PRE-SERVICE SCIENCE AND MATHEMATICS TEACHERS' COMPUTER RELATED SELF-EFFICACY, ATTITUDES, AND THE RELATIONSHIP AMONG THESE VARIABLES

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Approval of the Graduate School of Social Sciences

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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ABSTRACT

PRE-SERVICE SCIENCE AND MATHEMATICS TEACHERS' COMPUTER RELATED SELF-EFFICACY, ATTITUDES, AND THE RELATIONSHIP AMONG THESE VARIABLES

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The purpose of this study was (1) to explore pre-service science and mathematics teachers' levels of computer self-efficacy and attitude towards computers, (2) to investigate the effects of gender, grade level, major of study, and computer ownership of pre-service science and mathematics teachers on computer self-efficacy and attitudes towards computers, and (3) to examine the relationship between computer self-efficacy and attitudes towards.

For this study 650 students from two departments, which were Elementary Science Education and Elementary Mathematics Education, of three public universities in Ankara participated. Also, students were enrolled in first and fourth grades. The scales were administrated during 2006 Fall semester. Computer Self-efficacy Scale and Computer Attitude Scale which had four sub-scales, namely anxiety confidence, liking, and usefulness were used to determine pre-service teachers' computer self-efficacy and attitudes towards computer levels. Moreover, the

questionnaire had some questions that asked demographic characteristics of participants.

The results indicated that pre-service Science and Mathematics teachers had high computer self-efficacy and attitude levels. Furthermore, participants' gender was not a significant factor on their computer self-efficacy and computer attitude except for liking sub-scale. Males liked more computer than females. Major of participants did not have any effect on computer self-efficacy and computer attitude. Grade level was an important factor for computer self-efficacy and attitude; fourth graders had higher scores on both scales. Computer owner participants had significantly higher scores of computer self-efficacy and attitudes towards computers. Finally, results showed that participants' computer self-efficacy scores were related to sub-scale scores of computer attitude scale.

Keywords: Computer Self-Efficacy, Attitude towards Computer, Computer Anxiety

ÖZ

FEN BİLGİSİ VE MATEMATİK ÖĞRETMEN ADAYLARININ BİLGİSAYARA İLİSKİN ÖZ-YETERLİKLERİ, TUTUMLARI VE BU DEĞİŞKENLER ARASINDAKİ İLİŞKİLER

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Bu çalışma, (1) Fen Bilgisi ve Matematik öğretmen adaylarının bilgisayar öz-yeterlik ve bilgisayara karşı tutumlarını; (2) öğretmen adaylarının cinsiyetlerinin, sınıf düzeylerinin, bölümlerinin ve bilgisayara sahip olup olmadıklarının onların bilgisayar öz-yeterlikleri ve bilgisayara karşı tutumları üzerindeki etkisini ve (3) öğretmen adaylarının bilgisayar öz-yeterlikleri ile bilgisayara karşı tutumları arasında anlamlı bir ilişki olup olmadığını araştırmak amacıyla yapılmıştır.

Ankara'daki üç devlet üniversitesinden 1. ve 4. sınıf 650 Fen bilgisi ve Matematik öğretmen adayı çalışmaya katılmıştır. Öğretmen adaylarına, 2006-2007 eğitim-öğretim yılının güz döneminde Bilgisayar Öz-Yeterlik ölçeği ve Bilgisayara Karşı Tutum Ölçeğidir uygulanmıştır. Bilgisayara Karşı Tutum Ölçeği kaygı, güven, hoşlanma ve yararlılık alt boyutlarına sahiptir.

Sonuçlar, Fen Bilgisi ve Matematik öğretmen adaylarının yüksek düzeyde bilgisayar öz-yeterliğine ve bilgisayara karşı tutuma sahip olduklarını göstermiştir.

Öğretmen adaylarının cinsiyetlerinin, onların bilgisayar öz-yeterliğine ve bilgisayara karşı tutumlarına herhangi bir etkisinin bulunmadığı görülmüştür. Ancak sadece bilgisayara karşı tutum ölçeğinin hoşlanma alt boyutu üzerinde erkeklerin daha üstün olduğu sonucuna ulaşılmıştır. Fen Bilgisi öğretmen adaylarının bilgisayar öz-yeterlik ve bilgisayara karşı tutumları, Matematik öğretmen adaylarınınkilerle karşılaştırıldığında anlamlı bir fark bulunamamıştır. Çalışmanın sonuçları, sınıf düzeyinin bilgisayar öz-yeterlik açısından önemli bir faktör olduğunu göstermiştir. 4. sınıf öğretmen adayları 1. sınıf öğretmen adaylarından daha yüksek öz-yeterliğe sahipler. Aynı sonuçlar bilgisayara karşı tutum ölçeğinin güven ve hoşlanma alt boyutları içinde bulunmuştur. Sonuçlara göre bilgisayar sahibi öğretmen adayları hem daha yüksek bilgisayar-öz-yeterliğine sahipler hem de bilgisayara karşı daha pozitif tutum sergilemişlerdir. Son olarak çalışma sonuçları öğretmen adaylarının öz-yeterlik düzeyleri ile bilgisayara karşı tutumları arasında pozitif bir ilişki olduğunu göstermiştir.

Anahtar Kelimeler: Bilgisayar Öz-Yeterliği, Bilgisayara Karşı Tutum, Bilgisayar Kaygısı

To My Parents

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LIST OF ABBREVIATIONS

ESE: Elementary Science Education

EME: Elementary Mathematics Education

CSS: Computer Self-Efficacy Scale

CAS: Computer Attitude Scale

CHAPTER I

INTRODUCTION

Technology has been very influential in the life of modern society. Technology also infused into the discipline of education by affecting teaching, learning, and planning processes. Therefore, today's teachers are expected to be technologically literate by incorporating technological tools into their practice. Yıldırım (2000) stated that computer technology will affect almost all jobs in our life in the 21st century. One of the jobs that will be affected from computer technology is teaching. In other words, teachers should adopt the advancement of new technologies in education. Hopson, Simms, and Knezek (2002) stated that technological developments with instructional and pedagogical developments have changed ordinary education standards. Instructional and pedagogical improvements with technological advances have caused to changes in teaching/learning methods and environments (Marina, 2001). Furthermore, researchers expect that technology will continue to change and advance teaching and learning environments and strategies. Accordingly, incorporation of new technological developments into school curricula and the demand for teachers who are capable of using technology is ever increasing. In the following parts, I will present more detailed information about the aforementioned studies.

Computer related courses and practical applications equip teachers with the knowledge and skills necessary to integrate technology into teaching. In other words, the mean of these courses is computer training for pre-service teachers. Training about technology is an important factor for using technology. Several studies indicated that computer training improves computer using by affecting computer related constructs. Literature has determined two important constructs, namely computer self-efficacy and attitude towards computers (Ayersman and Reed, 1996; Brosnan, 1998; Busch, 1995; Karsten and Roth, 1998; Khorrami-Arani, 2001; Loyd and Gressard, 1984a; Loyd and Gressard, 1984b; Ropp, 1999; Torkzadeh & Koufteros, 1994; Zhang and Espinoza, 1998). According to Ropp (1999), computer self-efficacy, attitude towards computer, and computer anxiety, which is dimension of computer attitude, may provide information to determine the learning with technology and integration into teacher practice.

Compeau & Higgins (1995) defined computer self-efficacy as one's belief in his/her capability to use computer. Authors, also, stated that computer self-efficacy has a major impact on an individual's expectations towards using computers. According to this definition, computer self-efficacy has an important role for teacher integration technology. Delcourt and Kinzie (1993) claimed that teachers who have a high computer self-efficacy integrate technology into their practice.

Literature indicated that computer training correlates with computer self-efficacy (Torkzadeh & Koufteros, 1994; Torkzadeh, Pflughoeft, & Hall, 1999). Computer training provides higher level of computer-self-efficacy to participants. Therefore, computer training programs has a significance on computer self-efficacy (Marakas, Yi, & Johnson, 1998). Regarding this perspective, technology-related courses

or computer-related courses are important for teacher integration technology in teacher preparedness.

Another important construct determined for using computer is attitude towards computer. According to Levine &Donitsa-Schmidt (1998), an individual's behavioral intentions related to computer use influence his/her attitudes towards computer. Attitude towards computer has an important role with respect to using computer technology (Loyd & Gressard, 1984b). For instance, Ropp (1999) believed that "if preservice or inservice teachers demonstrate proficiency integrating technology into their teaching but do not believe that technology has a use in the classroom, they will probably not teach with technology despite their proficiency." (p. 403).

Attitude towards computers scales generally were developed by using some sub-scales, such as anxiety, confidence, liking, and usefulness (Berberoğlu & Çalıkoğlu, 1992; Delcourt & Kinzie, 1993; Loyd and Gressard, 1984a). Computer anxiety is the most important dimension of attitude towards computer scale since several research evaluate computer anxiety as a separable construct and found high relationship between computer attitude and computer anxiety (Bozionelos, 2001; Brosnan, 1998; Brosnan & Lee, 1998; Chua, Chen, & Wong, 1999; Durndell & Haag, 2002; Dyck & Smither, 1994). Chua *et al.* (1999) defined computer anxiety as a fear of computers, or fearing the possibility of using a computer. However, computer anxiety may also occur in different conditions. For instance, most of teachers who are working in public and private schools did not take any course or see any computer-based technology during their elementary or high school life. Hunt & Bohlin (1993) claimed that teachers' experience about using the computer is lower than the children of "Microcomputer-age". Therefore,

the low experienced teachers do not use computer source in educational settings. Also, authors stated that since they were not trained in the "microcomputer-age," fear of computers dominate the low experienced teachers. In other words, these teachers may form computer anxiety. On the other hand, some teachers have low level of experience for using computer. Besides, their experience is lower than their students' experience. According to Rowe (1998) these teachers, who have less experience than their students, see computers as a scary monster. In other words, they develop computer anxiety.

1.1 Problems and Hypothesis of the Study

1.1.1 Main Problems of the Study

The aims of the present study are (1) to investigate pre-service science and mathematics teachers' levels of computer self-efficacy and attitude towards computer, (2) to investigate the effects of gender, grade level, major of study, and computer ownership of 1st and 4th grade elementary science and mathematics pre-service teachers on computer self-efficacy and attitudes towards computers, and (3) to explore the relationship between participants' computer self-efficacy beliefs and attitudes towards computers.

1.1.2 Sub-Problems of the Study

The sub-problem related to main problem (1) are:

1. What are the pre-service science and mathematics teachers' levels of computer self-efficacy and attitude towards computer?

The sub-problems related to main problem (2) are:

Related to Gender

2. Is there a significant difference in the mean computer self-efficacy scores for males and females?

3. Is there a significant difference in the mean computer anxiety scores for males and females?

4. Is there a significant difference in the mean computer confidence scores for males and females?

5. Is there a significant difference in the mean computer liking scores for males and females?

6. Is there a significant difference in the mean computer usefulness scores for males and females?

Related to Grade Level

7. Is there a significant difference in the mean computer self-efficacy scores for first and fourth grade participants?

8. Is there a significant difference in the mean computer anxiety scores for first and fourth grade participants?

9. Is there a significant difference in the mean computer confidence scores for first and fourth grade participants?

10. Is there a significant difference in the mean computer liking scores for first and fourth grade participants?

11. Is there a significant difference in the mean computer usefulness scores for first and fourth grade participants?

Related to Major of Study

12. Is there a significant difference in the mean computer self-efficacy scores for major of participants?

13. Is there a significant difference in the mean computer anxiety scores for major of participants?

14. Is there a significant difference in the mean computer confidence scores for major of participants?

15. Is there a significant difference in the mean computer liking scores for major of participants?

16. Is there a significant difference in the mean computer usefulness scores for major of participants?

Related to Computer Ownership

17. Is there a significant difference in the mean computer self-efficacy scores for participants' computer ownership?

18. Is there a significant difference in the mean computer anxiety scores for participants' computer ownership?

19. Is there a significant difference in the mean computer confidence scores for participants' computer ownership?

20. Is there a significant difference in the mean computer liking scores for participants' computer ownership?

21. Is there a significant difference in the mean computer usefulness scores for participants' computer ownership?

The sub-problems related to main problem (3) are:

22. Is there a relationship between the computer self-efficacy scores and computer anxiety scores?

23. Is there a relationship between the computer self-efficacy scores and computer confidence scores?

24. Is there a relationship between the computer self-efficacy scores and computer liking scores?

25. Is there a relationship between the computer self-efficacy scores and computer usefulness scores?

1.2 Null Hypotheses

Null Hypothesis 1

There is no significant difference in the mean scores of computer self-efficacy between males and females.

Null Hypothesis 2

There is no significant difference in the mean scores of computer anxiety between males and females.

Null Hypothesis 3

There is no significant difference in the mean scores of computer confidence between males and females.

Null Hypothesis 4

There is no significant difference in the mean scores of computer liking between males and females.

Null Hypothesis 5

There is no significant difference in the mean scores of computer usefulness between males and females.

Null Hypothesis 6

There is no significant difference in the mean scores of computer self-efficacy between first and fourth graders.

Null Hypothesis 7

There is no significant difference in the mean scores of computer anxiety between first and fourth graders.

Null Hypothesis 8

There is no significant difference in the mean scores of computer confidence between first and fourth graders.

Null Hypothesis 9

There is no significant difference in the mean scores of computer liking between first and fourth graders.

Null Hypothesis 10

There is no significant difference in the mean scores of computer usefulness between first and fourth graders.

Null Hypothesis 11

There is no significant difference in the mean scores of computer self-efficacy between ESE and EME pre-service teachers.

Null Hypothesis 12

There is no significant difference in the mean scores of computer anxiety between ESE and EME pre-service teachers.

Null Hypothesis 13

There is no significant difference in the mean scores of computer confidence between ESE and EME pre-service teachers.

Null Hypothesis 14

There is no significant difference in the mean scores of computer liking between ESE and EME pre-service teachers.

Null Hypothesis 15

There is no significant difference in the mean scores of computer usefulness between ESE and EME pre-service teachers.

