement. Participants of the study are 104 students. Haderlie recommends that her study should be replicated with a more number of students.

However the restructuring process of teacher training programs are sources of vast amount of problems, no research evidence exists as to the extent to what degree teacher training programs fulfill the expectations, competency, and professional needs of their students. A number of investigations are mandatory through development, testing, and implementation of a successful technology integration process in education to make certain expected outcomes are achieved (Koszalka & Grabowski, 2003).

In closure, there are large bodies of literature recommending studies on teacher training institutions concerning different aspects of technological innovations. It is therefore critical to know what the current conditions of teacher education institutions about technology training. Can they really train competent technology user in both personal and instructional dimensions? Moreover, another critical point is whether any factors influenced in pre-service teachers' competency level about

usage of technology existed or not. The critical points will lead future developments of technology training in teacher education.

1.4. Research Questions

In accordance with the purpose of study, the following questions will be explored in this study:

Question 1: What are pre-service teachers' perceived self-competency levels concerning technology usage in educational environments, basic and advanced computer skills?

Question 2: Is there any significant relationship between technology use self-competency scores and demographic characteristics (gender, computer ownership and internet access, and year(s) of computer use) of pre-service teachers?

Question 3: How accurately can technology use self-competency be predicted from a linear combination of demographic characteristics of pre-service teachers?

Question 4: Is there any significant difference between demographic characteristics (gender, computer ownership and internet access, and year(s) of computer use) of pre-service teachers and their perceived self-competency level to use of technology?

Question 5: What are pre-service teachers' perceptions regarding to: (a) technology courses, (b) infrastructure of school of education, and (c) their faculty members' use of technology?

Question 6: Is there any significant difference among years of pre-service teachers' perceived self-competency?

1.5. Definitions of Terms

Pre-service teachers: A person is one who is current student of a teacher training institution.

Teacher training institution: An institution is where is providing necessary conditions (technological infrastructure, courses and technical support and i.e.) to

prepare pre-service teachers for Ministry of National Education's schools. Schools of Educations at Universities are responsible for that.

Perceived self-competency: One's perception about his/her technology usage skills. Theoretical foundation of this concept is self-efficacy. *The technology use self-competency scale* is used to define level of competency. If a student's mean score form the scale is:

1. higher than 3.68 then (s)he is named as *expert*, or
2. between 2.34 and 3.67 then (s)he is named as *intermediate*, or
3. lower than 2.33 then (s)he is named as *novice*.

Self-efficacy: Bandura (1994) defined perceived self-efficacy as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (p. 72).

Primary school teacher: A person is one who educates grade 1 to 5 students.

Technology training: The term means that specific training given in teacher training institutions. It may be separate course or independent professional development courses.

Skill: This term explains with two definitions in Collins Cobuild Dictionary (1995). First one is **"**a type of work or activity which requires special training and knowledge" and second one is "the knowledge and ability that enables you to do something well" (p. 1562).

Basic computer skills: Computer usage knowledge and abilities concerning software/hardware, troubleshooting, file management, word processors, spreadsheets, electronic mail, internet, and the last one is demonstration programs.

Advanced computer skills: Computer usage knowledge and abilities concerning printer problems, operating systems, driver software, desktop publishing, usage of scanner and digital camera, databases, and the last one is web-editor programs.

Technology use skills in educational environments: Technology usage knowledge and abilities concerning (ISTE - National Educational Standards for Teachers, 2002):

1. planning and designing learning environments and experiences,
2. teaching, learning and curriculum,

3. assessment and evaluation,
4. productivity and professional practice,
5. social, ethical, legal and human issues.

1.6. Assumptions

For this study, the following assumptions are made:

1. The participants responded accurately to all measures used in this study.
2. The participants gave careful attention on each item in the instrument.
3. The data were accurately entered and analyzed.
4. Reliability and validity of the all measures used in this study are accurate enough to permit accurate assumptions.
5. The sample selected for this study represents the population.
6. The perceived self-competency about technology use represents actual competency-level of persons because competency also measured by mastery (i.e. midterm in class exams) and performance (i.e. application exams in computer laboratory) tests.

1.7. Limitations

The following limitations are relevant to the present study.

1. Sample size is limited.
2. Validity of this study is limited to the reliability of the instruments used in this study.
3. Validity is limited to the honesty of the responses to the instrument used in this study.

1.8. Delimitations

The following delimitations are relevant to the present study.

1. Sampling method is convenient.
2. This study is limited to pre-service teachers in primary schools teacher training programs, elementary education department of Burdur School of Education, Süleyman Demirel University, Turkey.

3. The competency level of pre-service teachers is limited to their perceived self-competency technology use level.
4. Data collection of this study is limited to 2003 – 2004 spring semesters.

1.9. Organization of the Study

Chapter 1 provides an introduction to problems associated with teacher training and educational technology.

Chapter 2 includes a literature review of educational technology and teacher training. Sections of review will be consisted of technology in teacher education, technology use by pre-service and in-service teachers, technology competency standards, studies related to technology of pre-service teachers, and self-efficacy.

Chapter 3 consists of the research method. It includes the participants of the study, the design, independent and dependent variables of the study, the instrumentation and general procedures of the study, and the data analysis procedures.

Chapter 4 presents the major results of the study.

Chapter 5 reports the summary of the study, discussion, conclusions, theoretical implications, and recommendations for further study.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1. Introduction

This chapter provides a review of literature related to this study. The literature review is explained in four main sections: (a) Technology and Teacher Training, (b) Technology Standards, (c) Technology Competency Studies, and (d) Self-efficacy.

The purpose of this study is determining pre-service teachers' technology competencies during their four-year teacher training program at Burdur School of Education, Süleyman Demirel University in Turkey. In accordance with the purpose of study, the following questions were going to be investigated:

1. What are pre-service teachers' perceived self-competency levels concerning technology usage in educational environments, basic and advanced computer skills?
2. Is there any significant relationship between technology use self-competency scores and demographic characteristics (gender, computer ownership and internet access, and year(s) of computer use) of pre-service teachers?
3. How accurately can technology use self-competency be predicted from a linear combination of demographic characteristics of pre-service teachers?
4. Is there any significant difference between demographic characteristics (gender, computer ownership and internet access, and year(s) of computer use) of pre-service teachers and their perceived self-competency level to use of technology?
5. What are pre-service teachers' perceptions regarding to: (a) technology courses, (b) infrastructure of school of education, and (c) their faculty members' use of technology?
6. Is there any significant difference among years of pre-service teachers' perceived self-competency?

2.2. Technology and Teacher Training

2.2.1. Historical Evolution of Technology in Teacher Training

Because of changing society and its huge amount of new demands, teacher education institutions have to support their curriculum with introductory technology courses. Technological innovations had been crucial impact on definition of content of the courses. Historical evolution of instructional technologies in teacher education could be divided into three eras (Betrus & Molenda, 2002):

1. Early visual instruction courses: 1920s and 1930s: The dominant technology of this era was visual elements. Therefore, Starnes recommended a course outline having 'history of visual instruction', 'psychological background of visual aids', 'discussion of result of experimentation visual aids, and use of various media, including flat pictures, globes, object-specimen-model materials, motion picture, and others' (Starnes, 1937, p.13, as citied in Betrus & Molenda, 2002)
2. A gradual evolution of content: 1940s, 1950s, and 1960s: Due to the new emerged technology audio recoding and playback, the content of introductory technology courses were improved. They were consisted of audio materials as well. The new topic "theory of communication" and "instructional systems" also added to introductory technology courses as a result of progress of communications technologies and more support for the systems approach in the professional field (Betrus & Molenda, 2002, p.19).
3. The information age: 1980s and 1990s: The rapid development of computers in both society and education influenced the evolution of introductory technology courses' content. Computers were more important aspects of technology courses than other materials.

Betrus and Molenda (2002) divided courses into two categories. In the first and second era, *the classic course* was developed. Its content was sorts of media used in educational settings such as audio-visuals equipments (video, pictures, projectors, tape and i.e.) and computers. This course took into account balance between other

media and computer technologies. In the third era, *the new course* was developed. It was focusing on computer technologies rather than previous technologies.

Betrus and Molenda (2002) summarized that technology courses play especially serious role in teacher education but there is a gap between what the things taught and what the real things utilized in schools.

From the historical development, it can be concluded that the introductory technology courses always are in charge of changes due to rapid development of technologies. Today, the most powerful technology is computer so the technology courses give more attention on computer technologies and their usage in educational environments. In future, another technological tool definitely will enforce technology courses to change. Also, rapid developments resulted with many tried technology integration models in teacher education.

2.2.2. Technology Integration into Teacher Education Programs

Teacher training institutions are in adaptation process to meet current standards of information and communication society. They reorganize their curriculum and as well as their goals with respect to different aspects, which is the way of technology infusion into schools, the characteristic of curriculum, the teacher training system, and socio-political philosophy of the role of schools and teachers (Aufenanger & Yildirim, 2003). At this point, goals of teacher training institutions have critical roles.

In the literature, there are a number of goals recommended for teacher training institutions for information and communication society. For example, Niederhauser (2001) declared that "the ultimate goal of technology in teacher education is to enable K-12 teachers with necessary skills and understandings so they can provide a technology-rich learning experience for their students." (p. 3).

The other example which was proposed by Kennedy in 1987 (as citied in Willis & Mehlinger, 1996, p. 1002), focused on necessary computer skills pre-service teachers should know. He stated that:

> "The following computer skills [are] necessary for teacher training students:

- familiarity with machine teachings and assembly language as well as knowledge of a high level language;
- knowledge of computer-assisted instruction languages and list process languages;
- programming competencies to write, debug, and test programmes;
- knowledge of the system facilities;
- recognition of computer applications for a variety of group and individual activities;
- ability to recognise and use available software support services;
- ability to evaluate hardware and software;
- ability to adapt available software to a variety of subject areas." (Kennedy, 1987, as citied in Willis & Mehlinger, 1996, p.1002).

Kennedy's proposal was more concentrated on computer programming. However, it neglected pedagogical part of technology use skills. Makrakis (1997) reported that the most of information and technology instructors in universities are from the field of computer sciences without any pedagogical and educational computing background. Hence, the content of the technology course(s) were based on more technical aspects of technological tools. This condition caused dissatisfaction of students towards the technology training programs in teacher education. Therefore, Kennedy's skills could be resulted in some problems in teacher training.

In contrast, Davis (1992) mentioned necessary skills based on effective use of technology in educational environments rather than computer programming. Furthermore, he affirmed that pre-service teachers should be able to:

- "make confident use of a range of software packages and information technology devices appropriate to their subject specialism and age range;
- review critically the relevance of software packages and information technology devices appropriate to their specialism and age range and judge the potential value of these in the classroom;
- make constructive use of information technology in their teaching and in particular prepare and put into effect schemes of work incorporating appropriate uses of information technology;
- evaluate the ways in which the use of information technology changes the nature of teaching and learning." (as cited in Aufenanger & Yildirim, 2003, p. 274).

The last sample, Kynigos (2003) mentioned the technologies the teachers need to know. The development of pre-service teachers' skills about

these technologies also can be defined as goals of teacher training institutions. He divided these technologies into following groups:

- mindtools;
- communication and collaboration media;
- information resources;
- presentation and dissemination tools (Powerpoint presentations, web pages);
- administrative tools;
- authoring systems. (p. 253).

Kynigos (2003) also proposes that teachers initially learn how to use these technologies developed for educational use. Later, it is possible to utilize them in school settings. But mindtools have more important role from other tools because of its deeper requirements for both technical and instructional dimensions. Mindtools are a part of software used for educational purposes to "support exploration and expression of ideas by means of constructing models, handling data, representing ideas in different ways and carrying out experiments." (p. 254).

As mentioned before the teacher training systems is a factor affecting the goals of teacher education. Therefore, also it is crucial to investigate literature for the types of technology training. Dell and Disdier (1994) defined four general circumstances of effective technology training. The first one is integration of educational technologies into overall curriculum. Second one is that training should make connection between technology and curriculum. Third one is that training should support practical experiences so that pre-service teachers feel contented to use technology. The last one is that training should support detailed instruction of technology (as cited in Aufenanger & Yildirim, 2003).

The 1995 report of Office of Technology Assessment (OTA) proposes three types of technology training in teacher education: (a) discussion/demonstration, (b) technology practice, and (c) professional practice. Discussion/demonstration means that discussing how the technological tools can be used in educational environments and demonstrating a few samples of technological implications. Second one is technology practice meaning that preparing and utilizing technological tools with aid of instructors. The last one; professional practice, is observation of usage of technological tools in real job conditions such as classroom during instruction. Pre-

service teachers not only observe but also examine utilization of technology in the classroom. Also, at professional practice, pre-service teachers should gain experiences on teaching with technology. In method courses, they learn how to write lesson plans include technology and its practice in classroom and later they observe teacher using technology and finally they teach with technology themselves. This model can be accepted as core curriculum of technology training in teacher education. Today, most of the teacher education institutions have tried to realize this kind of technology training.

Kynigos (2003) mentions some elements, which can be explained in addition to OTA's report, should be integrated into teacher training. These are: (a) supporting life-long learning as a part of teacher professional development, (b) concentrating on educational issues rather than technical aspects of technology, (c) considering current schools conditions, (d) investigating, preparing, utilization of alternative materials, resources and tools to work with curriculum-based knowledge and content, and (e) developing understanding of diverse roles of technology such as learning tool, personal tool, educational software and material development tool, personal administrative tasks tool, medium tool for communication and using information, medium for participating forum either colleagues or with students. Kynigos also gives example activities to support this kind of integration:

- authentic debates;
- small group discussion and preparation of materials;
- reflection and enhancing techniques;
- classroom practice;
- construction of software and materials for students;
- use of observational data from their own teaching;
- participation in communities of practice with use of communication technology (p. 251 – 252).

Wilkerson (2000) proposed a technology integration approach. It has three areas of technology infusion, that is, communication, productivity, and research/instruction. Wilkerson explained communication area as appropriate technology utilization to facilitate communication between and among various groups involved in teacher training program. E-mail and video conferencing could be used as tools to interact pre-service teachers, instructors, and curriculum experts. He also continued to describe productivity area as personal productivity and support of

instruction. The last area is research/instruction component addressing use of technology for research and instruction. Wilkerson concluded that a program including these three areas could fulfill the challenge of preparation of pre-service teachers for effective utilization of technology for instruction.

In European countries, two forms of technology training can be observed. These are ICT as a compulsory and ICT as a voluntary subject. The most of the countries use courses and workshops to deliver ICT skills (Aufenanger & Yildirim, 2003). Authors also mentioned other innovative forms of teaching ICT skills. These are: (a) on-line courses; (b) learning networks; (c) learning labs; (d) collaborative workplaces for student-teachers; (e) blended learning or hybrid model of offline and on-line learning opportunities; and (f) virtual universities.

Moreover, Willis and Mehlinger (1996) explained two types of technology integration in their review about information technology in teacher education: (a) the stand-alone educational computing course, and (b) technology and the method courses. In the stand-alone courses, most of the strategies were explained based on behavioral models such as programmed instruction. In contrast to stand-alone courses, the underlying theory of integrating technology into method courses was constructivist theory. They also mentioned the importance of utilization of technology knowledge and skills by student-teachers during their practice teaching. Except for these two integration models, there is an innovate model to improve effectiveness of technology training. It can be named as field-base technology training model or job-embedded learning (Loucks-Horsley, Hewson, Love, & Stiles, 1997, as citied in Brush et al, 2001). This model might differ from one institution to another institution with respect to implications but it has common goals providing pre-service teachers with technology training in real teaching situations. Brush et al. (2001) mentions that “the model moves beyond the idea of integrating technology training into teaching method courses; in contrast, preservice teachers learn to integrate technology into their teaching as part of field-based experiences in real classrooms” (p. 16).

There are vast amount of studies related to these integration models in the literature. It is important to review some of these studies.

2.2.2.1. Stand-alone educational computing courses

Major question about educational computing courses is what the content included in these courses. There are many studies to answer this question. Betrus (2000) conducted a survey of pre-service instructional technology course content at undergraduate level. He listed most popular content items of instructional technology courses in the universities, as shown in Table 1.

Table 1. *The 12 Most Frequently Taught Topics in 2000*

Rank	Topic	% of courses
1	Internet / world wide web	95
2	Presentation software	90
3	Word processing / desktop publishing	87
4	E-mail / discussion groups / newsgroups	84
5	Spreadsheets	83
6	Software evaluation	80
7	Databases	76
8	Trends / ethics / issues	74
9	Technology integration	72
10	Multimedia authoring	66
11	Instructional design	60
12	Hardware installation and troubleshooting	46

Source: Betrus 2000, as citied in Betrus & Molenda, 2002, p. 21.

Leh (1999) conducted a study similar to Betrus's (2000) study. In this study, Leh discusses the characteristics of "the technology course". Initially, she analyzed content of technology courses in 25 American universities. She reported that ratio of content which are taught in the universities as shown in Table 2.

Table 2. *Topics Included in The Courses and Percentage of The Universities that Taught The Topics*

Topics	Percentage
Telecommunications	84 %
Multimedia	80 %
Spreadsheet	76 %
Webpage development	72 %

Table 2 continued

Word processing	68 %
Presentation	60 %
Software evaluation	60 %
Database	56 %
Curriculum integration	52 %
Computer issues	48 %
Hardware and software	44 %
Video	24 %
Desktop publishing	20 %
Traditional media	8 %

Source: Leh, 1999.

Other study by McKenzie (1994) performed needs assessment to identify which content are the most important for instructional technology courses. She applied the assessment surveys to practitioners, teachers, and students. Teacher needs assessment survey has 5-point Likert type items. Teachers were suggested five content are crucial for instructional technology classes. The authors ranked these contents in accordance with its mean scores. These contents are first computers, second CD-ROM players, third videotape player/Recorder, fourth laserdisc player, and the last one multimedia. Student needs assessment survey has 4-point Likert type items. 42 students contributed the study. Students stated the most valuable course content in the instructional technology course: First one is information on the new and emerging technologies in the schools (computers, video, laserdiscs) (52.4 %). The second one is learning how to operate variety of technology through demonstration and hands-on learning opportunities (24.0 %). The last one is information on how to design and prepare inexpensive instructional materials (overhead transparencies, mounting materials) (16 %). Moreover, the most of the students in the instructional technology class reported that this course had trained them for their current and prospective job conditions.