Null Hypothesis 16

There is no significant difference in the mean scores of computer self-efficacy between computer owner and non-computer owner participants.

Null Hypothesis 17

There is no significant difference in the mean scores of computer anxiety between computer owner and non-computer owner participants.

Null Hypothesis 18

There is no significant difference in the mean scores of computer confidence between computer owner and non-computer owner participants.

Null Hypothesis 19

There is no significant difference in the mean scores of computer liking between computer owner and non-computer owner participants.

Null Hypothesis 20

There is no significant difference in the mean scores of computer usefulness between computer owner and non-computer owner participants.

Null Hypothesis 21

There is no significant relationship between the computer self-efficacy scores and computer anxiety scores.

Null Hypothesis 22

There is no significant relationship between the computer self-efficacy scores and computer confidence scores.

Null Hypothesis 23

There is no significant relationship between the computer self-efficacy scores and computer liking scores.

Null Hypothesis 24

There is no significant relationship between the computer self-efficacy scores and computer usefulness scores.

1.3 Definition of Important Terms

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

Self-efficacy: Bandura (1977) defined self-efficacy as one's belief in his/her capacity to perform a specific task.

Computer self-efficacy: Compeau & Higgins (1995) defined computer self-efficacy as one's belief in his/her capability to use computer.

Attitude: Fishbein and Ajzen (1975, p. 6) defined attitude as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object".

1.4 Significance of the Study

Elementary Science Education Program has been re-designed in 2005 in Turkey. At the same time, "Science Education" (Fen Bilgisi) course name was changed with "Science and Technology" (Fen ve Teknoloji). When re-designing curricula and changing course name, technology use and new technological developments become an important part of science education course. As a result, today's science education teachers need to have more information and experience on technological tools. Therefore, teacher preparation programs have an important role to equip pre-service teachers with knowledge skills and

attitude that enable them to use technology effectively. Ropp (1999) stated that computer self-efficacy and attitude towards computer, and computer anxiety, which is dimension of computer attitude, might be important constructs to determine the learning with technology and integration into teacher practice. It is, therefore, critical to know general affecting factors for pre-service teachers' computer self-efficacy and attitudes towards computers.

Literature in Turkey indicated some related studies with current study. However, these studies explored pre-service teachers' computer self-efficacy and/or attitudes towards computer regarding different factors. The effects of gender and major of study on pre-service teachers' computer self-efficacy and attitudes towards computer were investigated (Akkoyunlu & Orhan, 2003; Gürcan-Namlu & Ceyhan, 2003; Yıldırım, 2000). However, the effects of grade level and computer ownership have not been investigated. In addition, there is not any study that we know about the relationship between pre-service teachers' computer self-efficacy and attitudes towards computer in Turkey. The current study aims to investigate pre-service science and mathematics teachers' level of computer self-efficacy and attitude towards computer with respect to some factors that has not been considered in the literature, that is grade level and computer ownership.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter presents reviews of literature about self-efficacy, computer self-efficacy, and computer attitude. The reviews start with defining these concepts and then continue with the empirical studies that involve these concepts.

2.1 Computer Self-Efficacy

Computer self-efficacy is a specific type of self-efficacy. Therefore, defining self-efficacy would be helpful to better understand computer self-efficacy. According to Bandura (1977), self-efficacy is one's belief in his/her capacity to perform a specific task. Individuals may define their skills and capabilities in order to perform certain actions or activities. Bandura, Adams, & Beyer (1977) stated that if individuals have high self-efficacy to carry out certain activities, they are more likely to attempt these activities. On the contrary, if individuals have low self-efficacy to do activities, they are less likely to attempt the activities.

Moreover, Wood and Bandura (1989, p.408) defined self-efficacy as belief in one's ability to "mobilize the motivation, cognitive recourses, and courses of action needed to meet given situational demands". Following these definitions, computer self-efficacy can be defined as one's belief in his/her capability to use computer (Compeau & Higgins, 1995). Bandura (1978, p.241) stated that "the outcomes one expects

derive largely from judgments as to how well one can execute the requisite behavior". According to Compeau and Higgins (1995), computer self-efficacy has a major impact on an individual's expectations towards using computers. Individuals who did not believe themselves as computer users were less likely to use computers (Kinzie & Delcourt, 1991; Oliver & Shapiro, 1993).

Bandura (1994) stated that individuals develop their self-efficacy beliefs as a result of experiences gained through four different sources. First one is one's previous performance or mastery experience. Individuals develop beliefs about their capability in actions or activities by interpreting the results of previous actions. Accordingly, successful outcomes affect an individual's self-efficacy positively; whereas unsuccessful outcomes affect it negatively. Second source of building self-efficacy is vicarious experience. Individuals develop self-efficacy by observing other people's perform tasks. They can learn activities from other people, who are more competent in doing these activities. In this way, they can increase their self-efficacy to do these activities. Third source is social persuasions. Persuaders may develop positive or negative self-efficacy. Their verbal judgment can affect individual's self-efficacy beliefs. The last source of building self-efficacy is somatic and emotional states. An individual's emotional states give a direction to their self-efficacy beliefs. People's stress and anxiety, which resulted in previous experience, can cause negative self-efficacy. On the other hand, positive experiences can cause positive self-efficacy. These sources may also exist for development of computer self-efficacy. For instance, one's previous computer experience may develop self-efficacy beliefs about computer capability. If an individual observes another people who are successful or unsuccessful in doing computer activities, he or she may develop his or her self-efficacy beliefs related to computer. Also,

persuaders may affect individuals with respect to building computer self-efficacy. Finally, if one's anxiety towards computer is high, he or she may develop negative computer self-efficacy.

Most of the researches related in the field of computer self-efficacy have investigated the computer self-efficacy and the relationship with other variables such as gender, age, grade, socio-economic status, and computer experience. The most consistent correlate of computer self-efficacy was gender. Literature on the relationships between computer self-efficacy and gender revealed inconclusive results. Some research indicated that gender was related to computer self-efficacy (Busch, 1995 for complex tasks; Durndell & Haag, 2002; Işıksal & Aşkar, 2003; Torkzadeh & Koufteros, 1994; Torkzadeh *et al.*, 1999, Whitely, 1997). Results showed that male participants exhibited a higher level of computer self-efficacy than female participants. On the other hand, some research stated that there was no significant correlation between computer self-efficacy and gender (Akkoyunlu & Orhan, 2003; Busch, 1995 for simple tasks; Karsten & Roth, 1998; Ropp, 1999; Sam, Othman, & Nordin, 2005). Literature on the correlation between computer self-efficacy and computer experience was very consistently. Wilfong (2006) carried out a study to explore this relationship. Accordingly, computer experience was an important predictor for computer self-efficacy. Whitely (1997) found same result in his meta-analysis studies.

Durndell & Haag (2002) investigated the relationship between computer self-efficacy, computer anxiety, attitude towards the internet and reported experience with the internet based on gender factor. The sample of the study consisted of 150 university students (74 females and 76 males). The students responded the four questionnaires (Internet experience, Computer Anxiety Rating Scale, Internet Attitude Scale, and

Computer Self-Efficacy Scale) and some questions that collected demographic characteristics (age, gender, etc.). Results of the study showed that computer self-efficacy has a positive correlation with the Internet attitude and reported time of use of the Internet. However, it has a negative correlation with computer anxiety. Accordingly, it is the significant predictor for computer anxiety. Another result of this study is that computer self-efficacy level changes with respect to gender. Males have more computer self-efficacy than female.

Busch (1995), in his study, revealed whether there are gender differences in computer self-efficacy and attitudes towards computer. Author collected data from 147 college students of business administration. They were 80 females and 67 males. To obtain data from participants, a questionnaire which included computer self-efficacy, computer anxiety, computer liking, and computer confidence was administrated. The study showed strong gender differences in students' computer self-efficacy level. However, gender difference was occurred in only complex tasks. On the contrary, it was not found any difference between male and female students in simple tasks. In addition, the results of the study displayed that computer self-efficacy and attitudes towards computer are strongly correlated.

Another study related with computer self-efficacy was held by Akkoyunlu and Orhan (2003), gender and age effects on computer self-efficacy were investigated. A hundred and fifty nine Computer and Instructional Technologies' students participated for administration the Computer Self-efficacy Scale. They were 51 females and 108 males. Also, their ages were 20, 21, and 22 years old. Two important results were found in the study. While gender was not effective for computer

self-efficacy, age was significantly effective for it. Older participants had more computer self-efficacy than younger participants.

Wilfong (2006) analyzed the relationship between the computer use, computer experience, and self-efficacy beliefs of users as predictors for computer anxiety and anger symptoms. The sample of the study consisted of 242 undergraduate students (138 females and 104 males). Their mean age was 22 years old. A questionnaire was used to collect data. It had questions which asked demographic characteristics and computer use, Computer Anxiety Scale, Computer Anger Scale, Computer Experience Scale, and Computer Self-Efficacy Scale. The results of analyzed questionnaire data indicated that computer self-efficacy belief was significantly related with computer anxiety and computer anger. Wilfong (2006) suggested that computer self-efficacy beliefs and computer experience were important predictors for computer anxiety and anger symptoms. Besides, computer self-efficacy was the most significant predictor for them.

Işıksal and Aşkar (2003) developed a new scale to measure elementary students' computer self-efficacy beliefs. Also, they investigated the gender difference in mathematics and computer self-efficacy. Therefore, they develop not only computer self-efficacy scale, but also they developed a new mathematics self-efficacy scale. Fifty-seven female and sixty male students were randomly selected from 7^{th} and 8^{th} grade level class. The important result of the current study was that there was a gender difference with respect to computer self-efficacy scores. According to result, male students had significantly higher scores than females. In other words, gender was an important factor to determine computer self-efficacy.

In a different study, Whitely (1997) carried out a meta-analysis research to examine the gender differences in computer-related attitudes and behavior. Author, also, focused the gender difference on computer self-efficacy. In total, 40.491 respondents (21.587 females and 18.904 males) were examined in a sample of 82 studies. According to the results of the meta-analysis, it was found that male have more self-efficacy beliefs than female. Another result was that high school students had largest gender difference. Grammar school students, college students, and adults had lower gender difference on computer self-efficacy than high school students. Also, the study stated that computer experience was correlated with computer self-efficacy.

The positive relationship between computer self-efficacy and attitudes towards computer is most consistent finding in using computer. Several studies indicated the effects of computer attitude and its sub-dimensions on computer self-efficacy (Busch, 1995; Delcourt & Kinzie, 1993; Khorrami-Arani, 2001; Ropp, 1999; Torkzadeh *et al.*, 1999; Torkzadeh & Van Dyke, 2002). Moreover, some research studied to observe the relationship between computer self-efficacy and computer anxiety (Brosnan, 1998; Durndell & Haag, 2002; Gürcan-Namlu & Ceyhan, 2003; Henderson, Deane, & Ward, 1995; Ropp, 1999). However, Sam, Othman, and Nordin (2005) found that that computer self-efficacy did not have significant relationship with computer anxiety, attitudes towards the Internet, and Internet use.

Khorrami-Arani (2001), studied to develop a scale as an effective tool for the measure of computer self-efficacy. In the study, developed computer self-efficacy scale was conducted with computer attitude scale that included computer anxiety, computer confidence, and computer liking sub-scales. The sample of the study was 105 students (61 females

and 44 males) from six different 8th grade level IT classes. The results of the study indicated that computer self-efficacy scores was quite highly correlated with computer attitude scores and its each sub-scales score.

Another study investigated the relationship between (1) computer self-efficacy and training and (2) computer self-efficacy and user attitudes (Torkzadeh *et al.*, 1999). A pre and post-test design survey method was used in the study. Torkzadeh *et. al.* collected their data from 414 undergraduate students who were taking a computer related course in two universities. The numbers of males and females were equal. The results of the study indicated that training has a significant effect on computer self-efficacy. At the same time, there was a positive correlation between user attitudes and computer self-efficacy. Another result of the study showed that there were no gender differences in mean scores for computer self-efficacy.

Sam *et al.* (2005), however, found different results in their study. Authors conducted a study to investigate the effects of some demographic characteristics (age, gender, faculty, et.) on computer self-efficacy, computer anxiety, attitudes towards the Internet, and Internet use. Also, it was examined whether there are a relationships between computer self-efficacy, computer anxiety, attitudes towards the Internet, and Internet use They used a questionnaire which had five sections such as collected demographic characteristics (age, gender, faculty, etc.), time spent in a week using the Internet, Computer Anxiety Rating Scale (CARS), Internet Attitude Scale (IAS), and finally Computer Self-Efficacy Scale (CSE). The subjects of the study were 148 undergraduate students and they were 81 females and 67 males. The sample mean age was 23.8 years old. According to the results of their study, gender was not an affecting factor for computer self-efficacy, computer anxiety, and

attitude towards Internet. Authors also mentioned that computer self-efficacy did not have significant relationship with computer anxiety, attitudes towards the Internet, and Internet use. According to this result, computer self-efficacy cannot be used as a predictor for computer anxiety.

Karsten and Roth (1998) used computer self-efficacy belief as an indicator to learn if student perceptions of their ability to use computers effectively in the future significantly improved as a result of their training experience in their research. Therefore, they administrated computer self-efficacy scale as pretest and posttest on 148 students. One result of the study was no significant difference in the student pretest scores based on gender. Moreover, prior computer experience of students was significantly and positively correlated with the pretest computer self-efficacy scores. According to posttest scores, although gender difference was not changed, prior computer experience was not significantly related with final levels of computer self-efficacy scores.

Torkzadeh and Koufteros (1994) conducted a study to investigate the effect of computer training on computer self-efficacy. Also, a computer self-efficacy scale which included 30-items was validated in the study. The sample consisted of 224 undergraduate students which continued at an introductory computer course. Computer self-efficacy scale was conducted to students at the beginning and end of the course. The results of the study showed that training had a positive effect the students' computer self-efficacy beliefs. Furthermore, male students exhibited higher self-efficacy than female students. In another study held by Delcourt and Kinzie (1993), a possible relationship between Attitude towards Computer Technology and Self-Efficacy for Computer Technology was examined. According to the results of the study,

computer self-efficacy was positively associated with computer attitude. In other words, the more positive computer self-efficacy was, the more positive attitude towards computer.