The course contents especially focused on computer concepts and skills. The principal components of the courses included word processing, spreadsheet, database, multimedia, presentation, telecommunications (e-mail, net searches), web page development, and integrating technology into instruction (Leh, 1999). Contrastingly, Andrews (1996) states that these kinds of courses are heavily concentrated on the

technical competence of pre-service teacher about computer usage. On the other hand, technical competence does not guarantee successful technology integration into classroom and teachers have to know pedagogical part of computers. He advises course designers to focus on following aspects 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)

Another point for educational computing courses is effectiveness. Educational computing courses must be effective and teach some skills to teachers because there is a high demanding society. Yildirim (1999) analyzed effectiveness of educational computing course with respect to expectations, attitudes and computer use, and professional development. Yildirim found that expectation of pre-service teachers from the courses are satisfied in accordance with prior computer expectations. Students having prior computer experience expected more advance activities and develop their current technology skills in the course. However, not having prior computer experience students expected that the course introduce them with the basic computer skills and applications. At this point, the course could only fulfill one group's expectations. Therefore, prior computer experience group did not think their expectation fulfilled. Also, the course had positive effect on attitudes and computer use of the most of pre-service teachers. Moreover, research indicates that prior computer experience shapes participants' opinions about contribution of the course to their professional development. Experienced students propose negative opinion because they believed that they could not learn new things. Non-experienced students propose positive opinion in contrast to experienced because they learned new things from the course.

Molebash and Milman (2000) carried out a study trying to investigate effect of technology course on teachers' both personal and instructional technology use confidence. They utilize an instrument including student demographics, previous computer instruction, current use of technology, attitudes toward using variety of technology, confidence in instructional use of technology, and confidence in personal use of technology. They found that there was a significant difference between pre and post-test confidence level results of pre-service teacher enrolled in the technology course. It means that pre-service teachers' confidence level is increased as a result of a technology course. Rovai and Childress (2002) indicated consistent results with Molebash and Milman's study. They found that computer literacy course was effective to reduce computer anxiety and increase computer confidence and computer knowledge of teacher education students. Also they recommended that a course aiming reduce computer anxiety should focus on improvement of computer confidence and computer knowledge of students.

Furthermore, Leh (2000) performed a research aiming to delineate teachers' comfort level, confidence, and attitude towards technology at a technology course. In contrast to two researches mentioned earlier, the participants of the study are 68 in-service teachers enrolled in the technology course in 1999 at a public university. Leh also investigate two different categories of courses. These courses were categorized concerning the instructors' approach. In Integration A classroom, professor was aiming to teach computer technologies using commonly in school settings and how to integrate them into their teaching effectively. In Integration B classroom, professor was aiming to teach permeating technology into subject areas. At the beginning of the courses, the students had moderate comfortable and confidence regarding technology use. On the other hand, they stated that they have positive attitudes. They indicated that they want to use technology but they did not feel proficient to use it. At the end of the course, they stated that the courses increased their comfort level, confidence, and positive attitudes. There is no significant difference between Integration A and B classrooms. Also, teachers stated that this course is functional and they use knowledge and skills learned from it in future.

Although there are vast amount of literature for evidence to effectiveness of educational technology courses, the challenges also exit. Duran (2000) stated that

stand-alone technology courses do not meet pre-service teachers needs of using information and communication technology in future practice because these type of courses provide only conceptual issues about technology. There is need for developing more practical technology courses such as utilization of technology in educational settings, and classroom management strategies in computer supported classrooms.

Sisk (2001) determines three challenges for educational computing courses. These are entry level computing skills, changes in hardware and software, and changing delivery methods. A longitudinal study revealed (Sisk, 2001) that entry level computing skills of the students are changing from 1995 to 2000. This means that new-comer students enter university with more technology or computer skills. Therefore, more technology or computer skills enforce instructors to improve curriculum of educational technology courses. Prior computer experience affects students' expectation from technology courses (Yildirim, 2000). Therefore, entry computer skills should be considered in educational computing courses. Another challenge is rapid development of hardware and software. If hardware and software are changed, the content of the courses must be adapted to these developments (Betrus & Molenda, 2002). Also, these kinds of changes influenced the content of the courses. The last challenge is changing delivery methods. Educational computing courses should be adapted to on-line teaching and learning situations.

A large body of the literature mentioned stand-alone technology courses in teacher training is problematic situation (Chen, 2004, Milken Exchange on Educational Technology, 1999, NCATE, 1997, Nonis & O'Bannon, 2001, Whetstone & Carr-Chellman, 2001). Such as, technology courses cannot associate well with technology skills and technology integration abilities of pre-service teachers. Another example is that adding stand-alone technology courses were common mistake of teacher education institutions.

Because of the disadvantages and important developments on instructional technology such as ISTE NETS for Teachers, the educational computing courses are needed to reorganize their content, curriculum, syllabus, teaching and learning activities. Burson and Willis (1994) used microteaching method in their computer literacy course. This method has some disadvantages, time and resource constrains.

They proposed that microteaching is one of the most efficient methods to provide students with practice integration technology into curriculum. On the other hand, Microteaching cannot replace observation or practice in schools but it may make them more meaningful and more effective.

Henry (1996) used active learning techniques in the pre-service technology course. The followings are defined as assignments in the course: students: (a) an oral presentation and written document describing an observation/interview of a technology-using teacher in a public or private school, (b) oral presentation and written abstract of a research article related to technology use in the schools, (c) in-class workshop on a software application or tool, (d) compilation of a notebook holding all handouts from workshops, articles, observations and group projects, (e) a book report as written response, and (f) participation in a group project. At the end of the semester, a final assignment and interview conducted to collect opinion of pre-service teachers about techniques applied in the course. Most of the students stated that they learned "a lot" of things. They also mentioned that this method is good and they like it. Furthermore, they explained that this method could be applied in the course again. Workshops and classroom discussion are chosen as the most effective two methods because they are hands-on activities. Active learning strategies always should be part of educational computing course since they are providing practical experiences.

University of Northern Colorado restructured their educational technology courses to meet standards of teacher preparation curriculum (Sindt, Summerville & Persichitte, 1997). The original course is offered in a loosely structured fashion. The course had not official syllabus and every instructor taught some fundamental computer applications such as word processing, Hypercard, and Pagemaker. But, there was no content consensus among instructors. The course was delivered the last semester before student teaching. With the restructuring, the course divided into two different courses. First one is emphasizing basic computer skills and various software packages. The second one is focusing on advance computer applications and the integration of various educational technologies into classroom environments.

On the other hand, Bauer (1998) utilized another approach, which is anchored instruction, to an educational technology course. At the end of the course, the author

applied a questionnaire to gauge pre-service teachers' feelings about anchored instruction. They stated that anchored instruction was good approach. Also, they stated that they learned technology skills and their applications, they could know how to integrate anchored instruction into their own teaching, and they enjoyed contributing the class. Also, the author indicated another important point that anchored instruction could help teacher educators to show how to integrate technology in teaching or learning environments.

The study of Nonis and O'Bannon (2001) reported revisiting educational technology course to meet ISTE NETS for Teachers. They first started from curriculum and they arranged their goals in the light of performance indicators of ISTE standards. Second, they provided conditions to make connection with technology knowledge/skills and planning and designing an instructionally sound, technology-rich lesson or series of lesson. Third, they improved their sources to support students and they emphasized instructor to be a model by using technology in their instruction. The last effort to fulfill ISTE standards is development of procedure of assessment. Assessment strategies should be appropriate to ISTE standards performance indicators. They used rubrics to evaluate students' works and they preferred to use electronic portfolio prepared based on required competencies of technology training.

Using electronic portfolios are important trend for educational computing courses. Swain and Ring (2000) mentioned that electronic portfolios could provide pre-service teachers with opportunities to show their knowledge and skills they learned. He continued that pre-service teachers graduated with important product demonstrating their knowledge and skills. And also he stated that electronic portfolios are reflection of pre-service teachers' development process. Russell and Butcher (1997) described the usage of portfolio in a technology course. The portfolio requested in the course has seven divisions:

1. Goals: Each student has to state goals for the course
2. Artifacts: Materials are used to illustrate progress toward the stated goals such as lesson plans, work sample, materials developed, evaluations, and position papers;

3. Caption: a short written explanation of artifact and what it presents in the portfolio;
4. Rubrics: Students develop the rubrics to evaluate their own portfolio;
5. Self evaluation: Students compare current condition and their desired condition about portfolio;
6. Peer review: Students are reviewed classmates' portfolios twice times based on own rubrics;
7. Instructor review: It is used to be identical to peer review except the portfolio graded. The instructor review portfolio midway through the course and at the and o the course.

Carlson (1997) suggests that portfolios should not have strict rules because all portfolios are different. He continued that before portfolio assessment, students should be informed about what the portfolio is. Careful time plan is also needed during portfolio assessment. On the other hand; he proposed that all instructions and expectation should be stated clearly. Moreover, choices in the portfolio should be appropriate to students. Finally, he mentioned that teachers should encourage students thinking about rationale for each material in the portfolio.

Another important trend is using communication technologies to support educational computing courses. Chatel (2001) stated that she redesigned her literacy courses based on important reports and researches to make use of Internet and other digital resources. Also, she published all courses on Internet. All courses had links to all necessary resources. Especially, the course has concentration on e-mail assignments, threaded discussions and e-journals. At the end of the semester, most of the students showed dramatic developments.

Gurbuz, Yildirim and Ozden (2000) conducted a study to compare of student teachers' attitudes toward computers in on-line and traditional computer literacy courses. Firstly, they indicated that on-line computer literacy courses have not any effects on improvement of students-teachers' attitudes toward technology. On the other hand, traditional type of the course has a slight influence in attitudes of student-teachers. They also found that there is a combined effect of gender, computer literacy course type (on-line vs. traditional), taken any computer related courses, previous computer attitude and possession of home computer.

Another way to deliver educational computing courses is using constructivist approach and its applications. Bump (2001) stated that to introduce technology to pre-service teachers, teacher educators should model for this. Bump explained his restructuring process in the light of ISTE NETS for Teachers standards to support educational computing course with constructivist learning environments. He defined four features for educational computing course: (a) WebQuests to introduce new concepts and topics and provide practice with several technologies, (b) collaborative work, (c) web page creation by each individual student as assignment, and (d) discussion list to discuss topics and readings to classmates. Both at the beginning and end of the semester, all students in class evaluated themselves by an instrument developed based on ISTE standards. Most of the students showed significant improvements. Also, the author supported results with a reflective essay and students stated the same results with the instrument.

Keizer and Wright (1997) implemented a new model based on constructivist principles. They analyzed the course after one year by utilizing a survey to assess students' attitudes towards the course. The survey aimed to delineate (a) whether the courses perceived by students as different from other courses or not, (b) whether the coursework increase students' confidence in computer usage or not, and the last one whether there are any major differences in attitudes towards computer use or not. The result of the survey stated that 88 % of the students' opinion is that this course is different from other traditional courses. Also, 63 % of the students proposed that this course helps them to improve their confidence in computer use. Finally, the authors found that there is not an effect of gender and class levels on attitudes on computers. GPA scores have not an effect on attitude either. A similar study was conducted by İşman, et. al. (2003) in Turkey. The authors performed a research to analyze developments of students under the constructivist approach at computer courses. They found that students have positive tendency and developments on their learning under constructivist approach. They also stated that constructivist approach presents more experiential environments for non-experienced technology users.

Şahin (2003) carried out a study about instructional technology and material preparation course using constructivist approach in elementary teacher education program in Turkey. She indicated that students' perception on use of constructivist

approach is positive. Also, 90 % of the students think that being active is important aspects of this course. Finally, students stated that they learn more in constructivist environments as a result of teachers' guidance based on this approach.

Teachers should be aware of constructivism and its applications because ICT can be integrated into schools with this approach (Aufenanger & Yildirim, 2003). In teacher training, it could be realized by being role-model to pre-service teachers. Therefore, pre-service teachers could not only observe but also implement constructivism into their all professional related activities. It is so important that "teachers teach as they have been taught" (OTA, 1995, p. 181). If teacher educators utilize constructivist environments with technological support, pre-service teachers will use technology in their prospective job conditions.

2.2.2.2. Technology integrated method courses

Hunt (1997) proposed that "embedding the use of technology throughout teacher education programmes can do much more than develop expertise in the use of the technology itself" (p. 346). Technology integration into methods courses have some advantages with respect to stand-alone technology courses. Hunt also mentioned these advantages that integration technology into overall teacher training could widen students' views of world, improve their skills in utilizing information technology, they increase their instructional skills, and they could reduce anxiety of first experience in student teaching.

Whetstone and Carr-Chellman (2001) applied a survey to 49 pre-service teachers. They asked students where they learned technological knowledge and skills and the most of students stated method courses or self-taught experiences. The other learning experiences were friends and family members support and seminar provided from computer centers. This means that stand-alone computer courses could not teach necessary skills therefore alternative ways revealed.

Technology integration into entire teacher training program manifests itself with effective outcomes. Halpin (1999) stated that integration of computer literacy into methods courses increase pre-service teachers' confidence level to transfer computer knowledge and skills into classrooms based on their experiences gained

from these courses. Similarly, Abbott and Faris (2000) found that modular technology instruction and integrating technology skills and strategies into existing requirements of an integrated reading/language arts methods course resulted improvement in students' positive attitude towards computer technology. The authors also suggested that technology training should not only teach hardware and software but also it should provide knowledge and skills to integrate of computers into teaching and learning activities. Thomas and Cooper (2000) stated an advantage of technology integrated method course that students can make meaningful connection between technology and their subject matter they were learning to teach.

Vannatta and Beyerbach (2000) performed a research about facilitating a constructivist vision of technology integration among education faculty and pre-service teachers. They indicated that technology integrated methods course significantly increase pre-service teachers' technology proficiency skills such as CD-ROM, e-mail, database. Only LCD panel use skill did not show improvement. They concluded that technology integration into methods courses extended pre-service teachers technology proficiency level.

However, some obstacles also exist for technology integration into method courses. Gilley (2002) stated one of them that it requires education, more faculty expertise and interest. Vagle (1995) mentioned other problems of technology integration into method courses. First one is lack of time, second is instructors' lack of competency to do that, third is unavailability of technology for teaching methods courses.

Gilley (2002) proposed that a model including both of integration into methods and stand-alone technology courses could provide pre-service teachers with efficient technology supports. Hence, technology integration courses could provide opportunity to make connection between instructional technology and subject matters but stand-alone technology courses could provide concepts, discussion, theory and other related things about technology and its reflection on education such as gender gap.

2.2.2.3. The field based models

The field-base model supports "a mechanism for providing teacher education students with authentic opportunities to integrate technology into teaching and learning activities" (Brush et al, 2003, p. 59).

The authors discussed Arizona State University's field-based model in their article. First, they presented traditional model including optional stand-alone technology courses and modules defined based on specific content areas. Traditional model especially concentrate on basic technology skills such as word processing, database and etc. They also stated problems of this model. The model's problems are (a) lack of integration between teaching methodology experiences and technology integration practices, (b) student self-selection of inappropriate module, (c) lack of emphasize on technology integration in student –teaching experiences, and (d) lack of training among faculty and field-based mentor teachers with regard to effective integration of technology with educational activities. Only collaboration exists between methods faculty and mentor teachers. Also, educational technology faculty work independently to deliver technology training modules for pre-service teachers in a college classroom environment. The authors also proposed that there is a discrepancy between educational technology and field based experiences because faculty, pre-service teachers and mentor teachers could not work coordinatively and collaboratively.

On the other hand, Brush, et. al. (2001) explained field based model and new roles of methods, educational technology faculty, mentor teachers and educational technology graduate students. They used combination of these four task-forces to make technology training effective. In the field-base model, educational technology faculty members guide their graduate students to help them work with methods faculty, mentor teachers and preservice teachers. And also educational technology faculty members work with methods faculty members to provide guidance to pre-service teachers and to evaluate performance in field-base experiences. Moreover, methods faculty and mentor teachers work together to provide original teaching experiences to pre-service teachers. The last group educational technology faculty graduate students work in field-base settings to assist mentor teachers and pre-service teachers in utilizing and integrating technology during teaching practice.

Additionally, Wright, Wilson, Gordon, and Stallworth (2002) stated that the partnership between university faculty and secondary school faculty aids to close gap between the potential of technology and the reality of classroom use.

Brush, et. al. (2003) conducted a study to evaluate field-base model. 100 pre-service teachers contributed to study. 94 % are female and 91 % are between the ages 20 and 25. They indicated that 86 % of the pre-service teachers stated that they feel confident about integrating technology in their subject areas lesson. Moreover, 92 % of the pre-service teachers feel that they could develop technology integration ideas based on a given learning goal. Finally, the authors stated that 92 % of the pre-service teachers believed the importance of a variety of technologies to enhance students learning. On the other hand, the authors found that 53 % of the pre-service teachers thought that technology courses were not train them well. Moreover, 36 % of the pre-service teachers needed more training on technology integration into classrooms.

Furthermore, Brush, et. al. (2003) mentioned the barriers of technology integration during student-teaching. They can be listed as: (a) large class size, (b) lack of computer labs access, (c) lack of technology support, (d) lack of time, (e) lack of teachers' technology skills, and (e) lack of software availability. Cuckle and Clarke (2002) also stated another barrier for technology usage in student-teaching, that is, restricted access to equipments especially in classrooms.