Another study was examined the relationship between computer self-efficacy and computer anxiety (Gürcan-Namlu & Ceyhan, 2003). The study was conducted to investigate teacher candidate students' computer anxiety. The sample of the study was 1091 pre-service teachers from various programs of teacher education. The results of the study stated that pre-service teachers who had high computer self-efficacy exhibited low computer anxiety. Authors reported that computer self-efficacy was negatively correlated with computer anxiety.

Zhang and Espinoza (1998) held a study to determine the relationships between computer self-efficacy, attitude towards computer, and perceptions of desirability of learning computer skills. Authors collected data from 220 undergraduate students in 14 classrooms. They used Computer Technologies Survey in the study. It consisted of attitude towards computer technologies items, computer self-efficacy items, and desirability of learning computing skills items. According to the results of the study, computer anxiety which was the dimension of computer attitude scale was correlated with computer self-efficacy. Moreover, computer usefulness had a significant relationship with computer self-efficacy. In other words, computer anxiety and computer usefulness were an important predictor for computer self-efficacy.

To sum up, literature determined lots of factor affecting computer self-efficacy. Gender is one of the most important factors. Computer experience, computer attitude, and age were other important factors. Many study found gender differences on individuals' computer self-efficacy. Males generally have higher level of computer self-efficacy. On

the other hand, several researches stated that there was no gender difference on individuals' computer self-efficacy beliefs. Another important factor affecting computer self-efficacy is individuals' computer experience. Previous computer experience highly affects individuals' computer self-efficacy. Furthermore, literature revealed that computer attitude and its sub-dimensions, especially computer anxiety, was found as a significantly correlated with computer self-efficacy. It means that if an individual's computer attitude increases, his/her computer self-efficacy increases. Also, if his/her computer anxiety decreases, his/her computer self-efficacy increases.

2.2 Attitudes towards Computer

Fishbein and Ajzen (1975, p. 6) defined attitude as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object". A relationship is established between attitude and behavior in the Fishbein's theory. According to the theory, individuals' attitude determines their behavioral intensions (Fishbein & Ajzen, 1975). In other words, attitude is an important factor to determine behaviors. This theory can apply for computer use. Levine &Donitsa-Schmidt (1998) stated that an individual's behavioral intentions related to computer use affect his/her attitudes towards computer.

Most of the studies found several factor affecting computer attitude such as gender, computer experience, age, socio-economic status. The most studied correlation with attitudes towards computer was gender. Some studies stated that attitudes towards computers and gender were not significantly correlated (Brosnan & Lee, 1998; Comber, Colley, Hargreaves, & Dorn, 1997; Shashaani, 1994a; Shashaani, 1994b; Torkzadeh & Van Dyke, 2002; Whitely, 1997; Williams, Ogletree, &

Raffeld, 1993). Computer anxiety, which was the sub-dimension of computer attitude, was studied to investigate its relationship with gender in some studies. Chua *et al.* (1999) and Gürcan-Namlu & Ceyhan (2003) stated that gender had not an effect on computer anxiety. On the other hand, some studies revealed the gender effect on attitudes towards computers (Loyd & Gressard, 1984b; Ropp, 1999; Roussos, 2007) and they showed that gender was an affective factor for computer anxiety (Ayersman & Reed, 1996; Dyck & Smither, 1994).

Loyd and Gressard (1984b) studied whether computer experience and gender affects attitudes towards computer. They obtained the data from 142 high school students, 107 college students, and 105 college students living in dormitories. The instrument of the study was computer attitude scale which included of anxiety, confidence, and liking sub-dimensions. The results of the study revealed that computer experience was an important factor on three sub-dimensions of the computer attitude scale. Moreover, participants' age exhibited a significant effect on computer liking. Younger participants had higher level of computer liking than older participants. According to the results of the study, gender did not have any effect on any of the three sub-dimensions.

Similar results were found in Ropp (1999)'s study with respect to gender. She investigated the relationships among computer attitude, computer anxiety and computer self-efficacy. In addition, she examined the effects of age and gender on computer attitude, computer anxiety, and computer self-efficacy. Fifty-three teacher candidates students were participants of her study. The instrument of the study was a survey which included computer attitude, technology proficiency, computer anxiety, computer self-efficacy, and computer coping strategies questions. She resulted that age and gender were not affective on computer attitude,

computer anxiety, and computer self-efficacy. In addition, the results of the study revealed that computer self efficacy was significantly and positively related with computer attitude, whereas it was significantly and negatively related with computer anxiety.

Roussos (2007) developed a new computer attitude scale for Greek population. Also, he wanted to examine gender differences on computer attitude, and the relationships among age, computer experience, and confidence with computers and participants' responses on the new computer attitude scale. Four different samples were used for this study. Sample 1 which included 185 participants (99 females and 86 males) was to develop new scale, sample 2 which included 354 participants (207 females and 124 males) has a computer at home, sample 3 which included 222 teachers (125 females and 95 males), and sample 4 included 99 participants (63 females and 36 males). Thirty-item computer attitude scale was developed and conducted in this study. Results of the study showed that age and gender had not any important effect on all participants' computer attitude. Another finding of the study was that computer experience and computer confidence were highly correlated with computer attitude.

Brosnan and Lee (1998) administrated a study to compare gender differences in computer attitudes and anxieties of the United Kingdom's and Hong Kong's people. The sample of the study included 207 UK people which were 101 males and 95 females and 286 HK people which were 125 males, 126 females, and 35 unstated. All of students were 22 years old. A questionnaire which consisted of demographic items (assessing age, gender, computer ownership, etc.), previous experience scale, computer attitude scale, and computer anxiety scale were administrated in the study. A number of results were found in the study.

First was gender difference in computer experience. The results showed that male participants were more experienced with respect to computer than females for both samples. Second result of the study was that male and female participants were not different in terms of computer anxiety for UK and HK samples. However, according to the item-by-item analysis, males of the UK sample had less anxiety compared with males of the HK sample. Also, the UK sample had more positive attitude towards computers than the HK sample. In the UK sample male participants were more positive with respect to computer attitude than female participants, whereas in the HK sample there were no differences between male and female participants.

Literature found the positive relationships between computer self-efficacy and attitudes towards computers (Busch, 1995; Delcourt & Kinzie, 1993; Khorrami-Arani, 2001; Ropp, 1999; Torkzadeh *et al.*, 1999; Torhzadeh & Van Dyke, 2002,; Zhang & Espinoza, 1998). Furthermore, it was determined that computer anxiety was correlated with computer self-efficacy (Gürcan-Namlu & Ceyhan; 2003; Durndell & Haag, 2002; Henderson *et al.*, 1995; Ropp, 1999). In contrast, Sam *et al.* (2005) did not found any relationship between computer anxiety and computer self-efficacy.

As mentioned Section 2.1, Busch (1995) investigated the gender effects on computer self-efficacy and attitudes towards computer. Another results of the study revealed that strong gender differences in students' attitudes towards computer with respect to complex computer tasks, whereas it was not found that there was no any difference between male and female students in simple computer tasks. Furthermore, computer self-efficacy and attitudes towards computer were highly correlated with together.

Another consistent correlate for attitudes towards computers was computer experience. Several research indicated that prior computer experience was a significant predictor for attitudes towards computers (Loyd & Gressard, 1984b; Roussos, 2007; Shashaani, 1994a; Williams *et al.*, 1993). Also, some studies determined a positive relationship between computer anxiety and prior computer experience (Bozionelos, 2001; Chua *et al.*, 1999; Gürcan-Namlu & Ceyhan, 2003; Whitely, 1997).

As mentioned in the previous section (2.1), Whitely (1997) conducted a meta-analysis research to examine the gender differences in computer-related attitudes and behavior. According to another results of the meta-analysis, gender was an important factor for attitudes towards computer. Male participants have more attitudes towards computer than female participants. These gender differences were higher among high school students than grammar school students, college students, and adults. Another result was that computer experience was significantly correlated with attitudes towards computer.

In a different study, it was stated that computer anxiety had a relationship with computer experience (Bozionelos, 2001). The purpose of the study was to investigate the relationship between computer anxiety, computer experience and prevalence. For this purpose, computer anxiety levels and past computer experience of participants were recorded by using two questionnaires and several questions that asked some demographic characteristics. In total, the data obtained from 515 participants who were British individuals. The results of the study indicated that participants who have high computer experience observed low computer anxiety. In addition, younger participants exhibited more computer anxiety than older participants did.

Koohang (1989) was interested in the effect of gender on attitudes towards computers. In addition, the relationship between attitudes towards computer and prior computer knowledge was investigated in the study. Eighty-one undergraduate students were voluntaries from computer education courses at Midwestern University. According to the results of the study, it was found that prior computer knowledge was an important factor to determine attitudes towards computer while keyboarding, programming, using spreadsheets, and using word processing. Moreover, there was no gender difference on attitudes towards computer and its sub-scales, namely anxiety, confidence, and liking. Male participants had higher level of attitude towards computer than females. However, there was no any gender difference regarding computer usefulness.

Comber *et al.* (1997) carried out a study to examine the effects of age, gender, and prior computing experience on attitudes towards computers. The data obtained from two-age groups students, which were 11-12 and 15-16 years old. They were 278 secondary school pupils. The results of the study observed that there were age and gender effects on attitudes towards computer. Male pupils were more positive on computer with respect to attitude than female pupils. In addition, younger pupils had more positive attitude towards computers than older pupils. On the other hands, male pupils were more experienced on computer than female pupils. Also, it was found that younger pupils had more experience than younger pupils. When computer ownership was covariance, age differences was observed on enjoyment of computer and computer confidence. However, gender differences was found on only computer confidence. On the other hands, when computer experience was covariance, the results did not observe any age and gender differences regarding enjoyment of computer and computer confidence.

Ayersman and Reed (1996) held a study to investigate the computer training which included learning styles and programming and gender effect on computer anxiety. Experimental research design was used in the study. A computer anxiety scale was conducted on 36 females and 22 males which were undergraduate pre-service teachers. According to the results of the study, computer training had a decreasing effect on computer anxiety of participants. Furthermore, male and female participants did not exhibit different computer anxiety.

Another study held by Dyck and Smither (1994) was conducted to see the relationship between computer anxiety and computer experience and to observe the effects of age and gender on computer anxiety. Subjects (n=422) were from different age groups. First group was over 55 years old. Second group was under 30 years old. Subjects filled two questionnaires, namely Computer Attitude Scale and Computer Anxiety Scale. Three important results were found in the study. First was that younger adults have more anxiety than older adults. Second result was that younger adults have more confidence than older adults. The last important result was that there were no any differences between male and female adults with respect to computer anxiety.

Shashaani (1994a) was interested in the effect of gender on computer attitude and computer experience. Also, the relationship between computer attitude and computer experience was investigated in the study. Participants were from secondary schools students and they were 902 males and 828 females. According to the results of the study, it was found that computer experience was an important factor to determine attitudes towards computer. Moreover, there was a gender difference on attitudes towards computer and computer experience. Male participants were more experienced on computer than females. Also, males have

more attitude towards computer than females. Similar results were found in Williams *et al.* (1993)'s study. In their study, they examined the effects of gender and computer experience on attitudes towards computer. The results of the study observed that male participants have more experience on computer than female participants. Also, past computer experience was significantly related with computer attitude scores. In other words, male participants were more positive with respect to attitude towards computer than female participants.

Another study related to gender differences was held by Chua *et al.* (1999). Authors purposed to conduct a meta-analysis of relationships among computer anxiety and its correlates. Gender and computer experience were two important correlates for this study. Thirty six related studies publishing between 1990 and 1996 were used for sample of the study. The results of the study showed that computer experience was significantly related with computer anxiety. In other words, high experienced participants exhibited lower computer anxious than low experienced participants. Another important result of the study was about gender difference. Female undergraduate students generally have more computer anxiety than male undergraduate students.

In a different study it was found that computer anxiety had a relationship with computer self-efficacy (Brosnan, 1998). The purpose of the study was to examine the relationship between computer anxiety, computer self-efficacy, and computer performance. For this purpose, computer anxiety levels, past computer experience, and perceptions of computer self-efficacy were recorded by using two questionnaires. Computer Anxiety Rating Scale (CARS) and Computer Self-Efficacy Scale (CSE) were instruments of the study. The data obtained from 50 participants who were second year undergraduate students. They were 25

females and 25 males. Also, their age-range was between 20 to 22 years old. The results of the study revealed that participants who have low computer anxiety exhibited high computer self-efficacy. According to this finding, computer anxiety is considered as an important factor for determining computer self-efficacy. Furthermore, computer self-efficacy had a positive effect on computer performance. Therefore, it can be said that computer anxiety had a negative effect on computer performance.

A similar result was found in Henderson *et al.* (1995)'s study. They wanted to assess occupational differences on some psychological variables related to Management Information System (MIS). Primary psychological variable was computer anxiety. Moreover, computer confidence was determined to measure to assess computer self-efficacy in the study. Therefore, this study also investigated the relationship between computer anxiety and computer self-efficacy. A hundred and seven health care workers were participated in the study. Computer Attitude Scale which was developed Loyd and Gressard (1984a) was administrated to obtain data from participants. The results of the study were consistent with other studies. Findings of the study stated that computer self-efficacy was found to be significantly related with computer anxiety.

Some studies observed that socio-economic status was an important factor on computer attitude (Gürcan *et al.*, 2003; Shashaani, 1994b). Accordingly, higher socio-economic status caused higher level of attitudes towards computer. Shashaani (1994b), also, stated that there was a gender differences regarding computer attitude at low-level socio-economic status, any gender differences was not found at high-level socio-economic status with respect to computer attitude.

Gürcan *et al.* (2003), in their study, investigated pre-service teachers' computer anxiety with respect to some different variables, namely gender, major of study, grade level, location, socio-economic status, computer experience, computer ownership, frequency of using computer, the number of course taken about computer education, and computer self-efficacy. Results of the study showed that (1) male participants were less anxious than female participants. (2) Computer and Instructional Technologies' students had a lower computer anxiety than Special Education's, Fine Arts Education's, and Primary Education's students. (3) Fourth grade level students have less computer anxiety than lower grade level students. Results of the study revealed that (4) students who were living in a small city were more anxious than that were living in a large city. Furthermore, (5) higher socio-economic status caused lower computer anxiety. According to the results of the study, (6) more experienced students were less anxious than less experienced students. (7) Computer ownership students had less computer anxiety than students who did not have any computer. Results of the study observed that (8) the more frequency of using computer was, the less computer anxiety was. (9) The number of course taken about computer education had an effect on students' computer anxiety. If the number of course taken about computer education increases, the level of computer anxiety decreases. The last result was about the relationship between computer self-efficacy. According to the results of the study, computer self-efficacy was found to be an important factor to explain students' computer anxiety. The higher computer self-efficacy was, the less computer anxiety was.

Another study which was related to socio-economic status and computer attitude was held by Shashaani (1994b). She concentrated on the effect of family socio-economic status and parental sex-typed views on children's attitude towards computer. Thirty nine-item Computer

Attitude Scale was administrated on 1730 high school students. They were 902 males and 828 females at 9th and 12th grade level. According to the results of the study, socio-economic status and parents' educational level affected students' attitude towards computers. Moreover, there were gender differences in the lower socio-economic status. The lower socio-economic status was, the lower computer anxiety for females compared to males. Another finding of the study was that parental encouragement had a positive effect on children's attitude towards computer.

Torkzadeh and Van Dyke (2002) carried out a study to explore the computer training effects on Internet self-efficacy and computer user attitudes. Seventy eight males and 111 females were voluntary for training and filling the scales. An Internet Self-Efficacy Scale, which included 17 items, and a Computer User Attitude Scale, which included 20 items, was administrated before and after training. As a results of the study, males' and females' attitudes towards computer did not change after computer training. Moreover, it was observed that students who have high computer self-efficacy seemed to have high attitudes towards computer. It was also found that gender were affective on attitude towards computer. Male students were more positive with respect to computer attitude than female students were.

Although most of the literature supported strong relationships between computer experience and computer attitude, Garland and Noyes (2004) claimed that computer experience was a poor predictor to determine computer attitude scores. An instrument was administrated on 250 participants who were undergraduate students from two UK universities. The instrument was a questionnaire that includes five sections, namely demographic questions, computer use, computer skills, computer understanding, and subjective computer experiences used to

computer attitude. The most important result of the study was that computer experience had little ability to predict attitudes towards computer. Authors suggested that unmeasured computer-related and non-related activities might have an effect on attitudes towards computer.

As a conclusion, literature determined several effective factors for computer attitude. The most investigated factors were gender and computer experience. Literature were divided into two opposite claims about gender effect on computer attitude and its sub-dimensions such as computer anxiety, confidence, and liking. First was that gender had not any effect on computer attitude, whereas second claim was that gender was an important factor to effect computer attitude. Also, they claimed males generally had more positive computer attitude than females. Computer experience was a significant effect on computer attitude. The more experienced individuals on computer were, the more positive computer attitudes were. Moreover, computer self-efficacy was determined to be related with computer attitude. According to the literature, individuals who had high computer self-efficacy had more positive computer attitude. Age, in some studies, was seemed as an effecting factor for computer attitude, whereas some studies stated that there was no age effect on computer attitude. Socio-economic status was determined as a strong effective factor for computer attitude in most of the studies. Higher socio-economic status caused more positive attitude towards computer. Another affecting factor was individuals' computer ownership. Individuals who had a computer exhibited more positive attitude towards computer.

CHAPTER III

METHODS

This chapter presents information about population and sampling, description of variables, measuring instruments, data collection, and statistical techniques utilized in the analysis of data, assumptions, and limitations of the study.

3.1 Population and Sampling

This research was desired to be a national study and as the target population is all first grade and fourth grade pre-service elementary science and mathematics teachers in public universities in Turkey. However, entire population was not accessible for our study. Thus, it was necessary to determine an accessible population. All first and fourth grade pre-service science and mathematics teachers in state universities of Ankara were defined as the accessible population of this study. Not all universities in Ankara have Elementary Science Education (ESE) and Elementary Mathematics Education (EME) program. There were ESE and EME programs in three state universities. These were named as University A, University B, and University C. Thus, first and fourth grade students in the programs of these three universities were chosen as participants. In ESE and EME programs computer related courses are offered starting from second year. First year students are not allowed to take computer-related courses in their program of study. Therefore, being

in the last year of their program, fourth year students have more experience in and knowledge of working with computers in educational settings than first year students. Further, as a result of taking more computer-related courses, fourth year students are assumed to have more developed conceptualization of technology as an educational tool and its ever increasing role in education systems. Therefore, the choice of first year and fourth year students as a sample is justified by the difference in their level of knowledge and experience related to the use of computers.

A total of 650 pre-service science and mathematics teachers participated in this study. The subjects were 346 first grades, 304 fourth grade students. Table 3.1 represents the demographic information of participants. Table 3.1 illustrates that 417 (66.4 %) of participants were female, 211 (33.6 %) of the participants were male. Moreover, 290 (44.3 %) of the participants were from U1, 219 (33.5%) from U2, and 145 (22.2 %) from U3. With respect to programs, ESE students are 337 (51.5 %) and EME students are 317 (48.5 %).

Table 3.1: Some demographic characteristics of the subjects (n = 650).

		N	%
Gender	Female	417	66.4
	Male	211	33.6
University	University A	290	44.3
	University B	219	33.5
	University C	145	22.2
Major of Study	Elementary Science Education	337	51.5
	Elementary Mathematics Education	317	48.5
Grade	1st Grade	346	53.2
	4th Grade	304	46.8

3.2 Variables

A number of independent variables considered in the study helped explaining six different measures of dependent outcomes.

3.2.1 Independent Variables

Independent variables are variables that are controlled or manipulated in accordance with the purpose of the investigation. In this study, there are five independent variables: major of study, grade level, gender, computer ownership, and enrolled university.

Major of Study: This variable classifies program as either ESE or EME.

Grade Level: It labels the subjects' year in their program as either 1^{st} or 4^{th} grade students.

Gender: This variable labels gender as male or female.

Computer Ownership: This variable labels computer ownership of subjects.

3.2.2 Dependent Variables

A dependent variable is a measure of the effect of the independent variable. This study includes five dependent variables: computer self-efficacy, sub-dimensions of attitudes towards computer survey that are anxiety, confidence, usefulness, and liking.

3.3 Selection and Development of Measuring Tools

Two survey instruments were administrated in the research study: Computer Attitude Scale (CAS, Loyd & Gressard, 1984; Berberoğlu and

Çalıkoğlu; 1992) and Computer Self-Efficacy Scale (CSS, Torkzadeh & Koufteros, 1994; Murphy, Coover, & Owen, 1989). CAS was originally developed by Loyd and Gressard (1984) and then translated into Turkish and analyzed by Berberoğlu and Çalıkoğlu (1992). The result of their study showed that reliability coefficient was 0.90. The reliability coefficient value was found as .934 for this study. The CAS is a likert-type instrument consisting of 40 items. In CAS, there were four sub-scales: 1) computer anxiety or fear of computers 2) liking of computers, 3) confidence in ability to use or learn about computers, and 4) usefulness (importance) of computers in life. Each sub-scale has ten items and the items are rated on a likert-type scale with 1 equaling to strongly agree 4 equaling to strongly disagree. Their reliability coefficient value for this study were .805 for computer anxiety, .789 for liking of computers, .808 for confidence, and .779 for usefulness of computer. The maximum possible score for CAS is 160 and the possible minimum score is 40. Higher score denotes more attitudes towards computers.

CSS was translated into Turkish by the researcher. The result of the pilot study showed that reliability coefficient was 0.943. The reliability coefficient value was found as .938 for this study. The CSS is a likert-type instrument consisting of 24 items. The items are rated with 1 equaling to strongly agree, 5 equaling to strongly disagree. Total scores can range from 24 indicating the lowest level of computer self-efficacy to 120 indicating the highest degree of computer self-efficacy.

Additionally, participant subject were asked to respond questions about demographic characteristics (i.e. gender, grade level, major of study, and university) and questions about the ownership of PCs and PC related technical devices.

3.4 Procedure

3.4.1 Pilot Study

A pilot study was conducted to assess reliability and validity of the developed and translated instruments. Pre-service teachers (N = 140) from first and fourth grade ESE and EME program in METU were participated to the pilot study voluntarily. CAS (40 items) and CSS (25 items) were administrated as instruments. The purpose of the study was explained to the participants before they respond to the items. Students answered the instruments in about fifteen to twenty minutes. After the administration, reliability analysis was conducted for CSS. Cronbach's Alpha value was found as .943. After examining the items of CSS, item 14 was found very easy by participants. All participants marked "strongly agree" for item 14. Therefore, item 14 was omitted from the CSS.

3.4.2 Actual Data Collection

In this research study, pre-service science and mathematics teachers' computer related self-efficacy and attitudes were examined. Moreover, the relationships between pre-service elementary science and mathematics teachers' computer related self-efficacy and sub-dimensions of computer attitude namely anxiety, confidence, usefulness, and liking were investigated. Thus, the design of this study was both survey and co-relational study.

3.5 Statistical Techniques Utilized in the Study

All collected data which includes demographic information of participants, ownership information of PC and PC related devices, CAS,

and CSS survey responses transferred to computer environment as an SPSS data file. The data obtained from the study was analyzed in two parts namely descriptive statistics and inferential statistics by using SPSS 13.0.

3.5.1 Descriptive Statistics

The mean, standard deviation of the variables were calculated for descriptive statistics.

3.5.2 Inferential Statistics

MANOVA was performed to measure the effects of gender, grade level, major of study, and computer ownership on computer self-efficacy and sub-dimensions of attitude towards computer. To determine the relationship between computer self-efficacy and sub-dimensions of attitude towards computer, bivariate correlations were conducted with total data. The significance level was set to 0.05.

3.6 Assumptions and Limitations

The assumptions and limitations of this study considered by the researcher are given below.

3.6.1 Assumptions

1. The administrations of survey were under standard conditions.
2. The participants of the study responded to the items of the instrument sincerely.

3.6.2 Limitations

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 sincereness of the responses give to the instruments questions.

CHAPTER IV

RESULTS

This chapter represents the results of the data analysis. It is divided into three different sections. First section presents the descriptive statistics. The second section deals with inferential statistics. This section is organized based on the null hypotheses tested. The third section includes summary of the findings of the study.

4.1 Descriptive Statistics

Descriptive statistics concerns the subjects' rate on demographic characteristics (e.g. gender, grade level, major of study, and university) and questions about the ownership of PCs and PC related technical devices. In addition, descriptive statistics concerns the subjects' scores on computer self-efficacy scale and computer attitude scale.

4.1.1 Descriptive Statistics of the Subjects' Ownerships about PC and PC related Devices

Table 4.1 indicates the information related to participants' ownership of PCs and PC related technical devices. According to table, majority of participants (68.5%) have either a desktop or a laptop computer. Of this 68.5%, 54.4% of students owns desktop, whereas remaining 19.6% owns a laptop computer. The table also shows the ownership of PC related technical devices (digital camera, digital

camcorder, and MP3 player). The percentage of digital camera owner participants is 24.8. Only 6.7% of the participants have a camcorder. Digital audio player is the most owned PC related devices (39.6%).

Table 4.1: Ownership percentages of PC and PC related devices.

		N	%
Computer Ownership	Desktop or Laptop Computer	448	68.5
	Desktop Computer	356	54.4
	Laptop Computer	128	19.6
PC related devices	Digital Camera	162	24.8
	Digital Camcorder	44	6.7
	Digital Audio Player (MP3 Player)	259	39.6

Figure 4.1 shows the number of owned PC and PC related devices based on the affiliated university. It can be seen clearly that most commonly owned device is desktop computer across all groups. The number of having desktop computer and laptop computer is 219 in total, but the scores of having computer (desktop or laptop) is 201. It means that 18 participants have both desktop and laptop computer.

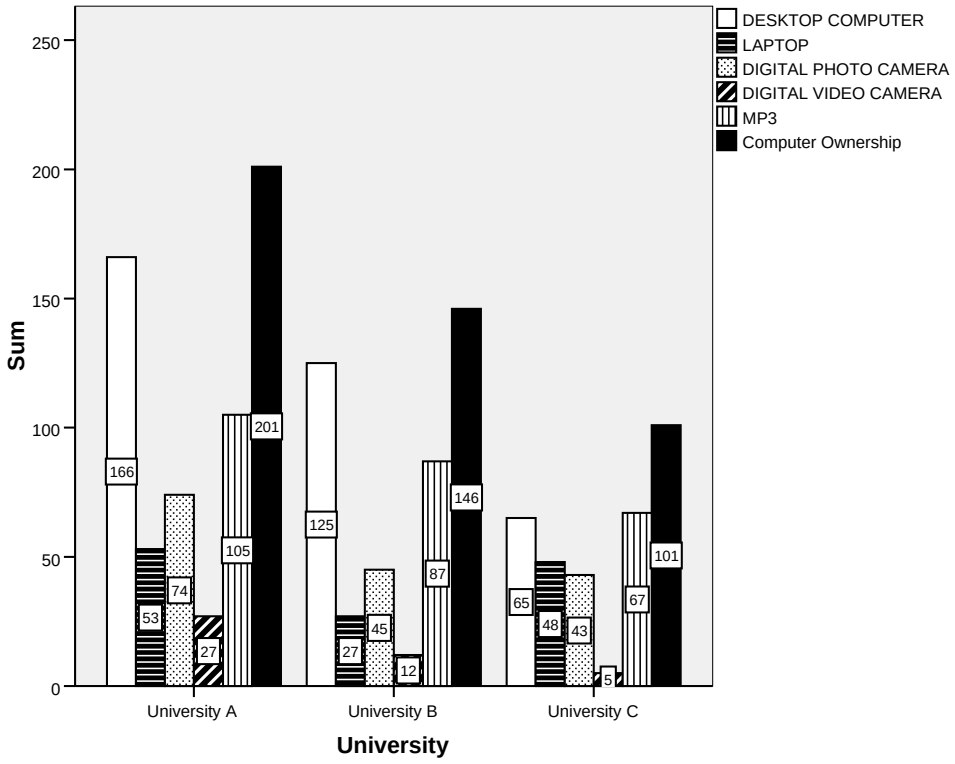

Figure 4.1: The number of owned PC and PC related devices based on university affiliation (N=287 for University A, N=214 for University B, and N=144 for University C).