Dawson and Norris (2000) investigated another field-base technology training model which is "Technology Infusion Project". TIP is a collaborative project between Albemarle Country Public Schools and the University of Virginia's Curry School of Education. A central component of this project is one to one collaboration between student-teacher and inservice teachers. In the project, pre-service teacher take an introductory computing course addressing integration of educational technologies into K-12 educational environments. And also, pre-service teachers' are visiting their assigned class. Finally, they start to work in their assigned classrooms. Dawson and Norris (2000) found that pre-service teachers' technology confidence level increased as a result of TIP experiences and the authors also added that TIP experiences also help pre-service teachers to be familiar with value of having and using technology related knowledge in the teaching profession. Furthermore, the

authors mentioned that pre-service teachers' knowledge and skills about content specific instructional uses of technology and classroom management issues of technology are improved. Finally, Dawson and Norris (2000) concluded that "TIP [Technology Infusion Project] help preservice teachers develop attitudes, knowledge, and skills necessary to become effective technology-using teachers" (p. 10)

2.2.3. Essential Technological Conditions for Teacher Education Institutions

Willis and Mehlinger (1996, p. 1015 – 1016) states essential technological conditions for teacher education institutions. They also mention that there should be no acceptance of lower standards in colleges of education. The essential conditions are listed that:

1. The college requires a fully integrated, networked, and switched voice, data, and video system that make available full capacity and access to all classrooms and offices within buildings and to other locations in the world. The buildings infrastructure must meet current needs and also it will satisfy future needs. Infrastructure must be compatible with most of the manufacturers' products so it can be easily up-to-dated and upgraded. The individual user should have control on infrastructure as much as possible with required constraints for security and cost of particular services.
2. All administrative units of college should be competent user of technology provided. Also, each department and administrative unit should have fax and hard copy capabilities. Admission information and students records should be effortlessly accessible.
3. Faculty offices should have required technologies to send and receive voice, data, and video. Each member of the faulty should access electronic and voice mail from not only their offices but also their homes.
4. All classrooms should have projection systems that provide all applications including to deliver digital interactive video real time lecturers from distance and computer based demonstration systems that consists of data, graphics, slides, and CD-ROM. These systems should be easily managed.

Faculty members should use their laptops in these systems without any problems for their presentations. Also all classrooms are supported with wireless communication technologies so that communication will be possible one classroom to another.

5. A college of education must have laboratories for course(s) and lesson design and development. Laboratories must have high standard technologies and authoring tools to prepare their own lesson plans, instructional materials and whatever related their teaching profession. In addition, it must have studios or classrooms to realize distance learning applications as well as full-motion, two-way video. Also it must have also places to apply microteaching strategy.
6. Student must access to computers and printers in not only day but also evening to do their work. Also, students must reach on-line databases and search library documents from their dormitory rooms or homes.
7. The library must have collection of high-quality courseware, educational software, programs used in schools. It should support electronic search tools that support access to information and data sources worldwide. It should collect faculty-generated products for usage of students such as CD-ROM programs on important teaching moments or videotapes of guest lecturer, and courseware.
8. A college of education must invest the most portion of its budget for technology support and faculty/staff development. It must employ a technical expert capable of managing current infrastructure. Faculty and staff development must be supported to use technological infrastructure effectively.

Obtaining of essential technological resources is not always resulted with effective technology training. That is, the more amount quantity of technological resources does not mean that the more the quality consequences of technology training (Willis and Mehlinger, 1996). There are a number of factors influencing technology in teacher education. Especially, considering major obstacles are needed to improve teacher training effectiveness. İmer (2000) stated that schools of education in Turkey had low ratio of number of students and number of computers.

Also, especially, Süleyman Demirel University, Burdur School of Education cannot meet standards completely proposed by Willis and Mehlinger (1996). About 3 or 4 instructors have one computer. Only 30 computers can be used by students. Two electronic classrooms exist but instructors and students cannot use frequently these classrooms due to loaded schedule. Library has too limited electronic resources. Students previous works do not archived. Each room has only one internet connection socket. There is not printer for usage of students. Students can access computers in limited time. Such as, they can only use computer laboratories if there is no lecture in weeks. Also, they can use at between 09:00 and 17:30 at weekends.

2.2.4. Obstacles to Technology Integration

There are enormous amount of reported obstacles to technology and teacher training in the literature. They should be covered to train pre-service teachers fully capable of technology user in their prospective jobs conditions.

One of these obstacles is lack of resources (OTA, 1995; Topp, et. al., 1995, as citied in Abdal-Haaq, 1995; Baron & Goldman, 1995, as citied in Abdal-Haaq; 1995, Hofmann, 1996; Conlon & Simpson, 2003; Murphy & Greenwood, 1998; Williams, et. al., 2000). OTA states that colleges of teacher education have little resources. Computer companies and governments should support institutions for required technological equipments. Especially, limited budget of governments do not always allow supporting colleges of educations continuously. Supporting technological resources are not effective solution of this problem because upgrades and maintaince of these resources also caused new loading for budget of colleges of education. Also, Kortecamp and Croninger (1996) mentions high cost of obtaining, sustaining and upgrading technological resources is the most problematic theme of technology infusion. Williams et al and Hoffman also states that lack of resources also is important factor preventing use of ICT in schools.

The other obstacle is staff/educator/faculty comfort level, attitudes, and training (OTA, 1995; Conlon & Simpson, 2003; Williams, et. al., 2000; Topp, et. al., 1995, as citied in Abdal-Haaq 1995; Baron & Goldman, 1995, as citied in Abdal-Haaq, 1995; Kortecamp & Croninger, 1996; Hofmann, 1996). Abdal-Haaq (1995)

states that instructors' doubt about the pedagogical validity of utilization of new technologies is an important barrier for technology integration. OTA (1995) report also mentions that most of teacher educators think that ICT is important for K-12 and teacher education so they have positive attitude towards technology in education. But this positive attitude cannot be used efficiently in well prepared technology action plan. Therefore, there is a requirement for effective ICT policy otherwise Murphy and Greenwood (1998) states it will be an obstacle. The comfort level of educators is another critical factor for technology integration. In studies of Conlon and Simpson (2003) and Williams et al (2000), lack of skills is proposed as barrier to use information technologies. The educators comfort level should be improved by more training.

Staff and institutional support is an another obstacle (OTA. 1995; Hofmann, 1996; Topp, et. al., 1995, as citied in Abdal-Haaq, 1995; Baron & Goldman, 1995, as citied in Abdal-Haaq, 1995; Conlon & Simpson, 2003). OTA (1995) states that most of the colleges of education have full-time computer lab manager or full-time technician. Also, they use graduate students for supplementary support. Especially, technical support is necessary for not only maintenance of technological systems but also supporting pre-service teachers during working with technology such as material development, writing technology-enriched lesson plans and whatever related to instructional technology. Technical support staff can also aid pre-service teachers while they are learning technology. There is a requirement to improve technology integration by increased institutional support. The incentive systems cannot work effectively to develop innovative technology usage in higher education so institutions should focus on different types of support.

Moreover, unclear definition of use plan, goals and expectations of technology training is a different obstacle for teacher education (Hofmann, 1996, Topp et al, 1995, as citied in Abdal-Haaq, 1995, Baron & Goldman, 1995, as citied in Abdal-Haaq, 1995). All teacher training institutions should have effective technology use plan and goals. Also, institutions should state their expectations from faculty or staff about technology usage.

The lack of time for use technology is proposed as a barrier (Conlon & Simpson, 2003, Topp et al, 1995, as citied in Abdal-Haaq, 1995, Baron & Goldman,

1995, as citied in Abdal-Haaq, 1995). Conlon and Simpson (2003) proposed teachers have too many priorities and limited time so they cannot manage all of these effectively. Authors also stated lack of motivational examples of classroom utilization and materials of ICT as problem inhibiting use of ICT.

The continuous argument about the best approach of teacher technology training among teacher educators is another obstacle (Abdal-Haaq, 1995). As previously mentioned, there are two types of approach, stand-alone courses and technology-integrated methods courses. There are not any definite results yet about which one is effective (Gurbuz, Yildirim & Ozden, 2001).

2.3. Technology Standards

Because of wide variety of teacher training programs, outcomes of one teacher technology training program cannot be parallel with outcomes of other teacher training programs. Especially, it manifests itself in both between and within countries. For example, Leh (1998) mentions that the structure and content of introductory computer courses do vary from one university to another. Also, she proposes same result in her study conducted in 1999. Hence, there are powerful necessities for determining for standards. Standards can help teacher training institutions to not only train fully capable of technology user teachers but also define goals related to technology training. As a result of this, many studies exist related to developing standards along international, nation, state or district wide. Some examples of theses standards are going to be presented.

One of the most famous and broad standard project is International Society for Technology in Education National Educational Standards for Teachers (2001). The ISTE NETS for Teachers (2001) are focusing on preservice teacher education to define the basic concepts, knowledge, skills, and attitudes for utilizing technology in educational environments. All pre-service teachers in teacher preparation should fulfill these educational technology standards. Providing opportunities and necessary condition for pre-

service teachers to fulfill these standards are responsibility of the teacher education institutions.

Each standard defined with specific performance indicators to determine whether standards are fulfilled or not. Also ISTE proposes that performance indicators present specific outcome to be gauged during constructing a set of assessment tools. Each standard and their performance indicators are listed below:

I. **Technology Operations and Concepts:** Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:
   A) demonstrate introductory knowledge, skills, and understanding of concepts related to technology
   B) demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

II. **Planning and Designing Learning Environments and Experiences:** Teachers plan and design effective learning environments and experiences supported by technology. Teachers:
   A) design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
   B) apply current research on teaching and learning with technology when planning learning environments and experiences.
   C) identify and locate technology resources and evaluate them for accuracy and suitability.
   D) plan for the management of technology resources within the context of learning activities.
   E) plan strategies to manage student learning in a technology-enhanced environment.

III. **Teaching, Learning, and the Curriculum:** Teachers implement curriculum plans, that include methods and strategies for applying technology to maximize student learning. Teachers:
   A) facilitate technology-enhanced experiences that address content standards and student technology standards.
   B) use technology to support learner-centered strategies that address the diverse needs of students.
   C) apply technology to develop students' higher order skills and creativity.
   D) manage student learning activities in a technology-enhanced environment.

IV. **Assessment and Evaluation:** Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:
   A) apply technology in assessing student learning of subject matter using a variety of assessment techniques.

B) use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
C) apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

V. Productivity and Professional Practice: Teachers use technology to enhance their productivity and professional practice. Teachers:

A) use technology resources to engage in ongoing professional development and lifelong learning.
B) continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
C) apply technology to increase productivity.
D) use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

VI. Social, Ethical, Legal, and Human Issues: Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:

A) model and teach legal and ethical practice related to technology use.
B) apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
C) identify and use technology resources that affirm diversity
D) promote safe and healthy use of technology resources.
E) facilitate equitable access to technology resources for all students. (ISTE NETS for Teachers, 2001, available http://cnets.iste.org/teachers/t_stands.html)

The standard I-A is also proposed as students' technology standards by ISTE.

They have six extensive categories. They are listed below in details:

Technology Foundation Standards for Students

1. **Basic operations and concepts**
   - Students demonstrate a sound understanding of the nature and operation of technology systems.
   - Students are proficient in the use of technology.
2. **Social, ethical, and human issues**
   - Students understand the ethical, cultural, and societal issues related to technology.
   - Students practice responsible use of technology systems, information, and software.
   - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
3. **Technology productivity tools**
   - Students use technology tools to enhance learning, increase productivity, and promote creativity.

- Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

4. **Technology communications tools**
   - Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
   - Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.
5. **Technology research tools**
   - Students use technology to locate, evaluate, and collect information from a variety of sources.
   - Students use technology tools to process data and report results.
   - Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
6. **Technology problem-solving and decision-making tools**
   - Students use technology resources for solving problems and making informed decisions.
   - Students employ technology in the development of strategies for solving problems in the real world. (ISTE NETS for Students, 2001, available http://cnets.iste.org/students/s_stands.html)

Teachers should be aware of these standards while they are designing, developing, and assessing technology enriched teaching and learning settings.

As mentioned before, providing necessary conditions are compulsory process for institutions to meet the teacher standards. Furthermore, ISTE recommends some features of teacher training for realization of meeting standards. These features are listed below:

Shared Vision: There is proactive leadership and administrative support from the entire system.
Access: Educators have access to current technologies, software, and telecommunications networks.
Skilled Educators: Educators are skilled in the use of technology for learning.
Professional Development: Educators have consistent access to professional development in support of technology use in teaching and learning.
Technical Assistance: Educators have technical assistance for maintaining and using the technology.
Content Standards and Curriculum Resources: Educators are knowledgeable in their subject matter and current in the content standards and teaching methodologies in their discipline.
Student-Centered Teaching: Teaching in all settings encompasses student-centered approaches to learning.

Assessment: There is continuous assessment of the effectiveness of technology for learning.
Community Support: The community and school partners provide expertise, support, and resources.
Support Policies: School and university policies, financing, and rewards structures are in place to support technology in learning. (ISTE Essential Conditions for Teacher Preparation, 2001, available http://cnets.iste.org/teachers/t_esscond.html)

Kirschner and Davis (2003) conducted a study about composition of pedagogic benchmarks for ICT in teacher training programs. They proposed five benchmarks for good pedagogical practice models.

In Benchmark 1 – Personal ICT Competencies, the authors stated that teacher training programs should train pre-service teachers to be proficient personal users of ICT. They presented minimal fundamental competencies. Teachers should use:

- office applications such as word processing, spreadsheets, databases, drawing packages and a simple web-page editor;
- resource tools such as CD-ROMs, the internet, web portals, different types of search engines;
- communication tools such as email, listserv and synchronous chat. (p. 141).

They also explained that teacher training programs should train pre-service teacher for developing skills to utilize ICT effectively for:

- communication between and within students groups;
- communication between and with other teachers;
- continuing their own education once they have completed their studies, including self-assessment of own learning and learning needs. (p. 141).

In Benchmark 2 – ICT as a Mindtool, they stated that teacher training programs should facilitate pre-service teachers to be able to use ICT as a mindtool. Teachers should develop competencies to use mindtools for:

- cooperation (between teachers, teacher educators and student teachers);
- collaboration on pedagogical projects (with other teachers, experts and designers, etc.). (p. 142).

In Benchmark 3 – Educational/Pedagogical Use of ICT, they state that teacher training programs should train pre-service teachers to able to use of ICT in broad diversity educational/pedagogical environments. Teachers should have fundamental qualifications to use ICT effectively for:

- collaboration/cooperation in both asynchronous (email, discussion lists, web-based forums, listservs) and synchronous (video, audio, chat, whiteboard, file sharing);
- resource-based learning (informing, asking questions, evaluating and comparing). (p. 142).

In Benchmark 4 – ICT as a Tool for Teaching, they stated that pre-service teachers are proficient not only theoretical but also practical dimension of utilization of ICT. Teacher should also have competencies in:

- adapting technologies to good/better teaching such that the teaching/learning can change for the better;
- planning for relevant individual, group and whole-class activities;
- preparing and producing learning materials with the help of ICT;
- dealing with the possibilities/consequences of using ICT;
- teaching and learning specialists subject(s) with ICT;
- team teaching in situ or at a distance. (p. 143).

Finally in Benchmark 5 – Social Aspects of ICT Use in Education, The authors states that inservice and pre-service teachers should have competencies to:

- engage as member of a (wired) school community;
- provide a role model of good ICT practice;
- learn to share and build knowledge;
- understand the implications of the information age on schools and schooling, and
- realise and discuss the impact of ICT on society. (p. 143).

These five benchmarks are developed based on 26 good cases from different geographical regions acquiring successful implementation of technology training (Kirschner & Davis, 2003). 3 of 26 are from Australia, one of 26 is from Canada, 6 of 26 are from Scandinavia, 4 of 26 are from Europe, one of 26 is from Israel, 6 of 26 are from United Kingdom, and finally 5 of 26 are from USA. In closure, these benchmarks are composed from practical dimension of technology training. Therefore, they are convinced as valuable standards.

The last sample is from Australia. Queensland State expressed professional standards for teacher to use ICT for personal and educational purposes (Pearson, 2003). These standards are explained as statements below:

- Determine students' learning needs in relation to the use of available information and communications technologies;

- Select learning strategies and resources based on the use of information and communication technologies to cater for students' learning needs and styles;
- Create learning experiences in which students actively use information and communication technologies to organise, research, interpret, analyse, communicate and represent knowledge;
- Evaluate the effectiveness of teaching and learning approaches based on the use of information and communication technologies;
- Use information and communication technology tools to access and manage information on students learning. (Education Queensland, 2002, p. 17, 18).

In Turkey, Ministry of National Education performed a study to develop general and common teacher competencies. These competencies are determined in three main dimensions general background knowledge and skills, subject-matter, and education/instruction competencies (Öğretmen Yeterlilikleri, 2002). The first dimension general background knowledge and skills can be explained as a teacher's knowledge and skills about other disciplines to support his/her subject matter and education/instruction knowledge and skills. History, geography, citizenship, Turkish, mathematics, philosophy of science, psychology, sociology, economy, art, civil defense can be shown as sample for general background knowledge and skills. The second dimension subject matter can be explained as a teacher's knowledge and skills about his/her teaching subject. A teacher has to know concepts, theories, assumptions, discussions, and research techniques of his/her subjects matter. The last dimension; educational/instructional competencies are knowledge and skills of a teacher about teaching and learning. This dimension has to be realized both theoretical and practical. Otherwise teachers know so many things about education and instruction but they cannot utilize them. The educational/instructional competencies are divided into 14 competencies and 206 sub-competencies. They are given in below:

a. being familiar with the 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.

The third dimension is related to technology competencies of teachers (Öğretmen Yeterilikleri, 2002). Especially, information and communication technology competencies are not considered as separate title. It is diffused in other 14 competencies such as designing computer screen, managing computer during instruction, and etc. On the other hand, there is not detailed definition of technology standards for teachers like ISTE NETS for Teachers (2001), Education Queensland (2002), Kirschner and Davis (2003). Therefore, there is a need to develop detailed technology standards for teachers in Turkey.

2.4. Technology Competency Studies

Hughes (1997) conducted a study to delineate English initial teacher education students' information technology competency. He collected data from three group 1993/4, 1994/5 and 1995/6 students. He wanted the students to rate their level of IT competency and computing expertise on a 1-4 scale, one is defined as expert, four is defined totally beginner. 81 % of the students stated their expertise as average to total beginner in 1993/4. 86.3 % of the students in 1994/5 stated that they are average to no expertise. In 1995/6, the authors changed their instrument. They asked seven questions about low level IT skills (e.g. loading and running a computer, using a keyboard, saving and loading work, storing, sorting and retrieving information, and using word processor) and five questions about the production of charts and graphs, manipulation of images, sending and receiving messages; accessing the World Wide Web and information retrieval, e.g. CD-ROM. The authors want students to rate themselves on a 1 (low) – 5 (high) scale. In the lower

level, 42.8 % of the students rated themselves between 1 or 2, whereas 50 % of them rates between 4 or 5. On the other hand, in the newer IT skills, 78.5 % of the students rated themselves in 1 or 2 but only 14 % of them put themselves in 4 or 5.