4.1.2 Descriptive Statistics of the Subjects' Demographic Characteristics based on Gender Variable

Descriptive statistics related to all participants' demographic characteristics based on their gender are presented in Table 4.2. According to table, 54% of female participants are first grade level students, the rest of female (46%) are fourth grade level students. The table also shows that the number of first and fourth grade level students is more balanced among male subjects, where first grade level students' percentage is 50.5% and fourth grade level students percentage is 59.5%. Regarding the major of study, 52.5% of female participants are ESE

Program students, the rest (47.5%) are EME Program students. The percentages of male students with respect to major of study are similar to female participants. The percentage of male participants is 51.7 in the ESE Program, 48.3 in EME Program.

Table 4.2: The percentage of the subjects' demographic characteristics based on their gender.

		Female		**Male**	
		N	**%**	**N**	**%**
Grade	1st	224/415	54	106/210	50.5
	4th	191/415	46	104/210	49.5
Major of Study	ESE	219/417	52.5	109/211	51.7
	EME	198/417	47.5	102/211	48.3
Computer Ownership	Desktop and/or Laptop	297/417	71.2	138/211	65.4
	Desktop Own.	235/417	56.4	108/211	51.2
	Laptop Own.	91/417	21.8	36/211	17.1
Computer Related Devices Ownership	Digital Camera	110/417	26.4	49/211	23.2
	Digital Camcorder	33/417	7.9	10/211	4.7
	Digital Audio Player	160/417	38.4	88/211	41.7

A majority of both female and male participants have a computer. More than seventy percent of female participants owned a computer, whereas this percentage is 65.4 among male participants. The percentages of a desktop computer owner participants are more than fifty percentage for both genders. However, the percentage of laptop computer owner participants is 21.8 for female and 17.1 for male participants. PC related technical devices (digital camera, digital camcorder, and MP3

player) are displayed on Table 4.2. According to the table, the percentage of participants who owned digital camera, camcorder, and digital audio player are 26.4, 7.9, and 38.4 respectively, whereas these percentages for male participants are 23.2, 4.7, and 41.7 respectively.

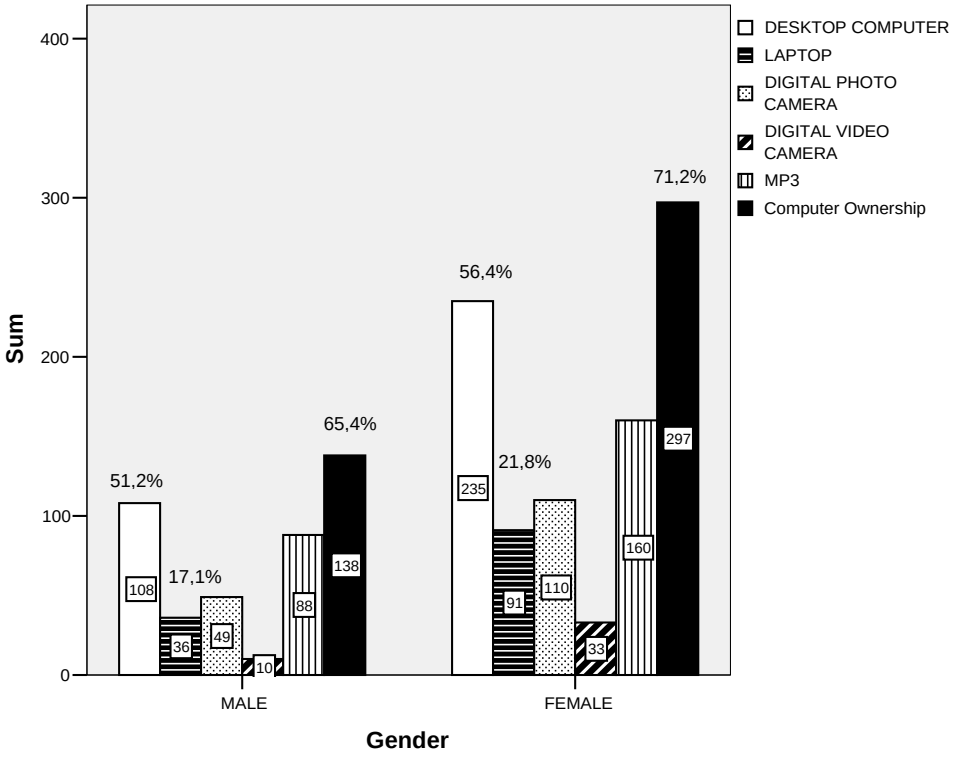

Figure 4.2: The number of owned PC and PC related devices based on gender of the subjects.

4.1.3 Descriptive Statistics of the Subjects' Demographic Characteristics based on Major of Study Variable

Descriptive statistics related to participants' demographic characteristics were categorized with regard to their major of study (ESE or EME) in Table 4.3. According to table, 66% of ESE and EME program's students are female. Half of ESE program's students (49.9%) are first grade level, other half (50.1%) are fourth grade level students. In

EME program, 56.8% of participants were first grade level, 43.2% of them were fourth grade level students.

Table 4.3: The percentage of the subjects' demographic characteristics based on their major of study.

		ESE		EME	
		N	**%**	**N**	**%**
Gender	Female	219/328	66.8	198/300	66
	Male	109/328	33.2	102/300	34
Grade	1st	167/335	49.9	179/315	56.8
	4th	168/335	50.1	136/315	43.2
Computer Ownership	Desktop and/or Laptop	239/337	70.9	209/317	65.9
	Desktop Own.	202/337	59.9	154/317	48.6
	Laptop Own.	57/337	16.9	71/317	22.4
Computer Related Devices Ownership	Digital Camera	91/337	27	71/317	22.4
	Digital Camcorder	26/337	7.7	18/317	5.7
	Digital Audio Player	143/337	42.4	116/317	36.6

Majority of both ESE and EME program participants have a computer. ESE program's participants have a computer (desktop or laptop) at the percentage of 70.9%, whereas EME program's participants have it at percentage of 65.9. Ownership of desktop computers is more common than that of laptops among the participants across the groups. PC related technical devices (digital camera, digital camcorder, and digital audio player) are presented on the Table 4.3. Almost half of ESE program's participants have a digital audio player. The percentage of

digital audio player owner EME program's participants is near (36.6%). A quarter of ESE and EME programs' participants have a digital camera. Moreover, only a small percentage of them have a digital camcorder.

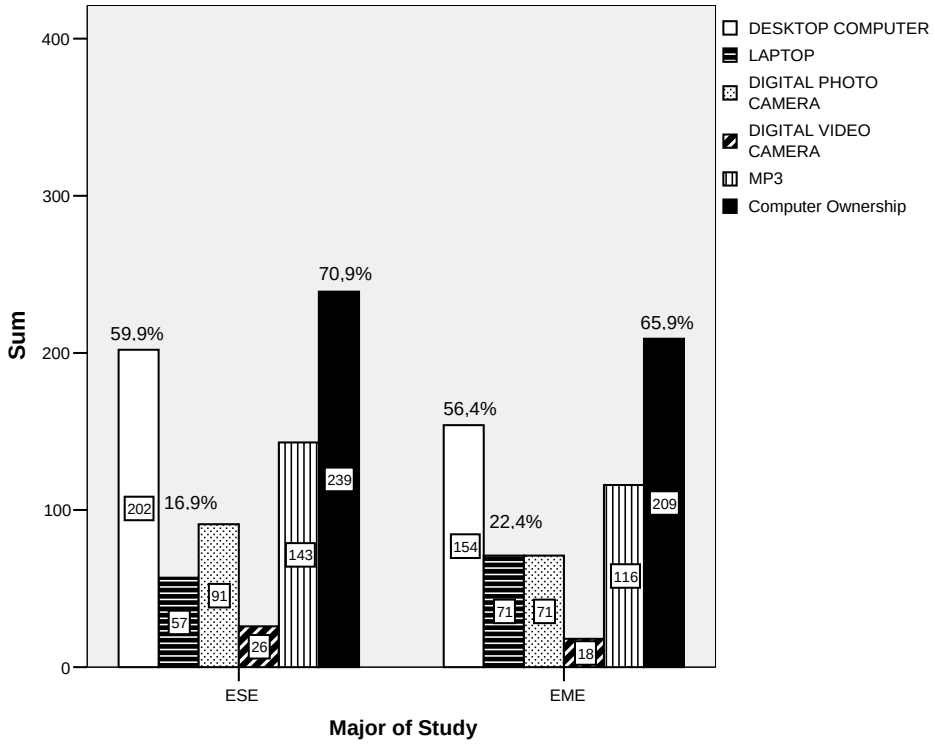

Figure 4.3: The number of owned PC and PC related devices based on major of the subjects.

4.1.4 Descriptive Statistics of the Subjects' Demographic Characteristics based on Grade Level Variable

Descriptive statistics related to all participants' demographic characteristics based on their grade level were illustrated in Table 4.4. As seen on the table, about a two-third of the participants were females in both first grades and fourth grades. ESE and EME programs' participants have almost balanced with respect to first grade level participants,

whereas the percentage of ESE programs' participants is a bit more than that of EME programs' participants regarding the fourth grade level.

Table 4.4: The percentage of the subjects' demographic characteristics based on their grade level.

		1st grade		4th grade	
		N	**%**	**N**	**%**
Gender	Female	219/328	66.8	191/295	64.7
	Male	109/328	33.2	104/295	35.3
Major of Study	ESE	167/346	48.3	168/304	55.3
	EME	179/346	51.7	136/304	44.7
Computer Ownership	Desktop and/or Laptop	212/346	61.3	233/304	76.6
	Desktop Own.	172/346	49.7	182/304	59.9
	Laptop Own.	52/346	15.3	74/304	24.3
Computer Related Devices Ownership	Digital Camera	76/346	22	86/304	28.3
	Digital Camcorder	28/346	8.1	16/304	5.3
	Digital Audio Player	140/346	40.5	119/304	39.1

The ownership data of PCs and PC related technical devices are also given on Table 4.4 According to the table, more than seventy five percent of fourth grade level participants owned a computer, whereas this percentage is 61.3 among first grade level participants. Regarding both desktop and laptop computer fourth grade level participants have more than 10 points percentage versus first grade level participants. PC related technical devices (digital camera, digital camcorder, and digital audio player) are displayed on the table. According to the table, the percentage

of first grade level participants who owned digital camera, camcorder, and digital audio player are 22, 8.1, and 40.5 respectively, whereas these percentages for male participants are 28.3, 5.3, and 39.1 respectively.

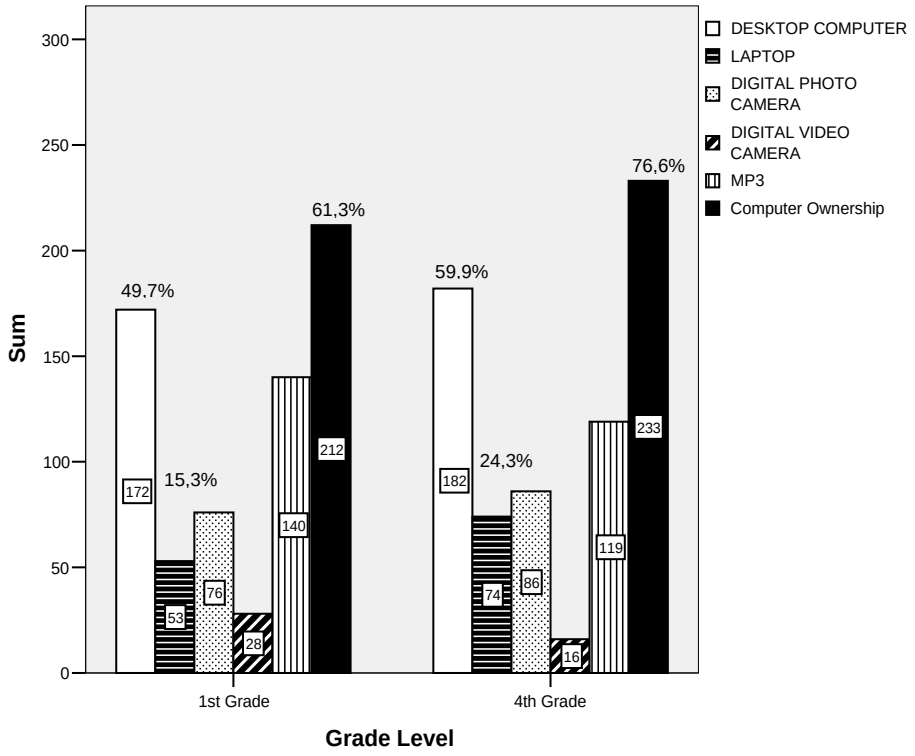

Figure 4.4: The number of owned PC and PC related devices based on grade level of the subjects.

4.1.5 Computer Self-Efficacy and Attitude towards Computers Levels of Subjects

Descriptive statistics related to participants' scores on the Computer Self-Efficacy Scale and Computer Attitude Scale were calculated for two majors, which were ESE (Table 4.5) and EME (Table 4.6).

Table 4.5: CSS and CAS scores of ESE participants.

	Sample Mean	Std. Dev.	Min. Score of the Test	Max. Score of the Test
Computer Self-Efficacy	93.69	14.967	24	120
Computer Anxiety*	34.08	4.654	10	40
Computer Confidence	31.32	4.837	10	40
Computer Liking	30.42	4.879	10	40
Computer Usefulness	34.48	4.332	10	40

*Higher score refers to less computer anxiety.

According to Table 4.1, ESE participants' had relatively high computer self-efficacy scores (93.69). However, maximum score of the CSS was 120. Results showed that ESE participants' sub-scale scores of the CAS were relatively high. Based on ESE participants' responses to CSS and CAS, they showed high computer self-efficacy. Likewise, participants had low computer anxiety, high computer confidence, liking, and usefulness scores.

Table 4.6: CSS and CAS scores of EME participants.

	Sample Mean	Std. Dev.	Min. Score of the Test	Max. Score of the Test
Computer Self-Efficacy	93.77	14.617	24	120
Computer Anxiety*	33.26	5.200	10	40
Computer Confidence	30.37	5.392	10	40
Computer Liking	29.38	5.478	10	40
Computer Usefulness	33.68	4.654	10	40

*Higher score refers to less computer anxiety.

On the other hand, EME participants had similar scores on CSS and CAS. According to Table 4.2, EME participants' had relatively high computer self-efficacy scores (93.77). In addition, they had low computer anxiety, high computer confidence, liking, and usefulness scores.

Table 4.7: The percentage of the subjects' general descriptive profiles.

		UNIVERSITY A (44.3%)				UNIVERSITY B (33.5%)				UNIVERSITY C (22.2%)			
		ESE (44.1%)		EME (55.9%)		ESE (62.1%)		EME (37.9%)		ESE (50.3%)		EME (49.7%)	
		1st (48.4%)	4th (51.6%)	1st (62.5%)	4th (37.5%)	1st (54.8%)	4th (45.2%)	1st (53.0%)	4th (47.0%)	1st (43.1%)	4th (56.9%)	1st (48.6%)	4th (51.4%)
		%	%	%	%	%	%	%	%	%	%	%	%
Gender	**M**	24.2	41.9	37.3	39	31.5	31.7	0	35.1	43.3	32.5	51.4	27
	F	75.8	58.1	63	61	68.5	68.3	100	64.9	56.7	67.5	48.6	73
Desktop Ownership		54.8	69.7	50	58.3	58.1	62.3	50	56.4	41.9	65.9	28.6	37.8
Laptop Ownership		16.1	15.2	14	30	5.4	21.3	4.5	20.5	32.3	24.4	37.1	40.5
Digital Camera Ownership		32.3	25.8	17	33.3	21.6	24.6	15.9	17.9	29	34.1	20	35.1
Digital Camcorder Ownership		17.7	10.6	4	8.3	8.1	1.6	9.1	2.6	0	2.4	8.6	2.7
Digital Audio Player Ownership		46.8	37.9	29	36.7	39.2	39.3	43.2	38.5	51.6	48.8	51.4	35.1

4.2 Inferential Statistics

Multivariate analysis of variance (MANOVA) was performed to investigate the effect of gender, grade level, major of study, and computer ownership on computer self-efficacy scores and four sub-dimensions of computer attitude scores. The dependent variables were the scores on the self-efficacy test and the each sub-dimensions of CAS, namely computer-anxiety, liking, confidence, and usefulness. Since the computer anxiety scores were reversed, higher computer anxiety scores were referred to lower computer anxiety of participants. The independent variables were gender, grade level, major of study, and computer ownership of participants.

4.2.1 Assumptions of Multivariate Analysis of Variance

4.2.1.1 Sample Size

As the cases in the cell are grater than the number of the dependent variables the sample size of the study was enough to precede MANOVA analysis.

4.2.1.2 Normality and Outliers

For normality assumption, univariate and multivariate normalities were checked.

To check univariate normality histograms and skewness and kurtosis values were examined. Histograms for all the groups appear to be normally distributed. Also skewness and kurtosis values were all in acceptable range being between -1 and +1.

To check multivariate normalities Mahalanobis distance was calculated and compared with the critical value given in the chi-square

table for five dependent variables (Tabachnik & Fidell, 1996). The chi-square value was found to be 20.52 and the maximum Mahalanobis distance of the sample was 32.958. This shows that there were outlying cases and they were (id 58, 95, 114, 336, 357, 493, 496, 611) removed from the data.

4.2.1.3 Linearity

To test the linearity of the scores the scatter plots are generated for each pairs of the dependent variables. The scatter plots indicate that in general there is no serious violation of linearity assumption for many pairs of dependent variables across different groups.

4.2.1.4 Multicollinearity and Singularity

As shown as in the table 4.8, correlation coefficients between dependent variables vary from 0.244 to 0.762. These values show that there is a linear correlation between the dependent variables. Although correlation between the variables is significant, the values show that the relation is not higher than 0.8.

Table 4.8: Correlation coefficients between dependent variables.

	Computer Self-Efficacy	Computer Anxiety	Computer Confidence	Computer Liking	Computer Usefulness
Computer Self-Efficacy	-	.306**	.363**	.326**	.244**
Computer Anxiety		-	.762**	.678**	.670**
Computer Confidence			-	.730**	.597**
Computer Liking				-	.624**
Computer Usefulness					-

**Correlation is significant at the 0.01 level (2-tailed)

4.2.1.5 Homogeneity of Variance-Covariance Matrices

MANOVA was performed for each independent variable. Then, the Box Test of Equality of Covariance Matrices and Homogeneity of Variance-Covariance Matrices were for each MANOVA conducted. The results of the Box Test of Equality of Covariance Matrices show that there is no violation for this assumption (p>0.000 for all MAVOVA).

Concerning homogeneity of variance assumption, Levene's Test of Equality of Error variance was checked for the MANOVA conducted. For gender variable, Levene's Test of Equality of Error variances has a significant value .150 for computer self-efficacy, .311 for anxiety sub-dimension of computer attitude, .046 for confidence sub-dimension, .168 for liking sub-dimension, and .112 for usefulness sub-dimension. According to these results, all significant values do not violate the equality of variances assumption except for confidence sub-dimension of computer attitude test.

For the grade level variable, Levene's Test of Equality of Error variances has a significant value at .053 for computer self-efficacy, .350 for anxiety sub-dimension of computer attitude, .331 for confidence sub-dimension, .438 for liking sub-dimension, and .426 for usefulness sub-dimension. According to these results, all significant values do not violate the equality of variances assumption except for computer self-efficacy.

For the major of study variable, Levene's Test of Equality of Error variances has a significant value .808 for computer self-efficacy, .030 for anxiety sub-dimension of computer attitude, .068 for confidence sub-dimension, .028 for liking sub-dimension, and .054 for usefulness sub-dimension. These results violate the equality of variances for anxiety

and liking sub dimension of computer attitude test. However, they do not violate the assumption for remaining variables.

For the computer ownership variable, Levene's Test of Equality of Error variances has a significant value .001 for computer self-efficacy, .001 for anxiety sub-dimension of computer attitude, .025 for confidence sub-dimension, .590 for liking sub-dimension, and .127 for usefulness sub-dimension. These results violate the equality of variances for computer self-efficacy test and anxiety and liking sub dimension of computer attitude test. However, they do not violate the assumption for remaining variables.

Analysis of variance is reasonably robust to violations of the homogeneity of variance assumption, provided the size of groups is reasonably similar (e.g., largest/smallest=1.5, Stevens, 1996, p. 249). Therefore, in the present study, violation of the assumption for major of study variable does not lead to serious problems because group size ratio is less than 1.5. For confidence sub-dimension of CAS at the gender variable significant value is .046. Since it is very close to the .05, the assumption cannot be violated for this sub-dimension. For computer ownership variable, the assumption is violated for computer self-efficacy, anxiety sub-dimension and confidence sub-dimension of CAS. In addition, group size is higher than 1.5. In spite of this situation, we continued MANOVA procedure in order to see the effect of computer ownership on computer self-efficacy and attitude towards computer with four sub-dimensions.

4.2.2 Multivariate Analysis of Variance

4.2.2.1 Effect of Gender on Computer Self-Efficacy and Attitude towards Computer

Null Hypothesis 1: There is no significant difference in the mean scores of computer self-efficacy between males and females.

Null Hypotheses related to attitudes towards computer:

Null Hypothesis 2: There is no significant difference in the mean scores of computer anxiety between males and females.

Null Hypothesis 3: There is no significant difference in the mean scores of computer confidence between males and females.

Null Hypothesis 4: There is no significant difference in the mean scores of computer liking between males and females.

Null Hypothesis 5: There is no significant difference in the mean scores of usefulness between males and females.

To determine the effect of the gender on participants' computer self-efficacy and attitude towards computer, MANOVA was conducted. The results revealed that the null hypotheses were rejected ($F(5,602) = 4.771$, $p = .000$; Wilks' Lambda=.962; partial eta squared=.038). Therefore, it was stated that there was a statistically significant difference between males and females regarding the combined dependent variables. When the results for the dependent variables were considered separately, gender has a significant effect on only computer liking variable at Bonferroni adjusted alpha level of .01. The F value and significance are found as $F(1,606) = 9.909$, $p = .002$ for computer liking sub-dimension of CAS.

Overall mean ratings and mean scores of the students are given in table 4.9 and 4.10 respectively. Means scores of males and females illustrated that males have slightly higher means on computer self-efficacy, computer anxiety, computer confidence, and computer liking than that of females. However, females have slightly higher means on computer usefulness than that of males.

Table 4.9: Mean scores and standard deviations CSS and CAS with respect to gender.

	Female		Male	
	Mean	S.D.	Mean	S.D.
Computer Self-Efficacy	92.70	14.259	95.63	15.726
Computer Attitude				
Anxiety*	33.59	4.800	33.85	5.113
Confidence	30.47	4.962	31.51	5.304
Liking	29.39	5.277	30.78	4.829
Usefulness	34.17	4.361	34.06	4.583

*Higher anxiety score is refer to lower participants' anxiety.

Table 4.10: Test of between subject factors.

	df	Error df	F	p	Partial eta squared	Observed power
Computer Self-Efficacy	1	606	5.375	.021	.009	.639
Computer Attitude						
Anxiety	1	606	.404	.525	.001	.097
Confidence	1	606	5.731	.017	.009	.666
Liking	1	606	9.909	.002	.016	.882
Usefulness	1	606	.761	.761	.000	.061

4.2.2.2 Effect of Grade Level on Computer Self-Efficacy and Attitude towards Computer

Null Hypothesis 6: There is no significant difference in the mean scores of computer self-efficacy between first and fourth graders.

Null Hypotheses related to attitudes towards computer:

Null Hypothesis 7: There is no significant difference in the mean scores of computer anxiety between first and fourth graders.

Null Hypothesis 8: There is no significant difference in the mean scores of computer confidence between first and fourth graders.

Null Hypothesis 9: There is no significant difference in the mean scores of computer liking between first and fourth graders.

Null Hypothesis 10: There is no significant difference in the mean scores of computer usefulness between first and fourth graders.

To determine the effect of the grade level on participants' computer self-efficacy and attitude towards computer, MANOVA was performed. The results indicated that the null hypotheses were rejected ($F(5,624) = 7.007$, $p = .000$; Wilks' Lambda=.947; partial eta squared=.053). Therefore, it was stated that there was a statistically significant difference between 1^{st} and 4^{th} grade level with respect to the combined dependent variables. When the results for the dependent variables were considered separately, grade has a significant effect on computer self-efficacy, computer confidence, and computer liking variables at Bonferroni adjusted alpha level of .01. The F value and significance are found as $F(1,628) = 30.005$, $p = .000$ for computer self-efficacy, $F(1,628) = 12.564$,

p=.000 for confidence sub-dimension of CAS, and F (1,628) =8.193, p=.004 for liking sub-dimension of CAS.

Overall mean ratings and mean scores of the students are given in table 4.11 and 4.12 respectively. Means scores of 1st and 4th grade level participants presented who 4th grade level participants have slightly higher means on all dependent variables than that of 1st grade level participants.

Table 4.11: Mean scores and standard deviations CSS and CAS with respect to grade level.

	1st Grade Level		4th Grade Level	
	Mean	S.D.	Mean	S.D.
Computer Self-Efficacy	90.83	15.380	97.16	13.308
Computer Attitude				
Anxiety*	33.29	4.797	34.09	5.089
Confidence	30.18	4.945	31.62	5.230
Liking	29.38	5.032	30.56	5.267
Usefulness	33.69	4.381	34.53	4.639

*Higher anxiety score is refer to lower participants' anxiety.

Table 4.12: Test of between subject factors.

	df	Error df	F	p	Partial eta squared	Observed power
Computer Self-Efficacy	1	628	30.005	.000	.046	1.000
Computer Attitude						
Anxiety	1	628	4.149	.542	.007	.529
Confidence	1	628	12.564	.000	.020	.943
Liking	1	628	8.193	.004	.013	.815
Usefulness	1	628	5.355	.021	.008	.637

4.2.2.3 Effect of Major of Study on Computer Self-Efficacy and Attitude towards Computer

Null Hypothesis 11: There is no significant difference in the mean scores of computer self-efficacy between ESE and EME pre-service teachers.

Null Hypotheses related to attitudes towards computer:

Null Hypothesis 12: There is no significant difference in the mean scores of computer anxiety between ESE and EME pre-service teachers.

Null Hypothesis 13: There is no significant difference in the mean scores of computer confidence between ESE and EME pre-service teachers.

Null Hypothesis 14: There is no significant difference in the mean scores of computer liking between ESE and EME pre-service teachers.

Null Hypothesis 15: There is no significant difference in the mean scores of computer usefulness between ESE and EME pre-service teachers.

To determine the effect of the major on participants' computer self-efficacy and attitude towards computer, MANOVA was conducted. The results showed that the null hypotheses were not rejected ($F(5,627) = 1.746$, $p = .122$; Wilks' Lambda=.986; partial eta squared=.014). Therefore, it was stated that there was not a statistically significant difference between ESE and EME program participants with respect to the combined dependent variables.

4.2.2.4 Effect of Computer Ownership on Computer Self-Efficacy and Attitude towards Computer

Null Hypothesis 16: There is no significant difference in the mean scores of computer self-efficacy between computer owner and non-computer owner participants.

Null Hypotheses related to attitudes towards computer:

Null Hypothesis 17: There is no significant difference in the mean scores of computer anxiety between computer owner and non-computer owner participants.

Null Hypothesis 18: There is no significant difference in the mean scores of computer confidence between computer owner and non-computer owner participants.

Null Hypothesis 19: There is no significant difference in the mean scores of computer liking between computer owner and non-computer owner participants.