Iding, Crosby and Speitel (2002) carried out a study about teachers and technology. Their participants are 78 pre-service and practicing teachers from special education and science education courses at a university in the Western United States. They designed a 25-item questionnaire to collect data. One of the major areas in the instrument was self-assessment of levels of computer proficiency. 97 % of the students have computer at home. 82 % of the students have internet access at home. Finally, 90 % of the students have printer at home. Moreover, 65 % of the students stated themselves as average, 12 % of them stated as high, and 14 % of them stated as fair, or using with assistance in their level computer knowledge. Nobody described themselves as having poor computer knowledge. Furthermore, the participants indicated that the most frequently used technology was e-mail.

Bennett et al (1997) compared year 2 and year 3 students' levels of confidence to teach with IT during school experience. They found that a number of Year 2 students felt confident (40 %) is higher than a number of Year 3 students (20 %). And also same result is valid for students felt relaxed. 45 % of the Year 2 and 30 % of Year 3 students felt relaxed. In contrast, 42 % of Year 3 and only 12 % of Year 2 students felt uneasy. They also indicated that entry prior IT experiences of Year 2 Bachelor of Education students. 50 % of the students had used word processing, and 25 % of the students had also experience about data handling. In addition, the rest of the group utilized design or modeling software either professionally or in education.

Hornung (2002) carried out a research to delineate student teachers preparedness, attitudes and self-efficacy on computer technologies use. The author indicated that student teachers described their preparedness level as slightly above prepared and prepared, $M = 1.58$. Score 1 is very prepared, 2 is prepared, and 3 is not prepared. Also, the author presented observation data collected by student teachers' supervisors. The supervisors reported student teachers' preparedness level as below prepared, $M = 1.39$. But there was no difference between student teachers' perceived and supervisors' observed scores. It can be summarized that student teachers felt moderately prepared to use computer technologies. Furthermore, Hornung (2002)

demonstrated that 87 % of student teachers (N = 310) felt prepared and very prepared to use computer technologies. There was a close result with supervisors' observations. 96 % of the supervisors (N = 140) reported student teachers prepared and very prepared.

Snider (2003) conducted a study to examine Learning and Integrating New Knowledge and Skills (LINKS) technology projects. This project is support by U.S. Department of Education Preparing Tomorrow's Teachers to Use Technology (PT^3). These project redesign teacher training at Texas Woman's University to address technology proficiencies desired by the public schools, recommended by NCATE, and delineated by professional associations. Snider (2003) mentioned that the primary goal of PT^3 grant is to train technologically proficient teachers. Therefore, the author selected self-evaluation instrument aiming to measure pre-service and in-service teachers' developments in basic and more advanced skills. Snider (2003) presented these skills in detail:

- Basic computer use (BCU): basic computer operation, file management, word processing, spreadsheet use, database use, graphics use, hypermedia use, network use, student assessment, and ethical use understanding. This instrument is administered to preservice teachers
- Advanced computer use (ACU): instructional software use, information literacy skills, modification of instructional delivery, assessment, individualization of the educational program, professional growth and communication, and research and evaluation of technology use
- Internet use (IU): e-mail and electronic lists, World Wide Web, search tools, newsgroups and gophers, obtaining and using files, real-time and push technologies, Web page construction, learning using the Internet, and Netiquette. (p. 238).

Snider (2003) applied technology proficiency instrument as both pre and post test to delineate development of technology proficiency of pre-service teachers as a result of technology training. Snider (2003) found that prospective teachers described themselves as more proficient technology user in accordance with basic, advance and Internet use skills on post-test than on the pre-test. Also, there are significant differences between pre and post-tests results. The similar results indicated by Lao (2001) that pre-service teachers confidence level was increased as a result of technology training in an educational computing course.

Simpson et al (1998) conducted a research about the ICT competence and confidence of pre-service students on course entry and exit. They used two independent population Bachelor of Education students who were not entered course yet and 4th year Bachelor of Education students completed their 4 year degree courses. They mentioned that the most of the incoming students (over 80 %) stated that they had had prior information technology use experience and the majority of the Bed students had positive attitudes towards ICT in education. They continued that the consisted results were observed from 4th year Bed students concerning attitudes. But, a significant minority of 4th year students stated dissatisfaction form their course experiences though the courses developed many of the students' basic skills word processing and spreadsheets. Furthermore, Simpson et al (1998) found that none of the institutions could provide pre-service teacher with adequate pedagogical utilization of ICT.

İmer (2000) performed a study among schools of education at 32 universities in Turkey to indicate teacher candidates' qualifications about computer and computer use in education. She found that the schools of education could develop pre-service teachers' computer skills at moderate level (N = 68, M = 44.85 out of 95, S = 9.80). Also she proposed that the schools of education could not train pre-service teachers enough to use computers in educational environments (N = 68, M = 29.05 out of 70, S = 8.16). Furthermore, she indicated that there is a significant difference concerning computer use qualifications among schools of education in accordance with their technological resources. Schools with enough technological resources have higher score than schools with moderate and not enough technological resources. However, she mentioned that there is not a significant difference concerning computer use in education qualifications among schools of education in accordance with their technological resources. Lindo (2001) also conducted a survey and he found that the vast majority of schools of education in USA develop required standards to train technology competent teachers based on NCATE/ISTE standards.

Namlu and Ceyhan (2002) carried out a study to delineate computer anxiety of students at Anadolu University, School of Education. They defined computer anxiety as dependent and computer competency as independent variable. They found that 36.5 % of the students felt not competent, 46 % of them felt moderately

competent, and 17 % of them felt competent computer user. They found there is a significant difference among these three competency groups. Finally, they indicated that computer competency is the most useful predictive factors of computer anxiety as a result of regression analysis. It accounted for 18.3 % of the total variance.

Nanasy (2001) indicated that pre-service teacher participated in the study felt competent teaching to their students. 84.7% of tem stated they were competent in teaching word processing; 78.1 % of them felt competent in teaching how to use email; and 76.6% of them proposed that they were competent in teaching students how to use the Internet. Only 28.5 % of them mentioned feeling competent in teaching about educational software; 29.9 % of them felt competent teaching how to use presentation programs; and 17.5 % of them reported that they felt competent teaching desktop publishing. Moreover, a smaller amount of pre-service teachers (9.5%) felt competent teaching database management; 7.3 % proposed a competency in teaching website design; and 3.6 % of them delineated that they felt competent enough to teach teleconferencing. Nanasy (2001) also investigate whether pre-service teachers felt comfortable or not during working with students and computers. The most of pre-service teachers (75.2%) agreed. A minority of them (10.9%) disagreed and some of them (13.9 %) stated uncertainty.

Haderlie (2001) conducted a study about pre-service teachers' achievements of educational technology standards. She asked four questions to indicate teaching with technology preparedness level of pre-service teachers. First question is about feeling to use existing teacher centered technology to support traditional learning environments and experiences. She found that 55.77 % of the participants stated themselves as somewhat prepared and more than 33 % of the participants felt well prepared for this. Second question is about supporting students' productivity traditional classroom centered learning environments and experiences. She indicated that 50 % of the participants felt well prepared and 47.12 % of the participants felt somewhat prepared for this. Third question is about making technology is integral part of curriculum through cooperative, project-based student centered learning environments and experiences. 62.50 % of the participants stated themselves as somewhat prepared and less than 33 % of the participants felt well prepared to do this. The fourth and last question is about creating new technology enhanced learning

environments and to discover innovative and effective uses of technology. She revealed that 24.04 % of the participants did not feel well prepared and 59.62 % of the participants stated themselves as somewhat prepared for this. Finally, Haderlie (2001) mentioned another critical point that there was not a significant difference between entry students of the program and students had completed. Furthermore, pre-service teachers did not think that their coursework during training developed their skills of integration technology in educational environments.

Krueger, Hansen and Smaldino (2000) proposed technology competency levels for pre-service teachers. Theses levels are (a) pre-novice, (b) novice/awareness, (c) apprentice/ professional skill, (d) practitioner/curricular integration, and (e) expert/reflection. They also stated that these standards were for not only to determination of incoming students' technology level but also development of students' technology proficiency.

Baylor and Ritchie found that the most important predictive of teacher's competency level is teacher's openness to change as a result of forward stepwise regression analysis (R^2 = .164). They finally discussed that if teachers are open to change, they are more willingly to try innovative technologies and these experiences also increase their technology competency level consequently.

Rovai and Childress (2002) indicated that there was a significant weak positive relationships between computer confidence and computer experience, r = .24. They found that there was a significant moderate relationship between computer confidence and computer knowledge, r = .40.

In this study, technology self-competency is defined based on concept of self-efficacy. Therefore, it is a necessity to review literature about self-efficacy and especially computer self-efficacy.

2.5. Self-Efficacy

Self-efficacy is defined by Bandura (1994) as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (p. 71). Bandura stated that self-efficacy beliefs are important factor for people to decide how to feel, think, motivate themselves, and

behave. Bandura (1997) also stated that self-efficacy is not based on skills what people possess. Actually, it is judgment about what one can do with current skills. He continued that without knowledge or skills performance is not possible, but without self-efficacy performance cannot be strived (as citied in Ertmer et al, 2003).

Ertmer et al (2003) proposed that teachers who are in high level of efficacy concerning teaching with technology are more likely to participate enthusiastically, making more efforts, continuing longer on technology related activities than teachers who are in low level of efficacy.

There are four sources of self-efficacy to develop it (Bandura, 1994). These are mastery experiences, vicarious experiences, social persuasion, and physiological and affective states. The mastery experiences, also it is defined as the most powerful way, develop positive beliefs in one's efficacy as a result of successful operations of behaviors. Otherwise, failures weaken it. The second powerful way is vicarious experiences other peoples' successful operations of behaviors. That is, it is role-modeling. The third one is verbal persuasion. People belonging necessary capabilities to perform a behaviors can motivate and develop one's self-efficacy. The last one is physiological and affective states. If there is stress, negative emotions, or unsuitable physiological conditions, they should be reduced or coped with to develop self-efficacy.

Albion (1999) stated that in accordance with self-efficacy theory, the most appropriate method to develop teachers' self efficacy to use computers would be to provide them with training and support to utilize successfully with computers in their classrooms. Furthermore, he proposed that enactive or mastery experiences could be supported by field-based experiences and vicarious experiences could be provided with schools of education faculty usage in their courses. Moreover, verbal persuasion could be used by faculty unless teacher candidates have occasion to do suitable behaviors. Also, Torkzadeh, Koufteros, and Pflughoeft (2003) mentioned that training programs should be provided to develop self-efficacy because they are positive impact on it. Hence, training programs support individual differences that affect attitudes and users' productivity.

Deborah and Higgins (1999) found that computer self-efficacy is strong predictor of individual's computer usage. They indicted that self-efficacy explains a

total of 18 % of variance in an individual's computer usage as a result of regression analysis. Moreover, Torkzadeh, Koufteros, and Pflughoeft (2003) stated that computer self-efficacy has potential effect on computer usage and it is therefore important to investigate it. Another study is indicated that self-efficacy shows significant positive effect on clerical/management (e.g. grade reporting, word processing, and e-mail), academic (e.g. drill/practice, remediating deficiencies, improving writing skills, and challenging bright students) and advanced (web-page development and desktop publishing) use of computers (Piper & Yan, 2001). And also Nanjappa (2003) found that the more computer self-efficacy caused the more positive teacher technology beliefs.

Watson (1997) conducted a study about pre-service teachers' views on their information technology education. He found that percentage of females (more than 20 %) who described themselves as novice are more than percentages of male (less than 20 %). And also he mentioned that the percentage of females (about 3 %) who described themselves as expert considerably lower than males (about 20 %). In contrast, the percentage of females who described themselves as average (about 70 %) is more than males (about 60 %). It can be summarized from Watson's study that the most of the pre-service teachers felt themselves at average level concerning computer self-efficacy. Torkzadeh, Pflughoeft, and Hall (1999) performed another study on business undergraduate students concerning computer self-efficacy. They applies self-efficacy questionnaire before and after training. That is, it is a pre-test and post-test research design. They divided computer self-efficacy into four skills beginning, advance, file management, and mainframe skills. Males' computer self-efficacy is higher than females except for mainframe skills in both pre and post tests. Mainframe skills are logging in, off, and working a mainframe computer. The authors also found that students' computer self-efficacy are improved as a result of the training. Furthermore, the other study by Lynch (2001) found that females had less technology skill self-efficacy than males.

Novick (2003) conducted a study to define relationship between computer self-efficacy and women pre-service teachers' views about role and utilization of computer technology in classrooms. The author indicated that women had high level computer self-efficacy in contrast to studies of Watson (1997), Torkzadeh,

Pflughoeft, and Hall (1999), and Lynch (2001). She continued that e-mail and using Internet shown highest level among other domains of ISTE. She stated that there is a significant positive relationship between computer self-efficacy and intention to integrate technology in K-12 classroom. Novick (2003) indicated that the most influential sources of development self-efficacy related to computer use are emotional states and verbal persuasion. Finally, she concluded that access and use of a home computer is the most dominant mastery experience for women pre-service teachers.

Hornung (2002) carried out a research to delineate student teachers preparedness, attitudes and self-efficacy on computer technologies use. The authors mentioned self-efficacy scores as well. The author indicated that student teachers described their self-efficacy level as close to strongly agree, $M = 1.12$. Score 1 is strongly agree, 2 is slightly agree, and 3 is slightly disagree, and 4 is strongly disagree. Also, the author presented observation data collected by student teachers' supervisors. The supervisors reported student teachers' self-efficacy level as close to strongly agree, $M = 1.15$. But there was a no difference between student teachers' perceived and supervisors' observed scores. It can be concluded that student teachers computer use self-efficacy is high. Moreover, the author stated that 87 % of student teachers ($N = 310$) strongly agreed that they have high self-efficacy to use computer technologies. There was a lower result with supervisors' observations. 75 % of the supervisors ($N = 140$) strongly agreed that student teachers have high computer self-efficacy.

Chao (2001) conducted a computer self-efficacy study on pre-service teachers in Taiwan. He found that there was no significant difference on computer self-efficacy in accordance with gender. He also indicated that there were significant differences due to computer experience, attending computer training course, and computer ownership. He continued that there was a significant correlation between computer self-efficacy and computer experience. The study revealed that pre-service teacher attended a computer training course had higher computer self-efficacy than not attended. Also, a same result exits for computer ownership variable that pre-service teachers with computers had higher computer self-efficacy than without computer. Furthermore, attending computer training course and possessing computer

produces more computer experience. Nanjappa (2003) found that computer self-efficacy is positively related to computer experiences.

Askar and Umay (2001) carried out about preservice elementary mathematics teachers' computer self-efficacy in Turkey. They found that students' computer self-efficacy is relatively low. They indicated that one the reason of this result is lack of computer experience of the students. They also proposed that self-efficacy on computers increases with more computer experience and usage as result of positive and significant correlation between variables, $r = .42$ and $r = .37$ respectively. On the other hand, there is a low significant positive correlation with access to home computers and computer self-efficacy, $r = .18$. Another similar study by Akkoyunlu and Orhan (2003) conducted in Turkey. They investigated relationships between demographics and computer self-efficacy on 159 4th year students at Eskişehir, Hacettepe, Dokuz Eylül, Karadeniz Teknik and Marmara Universities' Computer Education and Instructional Technology departments. They found that there is not a significant difference between males and females in accordance with basic computer skills but there is a significant difference between males and females in accordance with advanced computer skills. Males' computer self-efficacy is more than females in advance computer skills. They also indicated that overall level of students' efficacy on computer is high.

Ropp (1999) conducted a study that accepted computer self-efficacy and technology proficiency as separate variables. Computer self-efficacy includes essential elements of self-efficacy as applied to computer learning. Technology Proficiency Self-Assessment (TPSA) includes four domains; (a) e-mail, (b) World Wide Web, (c) integrated applications (e.g. Apple Works), and (d) integrating technology into teaching. She proposed that TPSA was a contextualized gauge of computer self-efficacy. Ropp (1999) found that the correlation between technology proficiency and computer self-efficacy was .83 and significant at $p < .001$. This means that technology proficiency increases with computer self-efficacy. Furthermore, she indicated that pre-service teachers showed significant improvement on their proficiency ($t = 5.01$, $p < .001$) and computer self-efficacy ($t = 2.02$, $p < .001$) as a result of training.

CHAPTER 3

METHOD

3.1. Introduction

The research design and procedures used in this study are explained in this chapter. This chapter has five main parts. The first part explains participants of the study; the second part explains research design and variables of the study; the third part explains development procedures and content of instrument; the fourth part explains data collection procedures, validity and reliability issues of instrument and the last part explains analyses of data.

The purpose of this study is to reveal pre-service teachers' technology competencies during their four-year teacher training program at Burdur School of Education, Süleyman Demirel University in Turkey. In accordance with the purpose of study, the following questions were going to be investigated:

1. What are pre-service teachers' perceived self-competency levels concerning technology usage in educational environments, basic and advanced computer skills?
2. Is there any significant relationship between technology use self-competency scores and demographic characteristics (gender, computer ownership and internet access, and year(s) of computer use) of pre-service teachers?
3. How accurately can technology use self-competency be predicted from a linear combination of demographic characteristics of pre-service teachers?
4. Is there any significant difference between demographic characteristics (gender, computer ownership and internet access, and year(s) of computer use of pre-service teachers and their perceived self-competency level to use of technology?
5. What are pre-service teachers' perceptions regarding to: (a) technology courses, (b) infrastructure of school of education, and (c) their faculty members' use of technology?

6. Is there any significant difference among years of pre-service teachers' perceived self-competency?

3.2. Participants

This study focused on pre-service teachers in Primary School Teacher Education (PSTE), Elementary Education Department, Burdur School of Education, Süleyman Demirel University. Consequently, participants could be stated as convenient sample in the study.

A convenient sample is effortless accessible group of persons using in a study (Fraenkel & Wallen, 2000). The most important reason why the researcher chose this sample is easily access to all pre-service teachers in Burdur School of Education. Fraenkel and Wallen (2000) also mentioned the disadvantage of the convenient sample that it cannot be regarded as representative sample.

PSTE program has two types of program; first type and second type. There were not any differences between programs with respect to faculty, facilities, curriculum, content of courses, types of examinations. Moreover, all students were graduated from the program by getting same degree and certificate. The course schedules were the only difference between the program types. First program starts at 08:15 and finish 16:55; subsequently second program begins at 17:05 and end 22:25.

PSTE program had 1341 students from all classes. 1086 (81%) students contributed the study voluntarily. Seven of the students did not write their gender and 81of the students did not state their years of computer use therefore they could not be used for descriptive statistics. Table 3 shows the description of the students in accordance with gender, years and program type, having computer, having internet access, number of computer courses taken, and years of computer use of students in 2003 – 2004 spring semester. Table 3 illustrates that 262 (24%) of the students are first year, 264 (24%) of the students are second year, 288 (27%) of the students are third year and 265 (24%) of the students are fourth year. In addition, 435 (40%) of the students are male and 644 (60%) are female. With respect to programs, first program type students are 600 (55%) and second ones are 479 (45%). Moreover, 278 (25%) of the students had home computer but 808 (75%) of the students did have not

computer. Finally, 165 (59%) of the students had computer with internet access at home.

In PSTE program, there are three compulsory technology courses: (a) Computer Literacy, (b) Fundamentals of Information Technology and (c) Instructional Technology and Material Preparation. Number of computer courses taken in Table 1 was showed that pre-service teachers were not intended to take additional technology courses because only 95 (8 %) of the students enrolled 4 and 5 courses. Four or five courses enrolled students preferred elective technology courses such as (a) Internet Applications in Education I or II and (b) Preparing Instructional Materials on Computer.

Finally Table 3 demonstrated that 129 (13%) of the students have been using computer for less than one year. 336 (%33) of the students have been using computer for one or two years. 397 (40%) of the students have been using computer for three or five years. Finally, 143 (14%) of the students have been using for more than five years. 81 of the students did not stated their years of computer use.

Table 3. *The Description of Participants*

	1st Year		2nd Year		3rd Year		4th Year	
Variable	F. P.	S. P.	F. P.	S. P.	F. P.	S. P.	F. P.	S. P.
Gender								
Male	61	58	54	54	55	43	70	40
Female	71	72	82	74	111	79	96	59
Home Computer								
Yes	32	46	28	43	35	32	37	25
With Internet	20	27	16	22	19	18	22	21
Without Internet	12	19	12	21	16	14	15	4
No	100	85	108	85	135	92	129	74
# of Computer Courses								
1	132	131						
2			136	128				
3					155	113	119	77
4					15	5	32	17
5						6	15	5
Years of computer use								
Less than 1 year	46	37	7	4	8	8	10	9
1 - 2 years	30	44	75	64	47	34	22	20

Table 3 continued

Variable	1st Year		2nd Year		3rd Year		4th Year	
	F. P.	S. P.	F. P.	S. P.	F. P.	S. P.	F. P.	S. P.
3 - 5 years	31	30	37	38	72	54	91	44
More than 5 years	16	10	11	14	26	24	25	17

Note. F.P. = First Program Type, S.P. = Second Program Type

Independent sample *t*-tests were performed on measurements of perceived self-competency to use technology for each year. The purpose of t-test was assessment of participants' homogeneity in accordance with program type. The t-tests results exposed that there were no significant differences between first and second program types in first year, t (261) = - .274, third year, t (292) = - .042, and fourth year, t (263) = - .547, p = .05. On the other hand, there was a significant difference between two program types in second year, t (262) = 2.096, $p < .05$. As a result of these analyses, first, third and fourth years accepted as combined groups, but second year accepted as two separate groups. Second year first program type has 136 and second program type has 128 students.

3.3. Design

The design of this study was a non-experimental descriptive study utilizing a survey instrument to collect data. Survey used for two purposes in this study. First one was collecting descriptive information about target population and second one was scrutinizing relationships between various factors (Rosier, 1988).

This study has four independent and one dependent variable.

3.3.1 Independent Variables:

1. Gender: It is a categorical variable with two levels (1 = male, 2 = female).
2. Year: It is a categorical variable with four levels (1 = first year, 2 = second year first program type, 3 = third year, 4 = fourth year, and 5 = second year second program type).

3. Computer ownership and internet access: Researcher collected this variable as two separate variables having computer (1 = Yes, 2 = No) and having internet access (1 = Yes, 2 = No). Then measures of these variables were computed and recoded as one variable. This new variable is categorical variable with three levels (1 = having neither computer nor internet access, 2 = having computer but not internet access and 3 = having both computer and internet access).
4. Year(s) of computer use: It is a categorical variable with four levels (1 = less than 1 year, 2 = 1 - 2 years, 3 = 3 - 5 years and 4 = more than 5 years).

3.3.2. Dependent Variables:

1. Technology Use Self-Competency Scale (TUSS): It is total measure of factors of instrument. The higher score on technology use self-competency, the more students feel confident concerning technology use. It contains three sub-scales; which are technology use in educational environments, basic computer skills, and advanced computer skills.

3.4. Instrumentation

Instrument's items are obtained from the web site of "Profiler" (http://profiler.hprtec.org). Moersch (2002) explained Profiler as an online survey-authoring tool financed by the U.S. Department of Education and afforded by the High Plains Regional Technology Education Consortium. More than 800 institutions used Profiler's questionnaire database to create custom surveys. The surveys help institutions to give necessary feedbacks for both individuals and groups.

81 items are chosen from Source of "Profiler" and were translated in Turkish based on criteria, appropriateness to the sample, curriculum of the teacher training program, and infrastructure of faculty of education. Profiler's items are developed in United States of America thus there were so many differences that they must be adapted to Turkey. Items are evaluated by five experts from Instructional Technology, Curriculum and Instruction, Turkish Language, Counseling Psychology and Guidance, Educational Administration field, and it was also examined by five

PSTE program students. After evaluation of items, 71 items were selected for the pilot study. Following the pilot study, 43 items were left for actual data collection.

Instrument had two sections. The first section has questions about demographics: (a) gender, (b) year, (c) program type, (d) having computer and internet, (e) years of computer use, and (f) number of courses taken related technology. The second section has *43* statements and pre-service teachers rated them regarding their feeling of competency to use technology. . Because of direct measurement of variables in the social sciences are complicated, rating scales are preferred commonly (Andrich & Masters, 1988).This section has 5 point - Likert Type scale Technology use self-competency scale is defined as 1 – the least successful condition for me, 5 – the most successful condition for me. Unless an individual feels in exactly 1 or 5, one chooses a number 2, 3, or 4.

Furthermore, the second section has three sub-sections, technology use in educational environments, basic and advanced computer skills. Basic computer skills section assessed the following contents:

1. Software and Hardware
2. Troubleshooting
3. File Management
4. Word Processors
5. Spreadsheets
6. Electronic mail
7. Internet
8. Demonstration Programs.

Advanced computer skills section assessed the following contents:

1. Printer problems
2. Operating Systems
3. Driver Software
4. Desktop Publishing
5. Usage of Scanner and Digital Camera
6. Databases
7. Web-Editor programs.

And the last section assessed use of technology with respect to following contents (ISTE - National Educational Standards for Teachers, 2002):

1. Planning and designing learning environments and experiences
2. Teaching, learning and curriculum
3. Assessment and evaluation
4. Productivity and professional practice
5. Social, ethical, legal and human issues.

3.5. Procedure

Data collection procedures explained in two sections. First section describes pilot study and its data analysis and second section describes actual data collection.

3.5.1. Pilot Study

Pilot study was conducted to assess reliability and validity of the instrument. Pre-service teachers (N = 322) from all classes from PSTE program were participated to the pilot study voluntarily. Instrument was answered at the beginning of lectures. Moreover, before responding items, the purpose of the instrument was explained. Students answered instrument in about twenty or thirty minutes.

During pre-service teachers responding instruments, the researcher observed the procedure. Main goal of observation was defining problems on the instruments such as spelling errors, unclear instructions or items and etc. Furthermore, participants allowed correcting items if they thought them with problems. Especially, four items in demographic part are revised in the light of this procedure.

3.5.2. Pilot Study Data Analysis

Explanatory Factor Analysis was performed for construct validity evidence. Green et al. (2000) proposed that the factors can match to constructs of a theory that assists us comprehend behavior.

Factor analysis might not be suitable for all kinds of data. Appropriateness of data for factor analysis could be investigated with Kaiser-Meyer-Olkin coefficient and Barlett Sphericity test. As Büyüköztürk (2003) mentioned that KMO coefficient

more than .60 and statistical significance for Barlett Sphericity test is an indication of data's appropriateness to conduct factor analysis. The results of KMO coefficient is .96 and Barlett Sphericity test, $\chi 2$ (2485, N = 332) = 16021.9, p <.001, is significant. Kaiser designated that measure higher than .90 was marvelous (George & Mallery, 2001). Hence, data were appropriate for factor analysis in the study.

Factor Analysis requires four basic steps: (a) computation a correlation matrix of all variables, and it calculates automatically In SPSS for Windows, (b) extract factors, (c) rotate factors to create a more comprehensible factor structure, and (d) interpret results (George & Mallery, 2001).

The dimensionality of the *71* items from self-competency for technology usage of pre-service teachers' measure was analyzed using principal component factor analysis. Three criteria were used to determine the number of factors to rotate: the scree test and the interpretability of the factor solution. The scree plot indicated that there are three or four factors. Consequently, three and four factors were rotated using Varimax rotation procedure separately. The rotated solutions yielded three interpretable factors, *basic computer skills, advanced computer skills,* and *technology usage skills in educational environments.* The basic computer skills factor accounted for 8.3% of the item variance, the advanced computer skills factors accounted for 5.1% of the item variance and the last factor technology usage skills in educational environment accounted for 38.5% of the item variance.

In the first rotation of factor analysis, 26 items are extracted from instrument because they are measuring both of the factors. But, 49th item was not eliminated because it is required skill, usage of word processor program, for a computer literate person. And, there is no alternative item similar to it. Its loading for Factor 1 is .455 and Factor 2 is .534 so the item accepted in Factor 2. The second rotation made with 46 items. As a result of second rotation, two items are extracted because of same reason at first one. At the last rotation, all items could be explained by three factors. 49th item showed the same results alike first rotation. The factor loadings of 44 items are shown in Table 4. Factor 1 has 22, Factor 2 has 12 and Factor 3 has 10 items. All scores of factors are ranging from .481 to .784.

Finally after factor analysis, 44 items left. 21st item also extracted because purpose of the item is overlapping 22nd item. Therefore, researcher selected the best

item; which is 22nd. Both items are related to usage of electronic mail. 22nd item was more clearly stated than the other item.

The expectation with conducting factor analysis is data-reduction, and with the aid of factor analysis numerous overlapping measures can be decreased (Green et al., 2000). In this study, researchers also used factor analysis for this purpose.

Table 4. *Factor Loadings of Each Item in The Instrument.*

	Factor Loadings		
Items	Technology usage skills in educational environments (Factor 1)	Basic computer skills (Factor 2)	Advanced computer skills (Factor 3)
36	.731		
52	.711		
54	.699		
46	.686		
45	.682		
37	.670		
62	.667		
69	.666		
42	.666		
61	.656		
66	.651		
38	.648		
47	.643		
58	.633		
55	.594		
23	.571		
71	.568		
19	.553		
11	.550		
35	.541		
56	.507		
44	.481		
06		.784	
67		.734	
51		.725	
08		.719	
01		.660	
22		.632	
26		.617	
21		.593	
04		.588	
03		.569	
49 [a]	.463	.521	
40		.496	
34			.778
18			.757
20			.745
41			.680
28			.662
24			.656
32			.650

Table 4 continued

Items	Factor Loadings: Technology usage skills in educational environments (Factor 1)	Basic computer skills (Factor 2)	Advanced computer skills (Factor 3)
50			.629
14			.613
16			.537

[a] It loaded both Factor 1 (Technology usage skills in educational environments) and Factor 2 (Basic computer skills). But, the higher factor loading considered deciding its group. Therefore, it was located in Factor 2.

Ensuing factor analysis, item analysis made on 43 items. According to Elbe's criteria, if discrimination index of an item is equal or more than .40, the item is quite operational adequately (Crocker & Algina, 1986). Because of Likert-type scale of instrument, item-scale correlation coefficient was descriptive for comparing Elbe's criteria. The lowest item-scale correlation score is .414 and the highest one is .779. It can be acknowledged that all items in the instruments have acceptable item-scale correlation indices.

The Cronbach alpha is .98 for 71-item instrument. Subsequent to factor analysis, reliability of 43-item instrument was recalculated. The result of second calculation was .96. Furthermore, Cronbach alphas of Factor 1, Factor 2 and Factor 3 were .95, .91, and .88 respectively. In conclusion, all scores were indicating that the instrument was satisfactorily reliable.

3.5.3. Actual Data Collection

A course was randomly selected from all years and program types of PSTE with respect to appropriateness to researcher's time schedule. After entering selected course, researcher explained the purpose of the study. Moreover, researcher stated that participation was voluntarily and unless students want to contribute the study, it would not result negatively. At the end, researcher also informed that all information about participants were kept confidential and only used for this study. Data collection carried on three weeks. Data were entered SPSS for Windows for analyses.

3.6. Data Analysis

In this study descriptive statistics, reliability, Pearson Correlation, Multiple Regression and univariate Analysis of Variance were used for exploring research questions.

For the first research question, mean scores were used to classify pre-service teachers' technology use self-competency level. Classification was made based on three groups which are defined novice, intermediate, and expert. Novices' mean scores were lower than 2.33, intermediates' mean scores were between 2.34 and 3.67 and the last group experts' mean scores were higher than 3.68. This classification was performed for dependent variable and its sub-scales overall technology use self-competency, technology use in educational environments, basic and advanced computer skills. In the light of this classification, frequencies were utilized to conclude the number of cases or instances of a particular characteristics or variable (Nicol & Pexman, 1999).

For the second research question, Pearson correlation was performed on technology use self-competency and all demographic characteristics of pre-service teachers. This statistical analysis scrutinized not only relationships between technology self-competency and independent variables but also among independent variables.

For the third research question, multiple regression analysis was conducted to predict dependent variables from multiple independent variables. Green et al (2002) proposed that multiple correlation point out that to what extent the predicted scores are related with the observed scores for a sample.

For the fourth and fifth research questions, univariate ANOVA was performed on dependent variables (technology use self-competency, technology use in educational environments, basic and advanced computer skills) and independents variables (gender, year, years of computer use, having computer and internet). The purpose of this analysis was inspecting significant differences among dependent variable across participants' demographic characteristics. Especially, independent variable year were used for examining fourth research questions. Subsequent to higher way ANOVA, post-hoc tests were made to elicit which group(s) caused

significant difference(s). For the sixth research question, descriptive statistics were used.

Reliability analysis was performed to assess internal consistency of instrument. Cronbach alpha were applied for this procedure. Reliability coefficients calculated for overall items and also all sub-scales of instrument.

CHAPTER 4

RESULTS

4.1. Introduction

The results of statistical analyses are explained in this chapter. The chapter is organized based on research questions. The first part of the chapter begins with the summary statistics of observed variables to explore research question 1. The second part explains the results of correlation analysis between independent variables and technology use self-competency to explore research question 2. The third part explains the results of multiple regression analysis to explore research question 3. The fourth explain results of univariate ANOVA and post-hoc tests to explore both research question 4 and 5. The sixth part of the chapter explains proportion of participants' answers to explore research question 6. The last part explains the reliability analysis of the measures used in this study.

4.2. Research Question 1

This part explicates what pre-service teachers' perceived self-competency levels are concerning technology usage in educational environments, basic and advanced computer skills.

Table 5. *Summary Statistics of Observed Variables: Mean Scores of Technology Use Self-competency Scale and Its Sub-scales.*

Variable	*M*	*SD*
Technology use self-competency	3,17	,76
Technology use in educational environments	3,43	,83
Basic computer skills	3,53	,88
Advanced computer skills	2,07	,90

Note. $N = 1086$. If $M < 2.33$, one is novice; if $2.34 < M < 3.67$, one is intermediate; and if $M > 3.68$, one is expert.

Means and standard deviations of observed variables are shown in Table 6. The higher score proposes the more self-competency. Pre-service teachers have highest scores on basic computer skills. On the other hand, they have lowest mean score on advanced computer skills.

Considering total score, pre-service teachers felt themselves as intermediate technology users. In detail, pre-service teachers are in intermediate level for using technology in educational environments and basic computer skills. In contrast, their level is novice for advanced computer skills.

Table 6 illustrates means and standard deviations of independent variables on technology use self-competency scale and its sub-scales.

Table 6. *Summary Statistics of Observed Variables: Mean Scores of Technology Use Self-competency Scale and Its Sub-scales in accordance with Independent Variables.*

Independent Variables	*n*	Technology use in educational environments (Factor 1)		Basic computer skills (Factor 2)		Advanced computer skills (Factor 3)		Technology use self-competency (Total)	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Year									
1st	243	3.52	.78	3.72	.73	2.17	.92	3.26	.68
2nd [a]	250	3.52	.73	3.76	.75	1.96	.84	3.22	.68
F.P.	136	3.59	.71	3.83	.70	2.02	.82	3.28	.63
S.P.	128	3.43	.77	3.63	.81	1.84	.83	3.12	.68
3rd	267	3.52	.85	3.34	.94	1.99	.88	3.12	.78
4th	237	3.50	.97	3.47	.97	2.24	1.00	3.20	.89
Gender									
Male	406	3.57	.82	3.76	.84	2.38	1.02	3.34	.77
Female	591	3.48	.84	3.44	.87	1.88	.77	3.10	.73
Home Computer									
Yes									
With Internet	163	3.84	.73	4.07	.70	2.76	1.08	3.64	.71
Without Internet	111	3.72	.67	3.82	.73	2.40	.99	3.44	.63
No	723	3.41	.85	3.42	.88	1.88	.77	3.10	.74
# of Computer Courses									
1	243	3.52	.78	3.72	.73	2.17	.92	3.26	.68
2	251	3.52	.73	3.76	.74	1.96	.84	3.22	.65
3	410	3.48	.90	3.33	.94	2.01	.90	3.10	.80
4	67	3.72	.94	3.78	.95	2.58	1.02	3.47	.90
5	26	3.48	.97	3.50	.97	2.42	1.15	3.24	.94

Table 6 continued

Independent Variables	*n*	Technology use in educational environments (Factor 1)		Basic computer skills (Factor 2)		Advanced computer skills (Factor 3)		Technology use self-competency (Total)	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Years of computer use									
Less than 1 year	128	3.19	.89	3.18	.90	1.76	.66	2.85	.73
1 - 2 years	333	3.33	.80	3.34	.86	1.78	.72	2.97	.68
3 - 5 years	393	3.59	.80	3.66	.79	2.12	.87	3.26	.69
More than 5 years	143	4.03	.67	4.20	.71	2.96	1.06	3.82	.68

Note. F.P. = First Program, S.P. = Second Program. If $M < 2.33$, one is novice; if $2.34 < M < 3.67$, one is intermediate; and if $M > 3.68$, one is expert.
[a] First and second program types of 2nd year are not homogenous. Therefore, each program types' *M* and *SD* scores are presented as well.