Null Hypothesis 20: There is no significant difference in the mean scores of computer usefulness between computer owner and non-computer owner participants.

To determine the effect of the computer ownership on participants' computer self-efficacy and attitude towards computer, MANOVA was performed. The results indicated that the null hypotheses were rejected ($F(5,627) = 12.231$, $p = .000$; Wilks' Lambda = .911; partial eta squared = .089). Therefore, it was stated that there was a statistically significant difference between computer ownership and no computer ownership with respect to the combined dependent variables. When the

results for the dependent variables were considered separately, computer ownership has a significant effect on computer self-efficacy, computer anxiety, computer confidence, computer liking, and computer usefulness variables at Bonferroni adjusted alpha level of .01. The F value and significance are found as F (1,631) =26.948, p=.000 for computer self-efficacy, F (1,631) =30.883, p=.000 for anxiety sub-dimension of CAS, F (1,631) =47.077, p=.004 for confidence sub-dimension of CAS, F (1,631) =34.113, p=.000 for liking sub-dimension of CAS, and F (1,631) =10.061, p=.002 for usefulness sub-dimension of CAS.

Overall mean ratings and Mean scores of the students are given in table 4.13 and 4.14 respectively. Means scores of computer ownership and no computer ownership participants presented who computer ownership participants have slightly higher means on all dependent variables than that of no computer ownership participants.

Table 4.13: Mean scores and standard deviations CSS and CAS with respect to computer ownership.

	Computer Ownership		No Computer Ownership	
	Mean	S.D.	Mean	S.D.
Computer Self-Efficacy	95.78	13.456	89.38	16.419
Computer Attitude				
Anxiety*	34.39	4.492	32.10	5.467
Confidence	31.77	4.709	28.87	5.423
Liking	30.70	4.997	28.18	5.221
Usefulness	34.47	4.368	33.26	4.707

*Higher anxiety score is refer to lower participants' anxiety.

Table 4.14: Test of between subject factors.

	df	Error df	F	p	Partial eta squared	Observed power
Computer Self-Efficacy	1	631	26.948	.000	.041	0.999
Computer Attitude						
Anxiety	1	631	30.883	.000	.047	1.000
Confidence	1	631	47.077	.000	.069	1.000
Liking	1	631	34.113	.000	.051	1.000
Usefulness	1	631	10.061	.002	.016	.886

4.2.3 Correlational Analysis

The correlational matrix presented in Table 4.15 indicated correlation coefficients between computer self-efficacy and sub-dimensions of CAS namely computer anxiety, computer confidence, computer liking, and computer usefulness. The matrix was generated to assess whether participants' computer self-efficacy and sub-dimensions of CAS were significantly related.

Table 4.15: Pearson Product-Moment correlation between computer self efficacy and sub-dimensions of CAS.

	Computer Anxiety	Computer Confidence	Computer Liking	Computer Usefulness
Computer Self-Efficacy	-.306**	.363**	.326**	.244**

**. Correlation is significant at the .01 level (2-tailed).

4.2.3.1 Correlation between Computer Self-Efficacy and Computer Anxiety Sub-dimension of CAS

Null Hypothesis 21: There is no significant relationship between the computer self-efficacy scores and computer anxiety scores.

A significant negative correlation was found between all participants' the computer self-efficacy scores and computer anxiety scores ($p=.000$, $r=-.306$). According to Cohen (1988), this result suggested a medium correlation between the computer self-efficacy scores and computer anxiety scores.

4.2.3.2 Correlation between Computer Self-Efficacy and Computer Confidence Sub-dimension of CAS

Null Hypothesis 22: There is no significant relationship between the computer self-efficacy scores and computer confidence scores.

A significant positive correlation between all participants' the computer self-efficacy scores and computer confidence scores was found ($p=.000$, $r=.363$). This result suggested a medium correlation between the computer self-efficacy scores and computer confidence scores.

4.2.3.3 Correlation between Computer Self-Efficacy and Computer Liking Sub-dimension of CAS

Null Hypothesis 23: There is no significant relationship between the computer self-efficacy scores and computer liking scores.

A significant positive correlation between all participants' the computer self-efficacy scores and computer liking scores was found ($p=.000$, $r=.326$). This result suggested a medium correlation between the computer self-efficacy scores and computer liking scores.

4.2.3.4 Correlation between Computer Self-Efficacy and Computer Usefulness Sub-dimension of CAS

Null Hypothesis 24: There is no significant relationship between the computer self-efficacy scores and computer usefulness scores.

A significant positive correlation between all participants' the computer self-efficacy scores and computer usefulness scores was found (p=.000, r=.244). This result suggested a small correlation between the computer self-efficacy scores and computer usefulness scores.

4.3 Summary of Results

According to the results, finding of the study are summarized in following section.

Computer self-efficacy

Gender	There is no significant difference between male and female with respect to computer self-efficacy.
Grade Level	Fourth grade level participants have more computer self-efficacy than first grade level participants.
Major of Study	There is no significant difference between ESE and EME program participants with respect to computer self-efficacy.
Computer Ownership	Computer ownership participants have more computer self-efficacy than no computer ownership participants.

Anxiety sub-dimension of CAS

Gender	There is no significant difference between male and female with respect to computer anxiety.
Grade Level	There is no significant difference between 1st and 4th grade level participants with respect to computer anxiety.
Major of Study	There is no significant difference between ESE and EME program participants with respect to computer anxiety.
Computer Ownership	Computer ownership participants have less computer anxiety than no computer ownership participants.

Confidence sub-dimension of CAS

Gender	There is no significant difference between male and female with respect to computer confidence.
Grade Level	Fourth grade level participants have more computer confidence than first grade level participants.
Major of Study	There is no significant difference between ESE and EME program participants with respect to computer anxiety.

Computer Ownership	Computer ownership participants have more computer confidence than no computer ownership participants.

Liking sub-dimension of CAS

Gender	Males have more computer liking than females.
Grade Level	Fourth grade level participants have more computer liking than first grade level participants.
Major of Study	There is no significant difference between ESE and EME program participants with respect to computer liking.
Computer Ownership	Computer ownership participants have more computer liking than no computer ownership participants.

Usefulness sub-dimension of CAS

Gender	There is no significant difference between male and female with respect to computer usefulness.
Grade Level	There is no significant difference between 1^{st} and 4^{th} grade level participants with respect to computer usefulness.
Major of Study	There is no significant difference between ESE and EME program participants with respect to computer

	usefulness.
Computer Ownership	Computer ownership participants have more computer usefulness than no computer ownership participants.

Relationship between computer self-efficacy and sub-dimension of CAS

Self-efficacy *Anxiety*	Participants' mean scores on computer self-efficacy were moderately correlated with computer anxiety.
Self-efficacy *Confidence*	Participants' mean scores on computer self-efficacy were moderately correlated with computer confidence.
Self-efficacy *Liking*	Participants' mean scores on computer self-efficacy were moderately correlated with computer liking.
Self-efficacy *Usefulness*	Participants' mean scores on computer self-efficacy were small correlated with computer usefulness.

CHAPTER V

CONCLUSIONS, DISCUSSIONS AND IMPLICATIONS

This chapter includes the summary of the research study, conclusions and discussion of the results, internal and external validity of the study, and finally presents the implications of the study and recommendations for further studies.

5.1 Summary of the Study

This study investigated the effects of gender, grade level, major of study, and computer ownership on participants' computer self-efficacy and sub-dimensions of Computer Attitude Scale (CAS) and the relationship of computer self-efficacy and sub-dimensions of CAS. Computer Self-efficacy Scale (CSS) and CAS were administered to a total 654 participants. In addition, some descriptive questions are asked to define demographic characteristic of participants.

5.2 Conclusions and Discussions of the Results

The results of the study indicated that ESE and EME participants had relatively high computer self-efficacy levels. Likewise, attitude towards computer levels of ESE and EME participants were relatively high. Accordingly, computer anxiety was low; computer confidence, liking, and usefulness of participants were high. The results of the study also showed that gender was not a factor on participants' computer self-

efficacy levels. Moreover, sub-dimensions of computer attitude were not affected by the gender except for computer liking sub-dimension. Male participants had relatively higher mean scores on computer self-efficacy and sub-dimensions of computer attitude than female participants except for computer usefulness.

According to the results, participants' grade level had a significant effect on computer self-efficacy and two sub-dimensions of computer attitude (computer confidence and liking). Other two sub-dimensions, computer anxiety and usefulness, were not significantly affected by participants' grade level. Participants' mean scores showed that 4th grade level participants had relatively higher mean scores on all dependent variables than 1st grade level participants.

Participants' program of study, ESE and EME, did not occur any significant difference on computer self-efficacy scores and sub-dimensions of computer attitude scores. It can be explained that teacher preparation programs of ESE and EME has same courses related to computer. Moreover, it is not expected to success complex tasks related computer from pre-service science and mathematics teachers. Since their tasks related computers are simple, both ESE and EME participants can be successful on their computer tasks. Accordingly, it may not be observed any difference on ESE and EME pre-service teachers' computer self-efficacy and computer attitude levels.

Participants' computer ownership had a significant effect on all dependent variables. That is, participants who have computers had more scores on computer self-efficacy and computer attitude scales.

The results also underlined that there was a significant relationship between computer self-efficacy and sub-dimensions of

computer attitude. Computer self-efficacy had a negative correlation with computer anxiety. It was a medium correlation. On the other hand, computer self-efficacy had a positive correlation with computer confidence, liking, and usefulness. It had medium correlations with computer confidence and liking. However, there was a small correlation between computer self-efficacy and computer usefulness.

When the results of this research were compared with those of previous ones, current research supports some findings from other studies. On the other hand, it does not support some others. Regarding gender, the results of the current study are consistent with the results of the study held by Sam, Othman, and Nordin (2005), Busch (1995), Karsten and Roth (1998), Akkoyunlu and Orhan (2003) and Ropp (1999), male and female participants were not different with respect to computer self-efficacy and computer anxiety. In addition, Ropp (1999), Roussos (2007), Loyd and Gressard (1984a) and Koohang (1989) found that there is no significant difference between male and female on sub-dimensions of computer attitude (anxiety, confidence, and liking). Several researches did not find any gender difference on computer anxiety (Ropp, 1999; Ayersman & Reed, 1996; Dyck & Smither, 1994). In another study, Roussos (2007) stated that gender did not have a significant effect on computer confidence scores. This result was similar to the current result. However, according to Koohang (1989)'s study, male participants had higher scores on computer usefulness than female participants. In the current study, gender difference was observed in only computer liking sub-dimension.

In the literature, some research was found that males had greater computer self-efficacy, computer attitude and lower computer anxiety than females (Brosnan & Lee, 1998; Comber *et al.*, 1997; Durndell &

Thomson, 1997; Durndell & Haag, 2002; Gürcan-Namlu & Ceyhan, 2003; Işıksal & Aşkar, 2003; Shashaani, 1994a; Shashaani, 1994b; Williams *et al.*, 1993; Whitely, 1997; Torkzadeh *et al.*, 1999; Torkzadeh & Koufteros, 1994; Torkzadeh & Van Dyke, 2002). However, in the present study there is no significant difference between computer self-efficacy and some sub-dimensions of computer attitude. This may be explained by male and female participants' computer and computer related device ownership. Table 4.2 revealed that 71% of female participants had own desktop or laptop computer, whereas 65.4% male participants had own computer. Similar situation was observed for computer related devices. Experience with computers which are likely to be developed by using one's own computer and computer related devices may affect participants' attitudes towards computer. The relationships of computer experience, computer self-efficacy, attitude towards computer, and computer anxiety have been identified in many studies (Chua, Chen, & Wong, 1999; Whitely, 1997; Wilfong, 2006). According to these studies, computer self-efficacy is positively related with attitude towards computer and negatively related with computer anxiety. Since male and female participants had same opportunity about computer and related devices, it may be reason to explain that there is no gender difference on computer self-efficacy and sub-dimensions of computer attitude except for computer liking. The results of the study displayed that there is a gender difference on computer liking, whereas Busch (1995), in their study, did not find any difference on computer liking.

Grade level was determined as another factor affecting computer self-efficacy and sub-dimensions of computer attitude of the participants. According to the results of the current study, the mean scores of 4^{th} grade level participants were significantly greater than that of 1^{st} grade level participants for computer self-efficacy and two sub-dimensions of

computer attitude (computer confidence and computer liking). First year students were not allowed to take computer-related courses in their program of study. Therefore, being in the last year of their program, 4th year students had more experience in and knowledge of working with computers in educational settings than 1st year students. Further, as a result of taking more computer-related courses, 4th year students were assumed to have more developed conceptualization of technology as an educational tool and its ever increasing role in education systems. In other words, 1st year and 4th year students were different in their level of knowledge and experience related to the use of computers.

Previous research indicates that computer experience has a positive relationship with computer self-efficacy and computer attitude (Loyd & Gressard 1984b; Roussos, 2007; Shashaani, 1994a; Wilfong, 2006; Willliams *et al.*, 1993). Therefore, the current study is consistent with previous research. However, there is no significant grade level difference with respect to computer anxiety. Literature revealed that computer experience has a negative relationship with computer anxiety (Chua et al., 1999; Bozionelos, 2001; Brosnan, 1998; Gürcan-Namlu & Ceyhan, 2003; Henderson *et al.*, 1995, Ayersman & Reed, 1996, Whitely, 1997). The results of the current study are not consistent with the literature. It may be explained with computer and computer related devices ownership of 1st and 4th grade participants. In spite of 4th grade participants seemed more experienced than 1st grade participants, 1st graders had same opportunities with 4th graders with respect to computer and computer related devices. In other words, 1st graders meet technological devices at younger than 4th graders. This situation may prevent to occur grade level difference with respect to computer anxiety and computer usefulness.

According to the results of the present study, major of the participants was not a factor affecting computer self-efficacy and sub-dimensions of computer attitude of the participants. In other words, participants from ESE and EME programs have equal level of computer self-efficacy and computer attitude beliefs. This can be ascribed to the fact that students in these programs take equal number computer related courses. Moreover, catalog descriptions of these courses and so their contents are quite similar. Therefore, it is not surprising that there is not a significant difference between ESE and EME students in terms of their computer related self-efficacy and computer attitude and its sub-dimensions.