2nd year, first program type students' mean score is the highest in factor 1. Furthermore, 2nd year, second program type students' mean score is the lowest. There are not enormous mean differences among years.

2nd year, first program type students' mean score is the highest in factor 2. Furthermore, 3rd year students' mean score is the lowest. 1st and 2nd year students' mean scores are higher than 3rd and 4th year students' mean scores. Only in this factor, 1st and 2nd year students feel themselves as expert but 3rd and 4th year students feel themselves as intermediate.

1st year students' mean score is highest one in factor 3. Furthermore, 3rd year students' mean score is lowest one. All years' mean scores on factor 3 are considerable lower than the other two factors.

2nd year, first program type students' mean score is highest one in total score. Furthermore, 3rd year students' mean score is lowest one. 1st and 2nd year students' mean scores are higher than 3rd and 4th year students' mean scores. All years' mean scores are slightly different from each other.

2nd year, first program type students' mean scores from three factors and total score are higher than 2nd year, second program type students' mean scores.

Male students' mean scores from three factors and total score are higher than female students' mean scores.

Students' having computer with internet has the highest mean scores. Furthermore, mean scores of students having computer are higher than mean scores of students not having computer.

Four-course enrolled students' mean scores are the highest mean scores among other groups. On the other hand, three courses enrolled students' mean scores are the lowest. Also, five-course enrolled students' mean score are lower than four-course enrolled.

More then five years computer using students have the highest mean scores among others. In contrast, less then one year computer using students have the lowest mean scores.

Table 7 shows that classification of pre-service teachers' self-competency level based on their mean scores in accordance with years.

Table 7. *Summary of Classification of Pre-service Teachers based on Their Competency Level.*

	Years				Total
Dependent Variables	1st	2nd	3rd	4th	
Technology use self-competency					
Novice	28	27	51	50	156
Intermediate	160	180	174	128	642
Expert	75	57	69	87	288
Technology use in educational environments					
Novice	11	21	37	37	115
Intermediate	113	140	134	113	520
Expert	139	103	123	115	451
Basic computer skills					
Novice	11	17	52	43	123
Intermediate	113	95	131	99	438
Expert	139	152	111	123	525
Advanced computer skills					
Novice	176	203	214	165	758
Intermediate	67	50	66	73	256
Expert	20	11	14	27	72

Note. $N = 1086$.

643 (59%) of the students feel themselves in intermediate group relating technology use self-confidence. Novice and expert groups are 156 (14%) and 288 (27%) respectively. Most of pre-service teachers feel competent to use technology.

520 (47%) of the students feel themselves in intermediate group relating technology use in educational environments. Novice and expert groups are 115 (11%) and 451 (42%) respectively. Most of the pre-service teachers feel competent for using technology in educational environments.

525 (48%) of the students feel themselves in intermediate group relating basic computer skills. Novice and expert groups are 123 (11%) and 438 (41%) respectively. Most of pre-service teachers feel competent to use computer at basic level.

275 (24%) of the students feel themselves in intermediate group relating advanced computer skills. Novice and expert groups are 723 (69%) and 72 (7%) respectively. Novice group frequencies are higher than intermediate and expert groups in contrast to other scores. Most of pre-service teachers do not feel enough competent to use computer at advanced level.

Table 8 demonstrates means and standard deviations of each item in instrument.

Table 8. *Means and Standard Deviations of Each Item in Instrument*

Items	*N*	*M*	*SD*
Factor 1: Technology Use in Educational Environments			
6	1078	3,37	1,25
10	1082	3,78	1,12
13	1084	3,50	1,20
19	1086	2,89	1,34
20	1084	3,38	1,24
21	1086	3,40	1,26
22	1084	3,31	1,37
25	1086	4,04	1,06
26	1083	3,38	1,18
27	1086	3,26	1,21
28	1085	3,77	1,11
29	1081	3,52	1,17
33	1086	3,88	1,09

Table 8 continued

Items	*N*	*M*	*SD*
34	1085	4,06	1,04
35	1086	3,44	1,30
36	1083	3,46	1,21
37	1085	3,80	1,15
38	1082	3,29	1,14
39	1083	3,20	1,16
40	1083	3,53	1,16
42	1084	3,57	1,18
43	1084	3,14	1,27
Factor 2: Basic Computer Skills			
1	1083	3,72	1,19
2	1082	4,28	1,18
3	1084	2,39	1,18
4	1086	4,02	1,21
5	1086	3,14	1,41
12	1084	4,29	1,11
15	1083	3,37	1,44
23	1086	3,17	1,49
30	1081	3,82	1,59
32	1083	3,33	1,41
41	1081	3,36	1,45
Factor 3: Advanced Computer Skills			
7	1082	2,16	1,38
8	1084	2,15	1,38
9	1080	1,90	1,24
11	1085	1,99	1,33
14	1083	2,29	1,29
16	1080	2,61	1,49
17	1083	1,74	1,16
18	1085	1,88	1,32
24	1082	1,83	1,10
31	1083	2,08	1,22

The highest score item indicated that pre-service teachers were aware of being competent about the skill measured. However, the lowest score indicated that pre-service teachers did not believe that they were competent about the skill measured. For factor 1, Item-19, writing technology supported lesson plans, got the lowest but item-34, managing students to use technological tools safely and healthily, got the highest score. For factor 2, Item-3, solving problems about computer, got the lowest but item-12, using electronic mail, got the highest score. Finally for factor 3, Item-24, using desktop publishing programs, got the lowest but item-16, scanning an

image to computer, got the highest score. For overall instrument, Item-24 has the lowest but item-12 has the highest score.

Safety and health issues of technology use was the most competent skill of pre-service teachers but writing technology supported lesson plans was the least competent skill in technology use in educational environments factor.

For the basic computer skills factor, using electronic mail was the most competent skills of pre-service teachers. However, solving problems about computer was the least competent skill.

In the last factor advance computer skills, using desktop publishing programs was the most competent skill of pre-service teachers but scanning an image to computer was the least competent skill.

4.3. Research Question 2

This part explicates whether there was any significant relationship between technology use self-competency scores and demographic characteristics (gender, computer ownership and internet access, and year(s) of computer use) of pre-service teachers or not.

Table 9 shows the results of correlation analysis between independent and technology use self-competency scores. Three of variables gender, years of computer use and computer ownership and internet access are related significantly to technology use self-competency scores. But gender variable has negative correlation with technology use self-competency scores.

There were also significant relationships among independent variables. Years of computer use was related to gender, and computer ownership and internet access. However, gender correlation is negative.

Table 9. *Correlation Matrix: Independent Variables and Technology Use Self-competency Scores.*

Variable	1	2	3	4
1. Gender	–	–.211*	–.019	–.153*
2. Year(s) of Computer Use		–	.148*	.376*

Table 9 continued

Variable	1	2	3	4
3. Computer ownership and internet access			–	.302*
4. Technology use Self-Competency				–

* $p < 0.01$, two-tailed

4.4. Research Question 3

This part explicates how accurately technology use self-competency can be predicted from a linear combination of demographic characteristics of pre-service teachers.

Multiple regression analysis was conducted to evaluate how well independent variables predicted technology use self-competency. There were four independent variables, while the criterion variable was the overall score of technology use self-competency. The linear combinations of independent variables measures was significantly related to technology use self-competency measures, F (3, 993) = 88.612, $p < .001$. The sample multiple correlation coefficient was .46, indicating that approximately 21% of the variance of the technology use self-competency can be accounted for by the linear combination of independent variables.

In the Table 10, researcher presented indices to specify relative strength of all predictors. Except for gender predictor, other predictors were positive bivariate correlations between technology use self-competency, and all of the three indices were statistically significant ($p < .001$). All predictors' partial correlations between technology use self-competency were significant. But only gender variable's partial correlation was negative. Year(s) of computer use variable partial correlation was higher than other variables' partial correlations. Due to these correlations, it was convinced to summarize that the most useful predictor was years of computer use. It alone accounted for 14 % of the variance of technology use self-competency scale. Moreover, computer ownership and internet access contributed 9 %, and the last one gender contributed only 2 % of variance.

Table 10. *The Bivariate and Partial Correlations of The Predictors with Technology Use Self-competency*

Variable	Correlation between each predictor and the technology use self-competency scale	Correlation between each predictor and the technology use self-competency scale controlling for all other predictors
Gender	–.158*	–.095*
Computer ownership and internet access	.305*	.274*
Years of computer use	.375*	.327*

Note. $n = 996$
* $p < .001$.

4.5. Research Question 4

This part explicates whether there was a significant difference between demographic characteristics (gender, computer ownership and internet access, and years(s) of computer use of pre-service teachers and their perceived self-competency level to use of technology or not.

Bock stated that analysis of variance could be applied in surveys, where the responses of participants in a single population or differential responses of subgroups of population were to be explained (as cited in Finn, 1988).

Univariate ANOVA is used when researcher has three or more independent variables and one dependent variable. Univariate ANOVA investigates not only 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 may be conducted (Green et al, 2000).

Table 11. *Analysis of Variance Results of Main Effects and Interaction Effects of Independent Variables on Technology Use Self-competency*

Source	*df*	*F*	Partial η2
Computer ownership and internet access (H)	2	13.36**	.03
Year (Y)	4	1.25	.01
Gender (G)	1	4.67*	.01
Year(s) of computer use (CU)	3	17.70***	.06

Table 11 continued

Source	*df*	*F*	Partial η2
H x Y	8	2.63**	.02
H x G	2	0.66	–
H x CU	6	0.36	–
Y x G	4	1.63	.01
Y x CU	12	1.18	.02
G x CU	3	0.86	–
H x Y x G	8	0.80	.01
H x Y x CU	21	1.27	.03
H x G x CU	6	0.38	–
Y x G x CU	11	1.30	.02
H x Y x G x CU	14	0.81	.01
S within-group error	890	(0.42)	

Note. Value enclosed in parenthesis represents mean square errors. *S* = subjects. Dashes indicate that cell values are less than .005
* $p < .05$, ** $p < .01$ *** $p < .001$.

The univariate ANOVA results were shown in Table 11. There were main significant effects of having computer and internet, gender, years of computer and interaction effects of year, and computer ownership and internet access (H x Y). On the other hand, year main effect and other interaction effects were nonsignificant.

4.5.1. Computer ownership and internet access

The ANOVA results as shown in Table 11 indicated that there was a significant effect of computer ownership and internet access on technology use self-competency. 3% of the variance in technology use self-competency is accounted for by having computer and internet. Follow-up test was performed to the main effect of three groups of having computer and internet. The follow-up tests consisted of all pairwise comparisons among three groups of computer ownership and internet access. Result of Levene's test of equality of error variances was significant, F (106, 890) = 1.63, $p < .001$, so it could be acknowledged that population variances of the dependent variable were not homogenous. Because of unequal variances, Dunnett's *C* test not assuming equal variances among groups was used. The result of the tests,

as well as means and standard deviations for computer ownership and internet access groups were presented in Table 12. There were significant differences among all groups. Having computer with internet access group technology use self-competency was higher than other groups. Likewise, having computer without internet access technology use self-competency was higher than not having computer group. It can be concluded that pre-service teachers' self-competency relating to technology use increased if they got computer with internet.

Table 12. *Dunnett's C Test Results: Differences among Groups in Computer Ownership and Internet Access*

Groups	*M*	*SD*	1	2	3
1. Having computer with internet access	3.64	.71	–		
2. Having computer without internet access	3.44	.63	*	–	
3. Not having computer	3.10	.74	*	*	–

Note. Dashes indicate that cell value was zero. An asterisk (*) = significance using the Dunnett's C procedure.

4.5.2. Gender

The ANOVA results (see also Table 11) indicated that there was a significant effect of gender on technology use self-competency, F (1, 890) = 4.67, $p < .05$. 1% of the variance in technology use self-competency was accounted for by gender. Moreover, means and standard deviations for gender were reported in Table 13. Mean score of males were higher than females. It could be stated that males perceived more competent technology users than females. There is a consistent result with correlation analysis.

Table 13. *Means and Standard Deviations of Participants in accordance with Gender*

	n	*M*	*SD*
Male	435	3.32	.78
Female	644	3.08	.74

4.5.3. Year(s) of computer use

The ANOVA results as shown in Table 11 indicated that there was a significant effect of years of computer use. 6% of the variance in technology use self-competency is accounted for by years of computer use. Follow-up test was performed to the main effect of four groups and the follow-up tests consisted of all pairwise comparisons. Result of Levene's test of equality of error variances was significant, F (106, 890) = 1.63, $p < .001$, so it could be convinced that population variances of the dependent variable were not homogenous. Because of unequal variances, Dunnett's C test, not assuming equal variances among groups, was used. The result of these tests, as well as means and standard deviations for year(s) of computer use groups were presented in Table 14. There were significant differences among groups except for between less than 1 year and 1-2 years. More than 5 years group's technology use self-competency was higher than other groups. It could be interpreted that the more experienced a pre-service teacher on computer, the more competent technology user (s)he is.

Table 14. *Dunnett's C Test Results: Differences among Groups in accordance with Year(s) of Computer Use*

Groups	*M*	*SD*	1	2	3	4
1. Less than 1 year	2.88	.73	–			
2. 1 – 2 years	2.97	.68	NS	–		
3. 3 – 5 years	3.26	.69	*	*	–	
4. More than 5 years	3.82	.68	*	*	*	–

Note. Dashes indicate that cell value were zero. NS = nonsignificant differences between pairs of means, while an asterisk (*) = significance using the Dunnett's C procedure.

4.6. Research Question 5

This part explicates what pre-service teachers' perceptions regarding to: (a) technology courses, (b) infrastructure of school of education, and (c) their faculty members use of technology are.

Technology courses: Table 15 illustrates pre-service teachers' perception about effectiveness of technology courses in teacher education program. Majority of the 1st and 2nd year students (69 % for 1st, 78 % for 2nd year students) stated that technology courses are effective o develop their competency. However, majority of the 3rd and 4th year students (53 % for both) mentioned that technology courses are partially effective to develop their competency. It could be summarized that 1st and 2nd year students perceived technology courses more effective than 3rd and 4th year students.

Furthermore, 53.4 % of the students stated that technology courses are effective to develop their technology competency, 38.5 % of the students stated that technology courses are partially effective to develop their competency, and only 8 % of the students stated that technology courses are not effective. 7 participants did not state their perception about technology courses.

Table 15. *Distribution of Pre-service Teachers' Perception about Technology Courses*

	Yes	No	Partially
Year			
1st	183	10	70
2nd [a]			
F.P.	109	1	25
S.P.	97	5	26
3rd	110	24	156
4th	81	41	141
Total	580	81	418

Note. F.P. = First Program, S.P. = Second Program.
[a] First and second program types of 2nd year are not homogenous. Therefore, each program types' perception scores are presented as well.

Infrastructure of school of education: Table 16 illustrates pre-service teachers' perception about infrastructure of school of education. The vast majority of the students (94 %) stated that infrastructure of schools of education are not enough to use technology during their technology training. 11 participants did not state their

perception about infrastructure of school of education. It could be concluded that infrastructure of school of education is not sufficient for technology training.

Table 16. *Distribution of Pre-service Teachers' Perception about Infrastructure of School of Education*

	Yes	No	Partially
Year			
1st	17	105	139
2nd a			
F.P.	8	82	43
S.P.	3	56	69
3rd	8	137	145
4th	18	123	122
Total	54	503	518

Note. F.P. = First Program, S.P. = Second Program.
[a] First and second program types of 2nd year are not homogenous. Therefore, each program types' perception scores are presented as well.

Faculty members' technology use: Table 17 indicates that 29 % of the students stated that none of their instructors used technology during their lectures apart from technology courses. 23 % of the students stated that only one instructor used technology during their lectures apart from technology courses. 39 % of the students stated that one or five instructors used technology during their lectures apart from technology courses. 4 % of the students stated that six or seven and all of instructors used technology during their lectures apart from technology courses. 46 of them did not answer this question. Totally, 769 (74 %) of the students stated their instructors used technology during their lectures apart from technology courses. It could be summarized that at least one or five of the instructors utilized technology through their lectures.

Table 17. *Distribution of Pre-service Teachers' Perception about Instructors' Technology Use*

	None of them	Only 1	1 or 5	6 or 7	All of them
Year					
1st	86	78	90	1	–
2nd [a]					
F.P.	26	41	56	4	3
S.P.	33	44	47	–	–
3rd	94	40	121	7	14
4th	78	47	113	7	10
Total	317	250	427	19	27

Note. F.P. = First Program, S.P. = Second Program. Dashes indicate that cell value was zero.
[a] First and second program types of 2nd year are not homogenous. Therefore, each program types' perception scores are presented as well.

Moreover, pre-service teachers stated instructors' frequency of technology usage. 769 of the students proposed their instructors used technology but 62 of them did not state instructors' frequency of technology usage. 129 (18 %) of them stated that their instructors used technology every times. 219 (31 %) of them stated that their instructors used technology two times in a week. 107 (15 %) of them stated that their instructors used technology one time in a month. Finally, 245 (35 %) of them stated that their instructors used technology one or two times in a semester. Also, some of the students proposed that technology use frequency were changed in accordance with topics and subjects.

Pre-service teachers also stated types of technology used by their instructors. 769 of the students proposed their instructors used technology. The most popular technology was overhead projectors. It was stated by all of 769 students. The second one was computer and it was stated by 428 (55 %) of the students. The third one was projector stated by 226 (29 %) of the students. The minority of the students stated that educational software, electronic presentation, internet, television, VCD, and slides were also used.

4.7. Research Question 6

This part explicates whether there was a significant difference among years of pre-service teachers' perceived self-competency or not?

The ANOVA results (see also Table 10) indicated that there was a non-significant effect among years of pre-service teachers on technology use self-competency, F (4, 890) = 1.25, p = .05. It could be summarized that technology use competency level of pre-service teachers did not change as a result of the technology training in teacher education program.

4.8. Reliability Analysis

The internal consistency reliability, α, is presented in Table 18. In a psychological test, .70 and higher calculated reliability coefficients accepted as efficacious (Büyüköztürk, 2003).

The overall reliability for the technology use self-competency scores was .96. Reliability coefficients may be understood directly as the percentage of score variances attributable to diverse sources (Anastasia, 1982). Thus, a reliability coefficient of .96 indicated that 96% of the variance depended on true variance in the construct measured, and 4% depended on error variance.

Crocker and Algina (1986) mentioned that the test developer had an obligation to report for subscales' reliability estimates as well. Therefore, the sub-scales' reliability were investigated and it was found that all had high reliability. Technology use in educational environments' α is .95, basic computer skills' α is .87, and finally advanced computer skills' α is .87.

Table 18. *Results of Reliability Analysis of Technology Use Self – competency Scores*

	Reliability Coefficient (Cronbach α)
Technology use self-competency	.96
Technology use in educational environments	.95
Basic computer skills	.87
Advanced computer skills	.89

CHAPTER 5

CONCLUSIONS AND IMPLICATIONS

5.1. Introduction

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

5.2. Summary

This study was undertaken to assess the current technology training program with respect to pre-service teachers perceived self-competency level at Primary School Teacher Education Program, Elementary Education Department, Burdur School of Education, Süleyman Demirel University.

5.3. Restatement of the Purpose of the Study

Willis and Mehlinger (1996) stated that teacher education institutions do not prepare completely their student to utilize technology in educational environments. Large body of the literature shows that reformation is not only solution for infusing technology into education at desired level. The reformation movements in education are necessary but not efficient in 21st century. Reforms are bringing new problems to education system as well. Therefore, teacher training institutions in Turkey are facing new problems. To challenge these problems, institutions have to evaluate their current conditions about technology training programs. In the light of evaluation of current condition, they continuously develop all aspects of teacher education programs.

Most of the teacher education institutions in Turkey assumed that their graduates should be well trained with respect to utilization technology in educational environments especially after restructuring process of Higher Education Council in 1997.

The purpose of this study is to reveal pre-service teachers' technology competencies during their four-year teacher training program at Burdur School of Education, Süleyman Demirel University in Turkey. Are pre-service teachers really felt being prepared to use technology effectively at the end of the four-year technology training?

5.4. Major Findings and Discussions

5.4.1. Research Question 1

The question is what pre-service teachers' perceived self-competency levels relating to technology usage in educational environments, basic and advanced computer skills are.

Pre-service teachers felt themselves as intermediate technology users (M = 3.17, S = .76). In detail, pre-service teachers are in intermediate level for using technology in educational environments (M = 3.43, S = .83) and basic computer skills (M = 3.53, S = .88). In contrast, for advanced computer skills (M = 2.07, S = .90), their level is novice. This result is indicated consistent result with Askar and Umay, 2001; Watson, 1997; Haderlie, 2001; Namlu and Ceyhan, 2002; İmer, 2000; Simpson, 1998; Iding, Crosby, and Speitel, 2002; and Hughes, 1997. They indicated that most of pre-service teachers were average level with respect to computer use. However, the study is found contradictory results with the literature (Akkoyunlu and Orhan, 2003; Chao, 2001; Hornung, 2002; Nanasy, 2001; Snider, 2003). They found that pre-service teachers were proficient about computer utilization.

Male students' mean scores from technology use in educational environments, basic computer skills, advanced computer skills (M = 3.57, S = .82; M = 3.76, S = .84; M = 2.38, S = 1.02 respectively) and total score are higher than female students (M = 3.48, S = .84; M = 3.44, S = .87; M = 1.88, S = .77 respectively). As a result of this,

males' mean score from overall instrument (M = 3.34, S = .77) are higher than females (M = 3.10, S = .73). In the literature there is a significant difference between males and females in accordance with using technology or computers especially males are more proficient user than females (Watson, 1997; Torkzadeh, Pflughoeft & Hall, 1999; Lynch, 2001). On the other hand, Novick (2003) indicated that women pre-service teachers' self-efficacy on role and use of computer technologies are high. Also, there are other studies stating no difference between males and females (Akkoyunlu and Orhan, 2003; Chao, 2001).

Students' having computer with internet has the highest mean scores (M = 3.64, S = .71). Furthermore, mean scores of students having computer (M = 3.44, S = .63) are higher than mean scores of students not having computer (M = 3.10, S = .74). Access and use of home computer is most influential source to develop women pre-service teachers' self-efficacy for computer technologies (Novick, 2003). Possessing home computer produces more computer experiences (Chao, 2001).

Four-course enrolled students' mean scores are the highest mean scores among other groups (M = 3.47, S = .90). This result revealed because the fourth and fifth courses are elective. Therefore, based on the researcher observation as an instructor, the most students' entry level motivation in elective courses is higher than compulsory courses. Since, they enroll courses to learn new skills about technology. On the other hand, three courses enrolled students' mean scores are the lowest one (M = 3.10, S = .80). Also, it is an interesting result that five-course enrolled students' mean score are lower than four-course enrolled (M = 3.24, S = .94). The consistent result exists in the literature that there is no relationship between the number of courses completed and technology proficiency (Ropp, 1999). Makrakis (1997) also found parallel results with this study. He found that the more number of courses causes the more dissatisfaction of students because he concluded that instructors of the courses are from computer science department. As a result of this, the content of technology course was focused on more technical aspects of technology. Therefore, pre-service teachers could not make connection with their technical knowledge and instructional environments.

More then five years computer using students have the highest mean scores among others. In contrast, less then one year computer using students have the lowest

mean scores. Prior computer experience is high positive effect on computer self-efficacy (Nanjappa, 2003; Chao, 2001).

643 (59%) of the students (N = 1086) feel themselves in intermediate group relating technology use self-competency. Novice and expert groups are 156 (14%) and 288 (27%) respectively. Most of pre-service teachers feel competent to use technology. 520 (47%) of the students feel themselves in intermediate group relating technology use in educational environments. Novice and expert groups are 115 (11%) and 451 (42%) respectively. Most of the pre-service teachers feel competent for using technology in educational environments. 525 (48%) of the students feel themselves in intermediate group relating basic computer skills. Novice and expert groups are 123 (11%) and 438 (41%) respectively. Most of pre-service teachers feel competent to use computer at basic level. 275 (24%) of the students feel themselves in intermediate group relating advanced computer skills. Novice and expert groups are 723 (69%) and 72 (7%) respectively. Novice group frequencies are higher than intermediate and expert groups in contrast to other scores. Most of pre-service teachers do not feel enough competent to use computer at advanced level. There are consistent results with the study in the literature (Hughes, 1997). Snider (2003) conducted a similar study but Snider (2003) mentioned three types computer skills, basic, advanced and Internet. Snider's study revealed that pre-service teachers felt themselves technology proficient users with respect to three skills.

Pre-service teacher felt more competent managing students to use technological tools safely and healthily (M = 4.06, S = 1.04) but less competent writing technology supported lesson plans (M = 2.89, S = 1.34) in technology use in educational environments factor. First result is parallel with Nanasy's (2001) result because the most of the pre-service teachers felt comfortable working with students and computers. Betrus (2000, as citied in Betrus & Molenda, 2002) and Leh (1999) studies could be an evidence for the second results. Curriculum integration or instructional design topics in technology courses are taught by about 50 – 60 % of the universities. There are large body of literature stated that there are deficiencies between what the topic taught in technology courses and what it implemented (Andrews, 1996; Milken Exchange on Educational Technology, 1999; NCATE, 1997; Nonis & O'Bannon, 2001; Whetstone & Carr-Chellman, 2001, Chen, 2004). .

Also pre-service teacher felt more competent using electronic mail (M = 4.29, S = 1.11) but less competent solving problems about computer (M = 2.39, S = 1.18) in basic computer skills factor. Iding, Crosby and Speitel (2002) found that the most frequently used technology was e-mail by pre-service and in-service teachers. Also, Nanasy stated that the major number of pre-service teachers felt competent to teach how to use e-mail. Novick (2003) indicated that using e-mail and Internet has highest level among other domains of ISTE by women pre-service teachers. This result is revealed because according to Betrus (2000, as citied in Betrus & Molenda, 2002) and Leh (1999), e-mail/telecommunications is one of the most popular topics in educational technology courses but they stated also that hardware troubleshooting is one of least popular topics.

Besides pre-service teacher felt more competent scanning an image to computer (M = 2.61, S = 1.49) but less competent using desktop publishing programs (M = 1.83, S = 1.10) in advanced computer skills factor. Leh (1999) found that only 20 % of the universities taught desktop publishing in their technology courses.

5.4.2. Research Question 2

The question is whether there was any significant relationship between technology use self-competency scores and demographic characteristics (gender, computer ownership and internet access, and computer usage year) of pre-service teachers or not.

Three of variables gender (r = -.15), year(s) of computer use (r = .38) and computer ownership and internet access (r = .30) are related significantly to technology use self-competency scores. But gender variable has negative correlation with technology use self-competency scores. It can be summarized that more computer experiences and computer ownership with internet access improve pre-service teachers' technology usage self-competency. Also Askar and Umay (2001) found that there was a low significant correlation between access to home computers and self-efficacy. Chao (2001) and Nanjappa's (2003) indicted that there is positive relationship between computer self-efficacy and computer experience. Furthermore, males were coded as 1 and females as 2 during analysis. That is, while gender is

increasing, technology self-competency is decreasing. As a result of this, negative correlation between gender and technology use self-competency means that males feel more competent than females. Watson (1997), Torkzadeh, Pflughoeft and Hall (1999) and Lynch (2001) also found consistent result like this study.

There were also significant weak relationships among independent variables. Year(s) of computer use was related to gender (r = -.21), and computer ownership and internet access (r = .15). However, gender correlation is negative. The similar results found in Ropp's (1999) study. Ropp found that there are weak correlations among background variables, age, gender, ease of use computer access, computer ownership, weekly computer use, completed computer courses, method of most computer learning, and the number of teachers who used computers in students' K-12 and college experiences. Also Ropp (1999) stated that ease of computer access and hours of weekly computer use were significantly correlated at $p < .05$.

5.4.3. Research Question 3

The question is how accurately technology use self-competency can be predicted from a linear combination of demographic characteristics of pre-service teachers.

The linear combinations of independent variables measures was significantly related to technology use self-competency measures, F (3, 993) = 88.612, $p < .001$. The sample multiple correlation coefficient was .46, indicating that approximately 21% of the variance of the technology use self-competency can be accounted for by the linear combination of independent variables.

Except for gender predictor, other predictors were positive bivariate correlations between technology use self-competency, and all of the three indices were statistically significant ($p < .001$). All predictors' partial correlations between technology use self-competency were significant. But year(s) of computer use and computer ownership and internet access partial correlation was positive. Year(s) of computer use variable's partial correlation was higher than other variables. Due to these correlations, it was convinced to summarize that the most useful predictor was years of computer use. It alone accounted for 14% of the variance of technology use

self-competency scale. Moreover, computer ownership and internet access contributed 9%, and the last one gender contributed only 2% of variance. There are parallel results with Chao (2001) and Nanjappa's (2003) studies. They found that computer self-efficacy was positively related to computer experiences. Askar and Umay (2001) indicated that lack of computer experiences and usage decreases computer self-efficacy of pre-service teachers.

5.4.4. Research Question 4

The question is whether there was a significant difference between demographic characteristics (gender, having computer, having internet, and computer usage year) of pre-service teachers and their perceived self-competency level to use of technology or not.

Gender: The ANOVA results indicated that there was a significant effect of gender on technology use self-competency, F (1, 890) = 4.67, $p < .05$. Mean score of males (M = 3.32, S = .78) were higher than females (M = 3.08, S = .74). It could be stated that males perceived more competent technology users than females. There are both consistent (Watson, 1997; Torkzadeh, Pflughoeft & Hall, 1999; Lynch, 2001).and inconsistent (Akkoyunlu and Orhan, 2003; Chao, 2001; Hornung, 2002; Haderlie, 2001; Nanasy, 2001; Snider, 2003, Gilley, 2002, Makrakis, 1997) results in the literature concerning gender and technology. The most important two reasons of the difference are cultural structure of Turkey and individual characteristics of females. In a mid-term exam, a female student stated good evidence for cultural effect that:

> My friend said that "I have to complete my assignments for computer course before going to my hometown". I advised her that she could do her assignment in Internet café so she could go hometown earlier. However, she stated that girls could not go internet café in their hometown because of people is not appreciated from this.

Novick (2003) stated that the most influential source of efficacy developed women pre-service teachers is their emotional states and providing verbal persuasion. It is obvious that males have more opportunity and providing more encouragement to

use technology in Turkish culture. However, Novick (2003) study indicated that if females also provided like males, this gap between males and females should be closed.

Another discussion about technology and gender is that males or females use technology for what. During data collection process, in each class one or two of the male students asked in humor that "could we write playing games with computer as computer experience?" Actually, these questions are perfect evidence for tool/toy divide of Gilley (2002). She stated that boys use computers for fun but girls use computers for completing task(s). In the light of tool/toy division, males' high competency level should be related more about their cultural and characteristics advantages. That is, this result could be a consequence of men's pseudo-competency.

Computer ownership with internet access: The ANOVA results indicated that there was a significant effect of having computer and internet on technology use self-competency, F (2, 890) = 13.60, $p < .01$. Follow-up test was performed to the main effect of three groups of having computer and internet. The follow-up tests consisted of all pairwise comparisons among three groups of having computer and internet. Dunnett's C test not assuming equal variances among groups was used. There were significant differences among all groups. Having both computer and internet group technology use self-competency were higher than other groups. Likewise, having computer without internet technology use self-competency was higher than not having computer group. It can be concluded that pre-service teachers' self-competency relating to technology use increased if they got computer with internet.

Access and use of home computer is most influential source to develop women pre-service teachers' self-efficacy for computer technologies (Novick, 2003). Possessing home computer produces more computer experiences and it has positive effect on computer self-efficacy (Chao, 2001). Also Askar and Umay (2001) found that there was a low significant correlation between access to home computers and computer self-efficacy.

Year(s) of Computer Use: The ANOVA results indicated that there was a significant effect of years of computer use, F (3, 890) = 17.70, $p < .01$. Follow-up test was performed to the main effect of four groups and the follow-up tests consisted of all pairwise comparisons. Dunnett's C test, not assuming equal variances among groups, was used. There were significant differences among groups except for between less than 1 year and 1-2 years. More than 5 years group's technology use self-competency was higher than other groups. It could be interpreted that the more experienced a pre-service teacher on computer, the more competent technology user. Prior computer experience is high positive effect on computer self-efficacy (Nanjappa, 2003; Chao, 2001).

5.4.5. Research Question 5

The question is what pre-service teachers' perceptions regarding to:, (a) technology courses, (b) infrastructure of school of education, and (c) their faculty members' use of technology are

Technology courses: Majority of the 1st and 2nd year students (69 % for 1st, 78 % for 2nd year students) stated that technology courses are effective o develop their competency. However, majority of the 3rd and 4th year students (53 % for both) mentioned that technology courses are partially effective to develop their competency. It could be summarized that 1st and 2nd year students perceived technology courses more effective than 3rd and 4th year students. This difference was result of diversity of instructors. In Burdur School of Education, 1st and 2nd year students' instructors are graduated from instructional technology department. They also used practical, hands-on, and constructivist activities during their technology courses. As a result most of the 1t and 2nd year students stated technology courses are effective. However, these conditions are not the same for 3rd and 4th students. Their instructors especially were field of computer sciences or more technical field. They also focused on theoretical part of the courses rather than practical. Therefore, most of the 3rd and 4th year students mentioned that technology

courses were not effective. Unfortunately, some of 3rd and 4th year students stated themselves as lost generation.

Furthermore, 53.4 % of the pre-service teachers stated that technology courses are effective to develop their technology competency, 38.5 % of the pre-service teachers stated that technology courses are partially effective to develop their competency, and only 8 % of the pre-service teachers stated that technology courses are not effective. 7 participants did not state their perception about technology courses.

Infrastructure of school of education: The vast majority of the pre-service teachers (94 %) stated that infrastructure of schools of education are not enough to use technology during their technology training. 11 participants did not state their perception about infrastructure of school of education. It could be concluded that infrastructure of school of education is not sufficient for technology training. Makrakis (1997) found that lack of access to suitable software is one the reasons for non-use of information technology by pre-service teachers.

Faculty members' technology use: 29 % of the pre-service teachers stated that none of their instructors used technology during their lectures apart from technology courses. 23 % of the pre-service teachers stated that only one instructor used technology during their lectures apart from technology courses. 39 % of the pre-service teachers stated that one or five instructors used technology during their lectures apart from technology courses. 4 % of the pre-service teachers stated that six or seven and all of instructors used technology during their lectures apart from technology courses. 46 of them did not answer this question. Totally, 769 (74 %) of the pre-service teachers stated their instructors used technology during their lectures apart from technology courses. It could be summarized that at least one or five of the instructors utilized technology through their lectures. Milken Exchange on Educational Technology report (1999) recommended that faculty of schools of education should be encouraged with more emphasis on professional development, and incentives.

Moreover, pre-service teachers stated instructors' frequency of technology usage. 769 of the pre-service teachers proposed their instructors used technology but 62 of them did not state instructors' frequency of technology usage. 129 (18 %) of them stated that their instructors used technology every times. 219 (31 %) of them stated that their instructors used technology two times in a week. 107 (15 %) of them stated that their instructors used technology one time in a month. Finally, 245 (35 %) of them stated that their instructors used technology one or two times in a semester. Also, some of the students proposed that technology use frequency were changed in accordance with topics and subjects.

Pre-service teachers also stated types of technology used by their instructors. 769 of them proposed their instructors used technology. The most popular technology was overhead projectors. It was stated by all of 769 students. The second one was computer and it was stated by 428 (55 %) of the students. The third one was projector stated by 226 (29 %) of the students. The minority of the pre-service teachers stated that educational software, electronic presentation, internet, television, VCD, and slides were also used.

5.4.6. Research Question 6

The question is whether there was a significant difference among years of pre-service teachers' perceived self-competency or not?

. The ANOVA results indicated that there was a non-significant effect among years of pre-service teachers on technology use self-competency, F (4, 890) = 1.25, p = .05. It could be summarized that technology use competency level of pre-service teachers did not change as a result of the technology training.