The results of the current study observed that computer owner participants had higher mean scores on computer self-efficacy and sub-dimensions of computer attitude. It was found that these mean score differences related to computer self-efficacy and sub-dimensions of computer attitude were significant. These results revealed that computer ownership is a significant factor affecting computer self-efficacy and computer attitude. Attewell and Battle (1999) found that available computer at home supports computer experience for computer users. In other words, computer owner participants gain more experience with computer than no computer owner participants. Computer experience is a factor improving computer self-efficacy and computer attitude. In the literature, Loyd & Gressard (1984b), Roussos (2007), Shashaani (1994a), and Willliams *et al.* (1993) stated that computer experience is positively correlated with computer self-efficacy and computer attitude. Moreover, Shashaani (1994b) founded that socio-economic status significantly affected participants' computer attitude. Consequently, computer ownership has an important effect on computer self-efficacy and computer attitude.

Moreover, participants who have a computer had higher mean scores on computer anxiety, which was a sub-dimension of computer attitude, than no computer owner participants. Gürcan-Namlu & Ceyhan (2003), in their study, stated that participants who have a computer had lower computer anxiety than no computer owner participants. Therefore, computer ownership has an effect to reduce computer anxiety of participants.

Results of this study provided support that computer self-efficacy was significantly related to all sub-dimensions of computer attitude. Computer self-efficacy had a negative relationship with computer anxiety, whereas it correlated positively with computer confidence, liking, and usefulness. There was a medium correlation between computer self-efficacy and three sub-dimensions of computer attitude (anxiety, confidence, and liking). However, computer usefulness had a small correlation with computer self-efficacy. These findings were consistent with earlier research. Literature stated that computer self-efficacy was negatively correlated with computer anxiety (Ayersman & Reed, 1996; Brosnan, 1998; Chua et al., 1999; Delcourt & Kinzie, 1993; Durndell & Haag, 2002; Gürcan-Namlu & Ceyhan, 2003; Sam *et al.*, 2005; Ropp, 1999; Wilfong, 2006). On the other hand, literature found that computer self-efficacy was positively associated with computer attitude (Busch, 1995; Khorrami-Arani, 2001; Ropp, 1999; Delcourt & Kinzie, 1993; Torkzadeh *et al.*, 1999; Zhang & Espinoza, 1998). According to Zang & Espinoza (1998), computer anxiety and computer usefulness were a significant factor to predict computer self-efficacy. However, computer usefulness did not have a very strong relationship with computer self-efficacy, whereas Khorrami-Arani (2001) stated that computer usefulness was significantly correlated with computer self-efficacy. These findings were consistent with the present study.

To conclude, computer self-efficacy and computer attitude are two major factors that affect the teachers' computer technology usage. The factors which affect computer self-efficacy are the grade level and computer ownership of participants. However, gender and major of participants do not have any effect on it. Moreover, computer ownership of participants affects highly computer anxiety, which is sub-dimension of computer attitude, whereas gender, grade level, and major of participants have not any effect on it. Another finding of the study is that computer ownership and higher-grade level participants have more computer confidence than no computer ownership and lower grade level participants. It is also found that gender has an effect only computer liking of participants. In addition, computer liking is affected by grade level and computer ownership of participants. Only computer ownership has an effect on computer usefulness. The findings related with correlations are that computer self-efficacy has significant relationship with all sub-dimensions of computer attitude. These correlations are negative for computer anxiety and small for computer usefulness.

This study will be a guide for educator by seeing the importance of computer self-efficacy and computer attitude in pre-service teachers' integration computer technology. Moreover, this study shows the effects of grade level and computer ownership on computer self-efficacy and computer attitude. It also shows that there are no any gender and major of study effects on computer self-efficacy and computer attitude. And last, it states the relationship between computer self-efficacy and computer attitude. They may develop new techniques for pre-service teachers' integration computer technology. We hope this study will contribute to new research related to computer and computer related technology integration to schools and teacher training.

5.3 Internal Validity of the Study

This research was studied in three big universities from Ankara. These three universities were the only ones that have both ESE and EME programs. In spite of this, random assignment of participants was not possible because participants were already formed as group or class. Since the participants of the study were not the individual, the groups were randomly assigned. Moreover, the sample was 55% of population of the study. Therefore, many subject characteristics (age, maturity, ethnicity, intelligence, speed, motivation, socio-economic status) were generally represented for the study. Also, socio-economic status was controlled by computer and computer related devices ownership of participants.

The grade level, gender, and major of study were independent variables of the study. These characteristics of participants were under investigation. The effects of interest and attitude were minimized by voluntary participation of the students.

Since names of the participants were not requested, there was no risk of confidentiality.

The instruments were administrated to all groups in similar physical arrangement of the certain classrooms and mostly by the researcher, location and instrumentation could not be threats to the study.

Finally, response rate was 80% in the study. Therefore, regression threat was minimized for this study.

5.4 External Validity of the Study

The sample of this study was 55% of population. The selection of the groups, also, was done randomly. Thus, there is no limitation to generalize the findings of the study to accessible population. Also, all the administration procedure took place in ordinary university classrooms during regular class hours. In other words, environmental conditions had no difference. Possible external effects were controlled in this way.

Furthermore, the accessible population was from three large universities in Ankara. There are several large universities which have similar opportunities in Turkey. Hence, the findings of this study may be generalized to similar big universities in Turkey.

5.5 Implications

Results of the present study have some implications for educators, school and faculty administrators, and researchers who deal with computer and technology integration in Turkey. First of all, computer ownership has an important effect on pre-service teachers' computer self-efficacy and computer attitude. In other words, the more use of computer for pre-service teachers is, the higher levels of computer self-efficacy and attitude are. Therefore, schools of education should restructure their technological policies. They should support pre-service teachers more opportunities to meet computer technology. The number of computer laboratories should be increased. Also, technology use in classroom should be improved by using computer and peripheral devices such as projector. All of these opportunities may increase pre-service teachers' computer self-efficacy and attitude towards computer. Second suggestion is that schools of education should reorganize their technology related courses in teacher education program since grade level has an effect on

pre-service teachers' computer self-efficacy and attitude in training. The results of the current study suggested that the more courses taken related to computer technology, the higher levels of computer self-efficacy and attitude for pre-service teachers. Schools of education should increase the number of courses related to computer and technological devices using skills. In addition, these courses should give more opportunities for pre-service teachers to do more practical applications with computers such as designing instructional materials or web pages.

Generally, any gender difference is not seemed on computer self-efficacy and computer attitude except for computer liking sub-dimension of computer attitude. However, male still have more computer self-efficacy and computer attitude. To eliminate gender difference on computer self-efficacy and computer attitude, especially computer liking sub-dimensions, school and faculty administrators, educators, and researchers should provide more opportunities for female pre-service teachers' computer use.

Another implication is that pre-service teachers' computer self-efficacy are correlated to their computer attitude. Especially, computer anxiety is an important factor to affect pre-service teachers' computer-self-efficacy. To increase pre-service' self-efficacy beliefs with related to computer, faculty administrators and educators should develop new policies that decrease computer anxiety. Basic computer courses should give more encouragement to pre-service teachers. In this way, they should be informed about that computer use is not complex and difficult, whereas it is simple and easy. Also, computer opportunities that provided for pre-service teachers may reduce their computer anxiety.

Finally, Elementary Science Education Program for teacher education should be revised by program makers. In Turkey "Science

Education" (Fen Bilgisi) course name was changed with "Science and Technology" (Fen ve Teknoloji) in 2005. In other words, the importance of technology was emphasized by name changing. Also, technological developments become a part of Science Education courses. Therefore, program makers should revise Elementary Science Education Program with respect to technology integration in science education courses.

5.6 Recommendations

Present study has suggested several useful topics for further research:

1. A similar study can be conducted with the small universities in Turkey because participants of this study are limited to large universities students in Ankara.

2. A qualitative research can be conducted to better understand the factors on pre-service teachers' beliefs towards computer and technology.

3. A longitudinal research design can be use to investigate the long-term effects of the computer usage on teachers.

4. A similar study can be conducted with in-service teachers instead of pre-service teachers to investigate the effects of the computer usage on teachers.

5. A study can be conducted to use other demographics (families' education level, age, families' socio-economic status) as independent variables of a research.

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APPENDICES

APPENDIX A

COMPUTER SELF-EFFICACY SCALE

1. Kişisel bir bilgisayarla çalışırken kendime güvenirim.
2. Bir bilgisayar programını açıp çalıştırmakta kendime güvenirim.
3. Yardıma ihtiyaç duyduğumda bilgisayardaki kullanıcı yönergesini kullanabilirim.
4. Bir bilgisayar programını kullandıktan sonra programdan çıkabilirim.
5. Bilgisayar ekranında incelemek için bir dosya arayabilirim.
6. Bilgisayar donanımı ve programları ile ilgili terimleri anlayabilirim.
7. Farklı çeşit bilgisayar programlarını kullanabilirim.
8. Belirli bir bilgisayar programının ilerlemiş özelliklerini öğrenebilirim.
9. Ekran üzerindeki menülerden seçme işlemi yapabilirim.
10. Rakamlardan oluşan bir veriyi analiz etmek için bilgisayarı kullanabilirim.

11. Bitmiş bir çalışmamın (tez, ödev, rapor, vs.) son halini almak için yazıcı kullanabilirim.

12. Bir diski kopyalayabilirim.

13. Herhangi bir dosyayı (word, resim, müzik, vs.) kopyalayabilirim.

14. Bir veri dosyasına (word, excel, vs. ile hazırlanmış bir dosya) yeni veri ekleyebilirim veya silebilirim.

15. Bilgisayar için basit programlar yazabilirim.

16. Yazı veya rapor yazmak için bilgisayarı kullanabilirim.

17. Bilgisayar donanımlarının (örn. klavye, ekran, CD sürücü, bilgisayar anakartı) işlevlerini tanımlayabilirim.

18. Data işlemedeki üç aşamayı anlayabilirim: Girdi, İşlem, Çıktı.

19. Bir bilgisayar programını doğru şekilde saklayabilirim.

20. Bir bilgisayar programının size verilen bir bilgisayarda çalışıp çalışamayacağını açıklayabilirim.

21. Bilgileri organize etmek için bilgisayarı kullanabilirim.

22. Bir dosyaya ihtiyacım olmadığı zaman onu silebilirim.

23. Dosyaları organize edebilirim ve yönetebilirim.

24. Bilgisayar sorunlarını bulup onları giderebilirim.

APPENDIX B

COMPUTER ATTITUDE SCALE

1. Bilgisayar beni hiç korkutmuyor.
2. Bilgisayarla aram iyi değil.
3. Bilgisayarla çalışmayı isterim.
4. Bilgisayarları hayatım boyunca birçok yerde kullanacağım.
5. Bilgisayarla çalışmak beni çok sinirli yapar.
6. Genellikle, bilgisayarda yeni bir problemle uğraşırken kendimi rahat hissederim.
7. Bilgisayarla problem çözme üstünlüğü bana cazip gelmez.
8. Bilgisayarlar hakkında bir şeyler öğrenmek zaman kaybıdır.
9. Başkalarının bilgisayarlar hakkında konuşması beni rahatsız etmez.
10. İleri düzeyde bir bilgisayar çalışması yapacağımı düşünmüyorum.
11. Bilgisayarlarla çalışmanın zevkli ve teşvik edici olduğunu düşünüyorum.
12. Bilgisayar öğrenmek zahmete değer (faydalı).

13. Bilgisayarlara karşı saldırgan ve düşmanca olduğumu hissediyorum.

14. Bilgisayarlarla çalışabileceğime eminim.

15. Bilgisayar problemlerini çözmeye çalışmak bana çekici gelmiyor.

16. Gelecekteki çalışma hayatım için bilgisayar kullanım hakimiyetine ihtiyacım olacak.

17. Bilgisayar dersi almak için zahmete girmem.

18. Bilgisayarlarla iyi şeyler yapmak için uygun biri değilim.

19. Bilgisayar programında hemen çözemeyeceğim bir sorunla karşılaştığımda yanıt bulana kadar uğraşırım.

20. Günlük hayatımda bilgisayarları çok az kullanacağımı tahmin ediyorum.

21. Bilgisayar beni rahatsız eder.

22. Bir bilgisayar dili öğrenebileceğime eminim.

23. Bazı insanların bilgisayarla nasıl bu kadar zaman harcadıklarını ve bilgisayardan nasıl bu kadar hoşlandıklarını anlamıyorum.

24. Meslek hayatımda bilgisayarı kullanabileceğim bir durum düşünemiyorum.

25. Bilgisayar dersinde rahat olduğumu hissediyorum.

26. Bilgisayar kullanmanın benim için çok zor olduğunu düşünüyorum.

27. Bilgisayarla çalışmaya başlayınca bırakmak oldukça zor gelir.

28. Bilgisayarın nasıl çalıştığını bilmek iş olanaklarımı arttıracaktır.

29. Bilgisayar kullanmayı düşündüğümde başımdan aşağı kaynar sular boşaldığını hissediyorum.

30. Bilgisayar derslerinde iyi notlar alabilirim.

31. Bilgisayarlarla mümkün olduğunca az çalışma yapacağım.

32. Bilgisayarla çozülebilecek herşeyi başka yollarla da çözebilirim.

33. Bilgisayarlarla çalışırken kendimi rahat hissederim.

34. Bir bilgisayar dersini becerebileceğimi sanmıyorum.

35. Eğer bilgisayar dersinde bir problem çözülmeden kalırsa üzerinde sonradan düşünmeye devam ederim.

36. Bilgisayar derslerinde başarılı olmak benim için önemlidir.

37. Bilgisayarlar beni huzursuz eder ve aklımı karıştırır.

38. Bilgisayarla çalışmak gerektiğinde kendime yeterince güvenirim.

39. Başkalarıyla bilgisayar hakkında konuşmaktan hoşlanmam.

40. Çalışma hayatımda bilgisayarlarla çalışmanın benim için önemi olmayacaktır.