The technology training program of schools of education in Turkey should be a reason for this result. There are only two stand-alone courses for technology training. These are computer literacy and instructional technology and material preparation. Moreover, Information Technology course was provided by Süleyman Demirel University as compulsory except for these two courses. Vast amount of literature stated that stand-alone technology courses were not the most effective way to improve pre-service teachers' technology utilization (Chen, 2004; Milken

Exchange on Educational Technology, 1999; NCATE, 1997). In the research question 5, about half of the pre-service teachers stated that technology courses were not benefit to develop their technology competencies. As a result of technology training program, pre-service teachers could not be trained adequately to use technology in their prospective conditions. This result is consistent with large body of literature (Willis & Mehlinger, 1996; Doering, 2003, OTA, 1995; Makrakis, 1997, İmer, 2000, Namlu & Ceyhan, 2002, Bennett et al, 1997, Simpson et al, 1998, Haderlie, 2001). However, there are vast amount of researches stated that technological training could develop pre-service teachers' technology training proficiency (Snider, 2003; Lao, 2001, Torkzadeh, Pflughoeft & Hall, 1999, Hornung, 2002, Chao, 2001, Ropp, 1999).

Instructors could be another reason for this result. First of all, instructors of technology courses have important influence on pre-service teachers' technology use. It could be summarized from findings of research question 5. Instructors from field of instructional technology were more positive effect on pre-service teachers rather than other instructors. They also supported more practical and hand-on experienced environments during technology training therefore their students felt more competent than other instructors' students. Second important point is role modeling of other courses' instructors. OTA (1995) stated that faculty of school of education should be trained to utilize technology in their lectures because pre-service teachers will use technology if they learned with technology. In this study, the researcher found that at most one or five instructors use technology during their lectures. Burdur School of Education employed about more than 100 teaching staff. One or five is very small number with respect to total number of instructors. Although instructors use technology, the most popular technological resource is overhead projector. Computer was second and projector was third. Only utilization of one type of technology could not provide role-modeling.

Moreover, insufficient technological resources should be reason for this result. In the light of findings of research question 5, technological resources of school of education were not perceived as sufficient by 94 % of the pre-service teachers. Some of the pre-service teachers also mentioned additional data in their questionnaires. They noted that computer laboratories were always closed. They also mentioned that

there was not enough amount of computers. Furthermore, they stated that most of the computers did not work properly and technical support could not fixed computers having problems. Other interesting statement is that school of education could not have a black curtain to perform technology supported lectures.

Another reason for this result could be improvement of pre-service teachers' entry level technology knowledge and skills. There are evidences from literature for this reason (Bennett et al, 1997, Simpson et al, 1998). That is, 1st year students have more knowledge, skills, and experiences than 4th year students even they are trained in teacher education program. Therefore, this kind of difference could be observed.

5.5. Theoretical Implications

This study contributes better understanding in what direction of teachers' technology proficiency changes due to technology training in schools of education. The data from this study indicated that teachers' technology proficiency level does not change across their four year training since the study found that there were not any significant differences among years of pre-service teachers.

The results of this study supported the position that teacher training institutions does not train well prepared technology user teachers (Willis & Mehlinger, 1996; Doering, 2003, OTA, 1995; Makrakis, 1997, İmer, 2000, Namlu & Ceyhan, 2002, Bennett et al, 1997, Simpson et al, 1998, Haderlie, 2001) because most of the pre-service teachers did not stated as themselves proficient technology users. Moreover, technological resources were so limited that technology competencies of pre-service teachers could be influenced negatively. Faculty of school of education could not be sufficient role-model for pre-service teachers. Most of the instructors responsible from technology courses were not from field of education. Most of instructors of technology courses were focused on theoretical dimension of technology training.

Because technology training program in Burdur School of Education supported only three stand-alone compulsory and three elective courses, this study indicated that stand-alone technology courses are not the most effective method to train pre-service teachers who are technology competent technology user (Chen,

2004; Milken Exchange on Educational Technology, 1999; NCATE, 1997). There were not any additional activities. In order for teachers to become fully capable of using technology in the classroom, not only stand-alone courses but also more practical, hands-on, constructivist, and field-based activities are necessary.

Finally, this study revealed that demographic characteristics of pre-service teachers have important influence in their technology competency level such as gender (Watson, 1997; Torkzadeh, Pflughoeft & Hall, 1999; Lynch, 2001), computer ownership and internet access (Novick, 2003, Chao, 2001), year(s) of computer use (Nanjappa, 2003; Chao, 2001).

5.6. Recommendations

Based on the findings and the discussions, the following are offered for practitioners and teacher education.

1. Schools of education should revisit their technology training in teacher education program.
2. Schools of education should support their technology training with more experiential, hands-on, authentic and constructivist activities. Especially, the technology courses should be reorganized. The technology training program should make connection between theoretical knowledge or skills learned from technology courses and practical applications in student teaching. Field-based models should be used for this.
3. Schools of education should provide advance computing skills courses. These skills are required especially during preparation of computer based instructional materials.
4. Pre-service entry technology proficiency skills should be considered before starting their technology training. Technology training should shape based on these entry skills.
5. Schools of education should develop new policies to close deficiencies between males and females.
6. Schools of education should improve their current technological resources. They invest more budgets for both purchasing, updating and upgrading

new technological resources. Especially, it is task of government. Therefore government should provide schools of education with more budgets.

7. Schools of education should employ technology support task force for both technical and instructional purposes.
8. Schools of education should prepare on-going technology plan.
9. Teaching staff of technology courses should choose from field of education.
10. Teaching staff of technology courses should be more attention on courses.
11. Faculty of schools of education should require additional training for utilization of technology. Furthermore, they should improve their technological knowledge and skills continuously.
12. Faculty of schools of education should be sustainable role-model for pre-service teachers by using technology both personally and instructionally.
13. Faculty of schools of education should cooperate and collaborate with mentor teachers in K-12 schools.

5.7 Direction to Future Research

The followings are offered as prospective research topics for researchers.

1. This study should be replicated to different conditions because participants of this study are limited to Primary School Teacher Education students at Burdur School of Education, Süleyman Demirel University.
2. In future researches, mastery and performance tests should be used to gauge per-service teachers' competency level to obtain more valid and reliable results of construct.
3. In future studies, qualitative research methods such as observations, interviews, and focus group discussions should be used to better understand the dynamic of the change in preservice teachers' technology competencies.
4. A longitudinal study should be conducted on 1st year students to investigate their development during four-year technology training.

5. Other crucial demographic characteristics (e.g. socio-economic status, type of city coming from, father's and mother's education level, type of high school graduated from, score taken from University Selection Exam, ÖSS, rank of department's choice) of pre-service teachers should be variables of a study.
6. Another study should be conducted to investigate the factors that are influences pre-service teachers' technology competency level.

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APPENDIX

APPENDIX A

THE INSTRUMENT

TECHNOLOGY USE SELF-COMPETENCY SCALE

Sevgili öğretmen adayı. Yakın bir gelecekte öğretmenlik mesleğine adım atmış olacaksınız. Siz de biliyorsunuz ki, çağımız bilgi teknolojilerinin çağıdır. Biraz sonra dolduracağınız anket sizin kişisel ve öğretim amaçlı teknoloji kullanımınıza yönelik kendinizi yeterli hissedip hissetmediğinizi ölçmeyi amaçlamaktadır. Anketten elde edilecek sonuçlar tamamı ile araştırma amaçlı kullanılacaktır. Anketi ilgi ve samimiyetle dolduracağınıza inanıyorum. Katkılarınızdan dolayı teşekkür ederim.

Araştırmacı Sacip TOKER

Bölüm 1: *Lütfen aşağıda istenen bilgileri doldurunuz.*

Sınıfınız: _____

Öğretim türünüz: ( ) I. Öğretim ( ) II. Öğretim

Cinsiyetiniz: _____

Yaşınız: _____

Bölüm 2: *Lütfen aşağıdaki soruları cevaplayınız.*

1. **Bilgisayarınız var mı?** ***Cevabınız hayır ise lütfen 3. soruya geçiniz***
   a) Evet b) Hayır
2. **Bilgisayarınızın internet bağlantısı var mı?**
   a) Evet b) Hayır
3. **Kaç yıldan beri bilgisayar kullanıyorsunuz?**
   a) 1 yıldan az b) 1-2 yıl c) 3-5 yıl d) 5 yıldan fazla

4. **Günde ortalama kaç saat bilgisayar kullanıyorsunuz?**

   a) Hiç kullanmıyorum b) 1 saatten az

   c) 1 – 2 saat d) 3 – 5 saat

   e) 5 saatten fazla e) Diğer _____

5. **Ödevlerinizi bilgisayar ortamında mı hazırlıyorsunuz?**

   a) Evet b) Hayır c) Bazen

6. **Aşağıda belirtilen seçmeli derslerden hangisini ya da hangilerini aldınız?** ***Birden fazla seçenek işaretleyebilirsiniz.***

   a. Eğitimde Internet Uygulamaları I
   b. Eğitimde Internet Uygulamaları II
   c. Bilgisayarda Materyal Geliştirme
   d. Diğerleri,_____

7. **Fakültede aldığınız teknoloji ile ilgili derslerin size katkısı oldu mu?**

   a) Evet b) Hayır c) Kısmen

8. **Teknoloji ile ilgili (Örnek: Bilgisayar, Öğretim Teknolojileri ve Materyal Geliştirme v.b.) dersler dışında, öğretim elemanlarının ne kadarı teknoloji destekli dersler işledi? C*evabınız "Hiç birisi" ise lütfen 11. soruya geçiniz***

   a) Hiç Birisi b) 1 tanesi c) 1–5 tanesi

   d) 6-7 tanesi e) Hepsi

9. **Teknoloji ile ilgili dersler dışında, öğretim elemanlarınız ne kadar sıklıkla teknoloji destekli ders işlemektedir?**

   a) Her Ders b) 2 derste bir c) Ayda bir

   d) Dönemde bir ya da iki kez e) Hiç Kullanmadı

   Yukarıdakilerden farklı bir seçenek belirtmek istiyorsanız lütfen yazınız _____.

10. **Teknolojiyi kullanan öğretim elemanlarının kullandıkları teknolojik araçlar nelerdi?** ***Birden fazla seçenek işaretleyebilirsiniz.***

    a) Tepegöz b) Bilgisayar c) Eğitim Yazılımları

    d) Projeksiyon Aleti e) Elektronik Sunumlar e) Internet

    Diğer; _____

11. **Eğitim Fakültesinin teknoloji alt yapısı öğrencilerin kullanması açısından yeterli mi? (Örnek: Laboratuarlar, sınıflar, eğitimsel ya da serbest kullanım amaçlı vb.)**

    a) Evet b) Hayır c) Kısmen

Bölüm 3: *Aşağıdaki ifadeler sizlerin öğretmen olduğunuzda sahip olmanız gereken bazı özellikleri içermektedir. Lütfen okuduğunuz ifadeleri* ***öğretmen gözüyle değerlendirerek*** *ve* ***şu andaki teknoloji kullanımına ilişkin becerilerinizi dikkate alarak yanıtlayınız****. İfadelerin tanımladığı özellikler sizi yansıtıyorsa aşağıdaki ölçeği göz önünde bulundurarak yanındaki kutucuğa 1 ile 5 arasında sizi en iyi tanımlayan değeri yazınız. 1 EN BAŞARISIZ OLDUĞUNUZ durumlarda sizi en iyi yansıtan ve 5 EN BAŞARILI OLDUĞUNUZ DURUMLAR da sizi en iyi yansıtan becerinin GÖSTERGESİDİR. Eğer kendinizi 1 ile 5 arasında bir yerde görüyorsanız 2, 3 ya da 4 sayılarından birini işaretleyiniz*

1	2	3	4	5
En başarısız olduğum durum	⟷			**En başarılı olduğum durum**

1. [_____] Bilgisayarda herhangi bir programı çalıştırabilirim
2. [_____] Bilgisayara disket ya da CD-ROM gibi araçları takıp çıkartabilirim
3. [_____] Bilgisayarda bir sorunla karşılaştığımda kendi kendime çözebilirim.
4. [_____] Bilgisayarda dosya ve klasörlerle ilgili her türlü işlemi yapabilirim. (Örnek: Kesme, kopyalama, yapıştırma, taşıma, yedekleme, silme vb.)
5. [_____] Hesaplama tablosu (Örnek: Microsoft Excel) programlarında formüller ile işlem yapabilirim.
6. [_____] Bütün öğrencilerin teknolojik araçlardan eşit düzeyde faydalanmasını sağlayabilirim.
7. [_____] Yazıcıdan kaynaklanan genel sorunları çözebilirim. (Örnek: Kağıt sıkışması, bitmesi yada bağlantılardan kaynaklanan sorunlar vb.)
8. [_____] Bilgisayarı çalışır hale getiren sistem yazılımlarını kurabilirim. (Örnek: İşletim Sistemi: Windows 98, ME, XP.)
9. [_____] Donanım parçalarını bilgisayara tanıtan sürücü yazılımlarını kurabilirim.
10. [_____] Derste kullanılan teknolojiyi değerlendirebilirim. (Örnek: Konuya uygunluk, öğrencinin seviyesine uygunluk vb.)
11. [_____] Bilgisayara herhangi bir uygulama yazılımı yükleyebilirim. (Örnek: Microsoft Office, Adobe Acrobat, vb.)
12. [_____] Elektronik posta aracını (e-mail) kullanabilirim. (Örnek: Elektronik posta açabilir, cevaplayabilir, ek dosya ya da dosyalar gönderip / alabilir, herhangi bir e-posta listesine kayıt olabilirim.)
13. [_____] Öğrencilere derste başarılı olmak için gerekli olan teknoloji bilgi ve becerilerini öğretebilirim.

14. [_____] Herhangi bir resim dosyasını bilgisayarda grafik programları ile düzenleyebilirim. (Örnek: Adobe Photoshop, Macromedia Fireworks, Corel Draw)
15. [_____] İnternetten dosya indirebilirim. (Örnek: Resim, müzik, program dosyaları vb.)
16. [_____] Tarayıcıdan herhangi bir belgeyi ya da resmi bilgisayara yükleyebilirim.
17. [_____] Web sayfası editörü (Örnek: Microsoft Frontpage) programları ile web sayfası yapabilirim.
18. [_____] Dijital kamera ile çektiğim görüntüleri bilgisayara hem resim hem de video olarak yükleyebilirim.
19. [_____] Teknoloji destekli ders planları yazarak uygulayabilirim.
20. [_____] Yaratıcılığı destekleyen öğrencinin sınıf içerisinde aktif olduğu etkinlikleri düzenleyebilirim.
21. [_____] Derslerime uygun eğitim yazılımlarını seçerek sınıfta kullanabilirim.
22. [_____] Bir konu ile ilgili web sayfasını öğretim materyali olarak kullanabilirim.
23. [_____] Internet destekli ortamlarda tartışmalara katılabilirim. (Örnek: Sohbet (Chat), Tartışma Grupları (Discussion List), Forumlar ve On-line dersler vb.)
24. [_____] Masaüstü yayıncılık programları ile çalışabilirim. (Örnek: Authorware, Toolbook ya da Hyperstudio.)
25. [_____] Teknoloji kullanımının önemi ve faydaları üzerine öğrencilerimi bilgilendirebilirim.
26. [_____] Öğrencilerin teknoloji yardımı ile yaptıkları çalışmaları değerlendirecek ölçütleri belirleyebilirim.
27. [_____] Öğrencilerin ileri düzeyde ve yaratıcı düşünmeleri için teknoloji destekli ders planları hazırlayarak uygulayabilirim.
28. [_____] Sınıfta teknoloji kullanımı konusunda sürekli kendimi değerlendirerek kendimi geliştirebilirim.
29. [_____] Derste öğretim ile ilgili sorunları gidermek için değerlendirme sonuçlarını kullanabilirim.
30. [_____] Kelime işlemci programları ders planı yazma, çalışma kağıdı hazırlama, sınav sorusu yazma gibi işlerde kullanabilirim.
31. [_____] Veritabanı (Örnek: Microsoft Access) programlarını kullanabilirim.
32. [_____] Hesaplama Tablosu (Örnek: Microsoft Excel) programlarında grafik oluşturabilirim.
33. [_____] Sınıfta teknoloji kullanımının öğrencilerin öğrenmeleri üzerinde ne tür yararları olduğunu tanımlayabilirim.
34. [_____] Öğrencileri teknolojik araçları sağlıklı ve güvenli bir şekilde kullanmaları için yönlendirebilirim.

35. [_____] Okulda teknoloji kullanımı ile ilgili ortaya çıkabilecek sorunları tanımlayarak bunlara uygun çözümleri belirleyebilirim. (Örnek: Internet'in amacı dışında kullanılması, oluşabilecek güvenlik tehditleri vb.)
36. [_____] Sınıf içerisinde öğrencilerin farklı özelliklerini dikkate alan yöntemleri desteklemek için teknolojiyi kullanabilirim. (Örnek: Çoklu zekâ kuramı, kubaşık öğrenme vb.)
37. [_____] Okulda bilgisayar ve internet kullanımı ile ilgili kuralları belirleyebilirim.
38. [_____] Eğitimde teknoloji kullanımı ile ilgili güncel çalışmaları sürekli takip ederek sınıfta teknoloji kullanımımı çalışmaların önerilerine göre düzenleyebilirim.
39. [_____] Sınıfta teknoloji kullanırken oluşabilecek sorunları belirleyerek bu sorunlara uygun çözümler üretebilirim.
40. [_____] Okulda bulunan teknolojik kaynakları tanımlar, bunun doğrultusunda derslerimi düzenleyerek, uygulayabilirim.
41. [_____] Bilgisayarda sunum programlarını (Örnek: Microsoft Powerpoint) kullanarak elektronik sunumlar hazırlayabilirim.
42. [_____] Öğrencilerin kendi öğrenmelerinden sorumlu oldukları ders etkinliklerini desteklemek için teknolojiyi kullanırım.
43. [_____] Sınıfta bedensel engelli olan öğrencilerin ihtiyaç duyabileceği teknolojik kaynakları sağlayabilirim

Anket bitmiştir.
Katkılarınızdan dolayı teşekkür ederim.
Sacip TOKER,
Süleyman Demirel Üniversitesi Burdur Eğitim Fakültesi