IDENTIFICATION OF FACTORS AFFECTING INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN BASIC EDUCATION SCHOOLS GRADES FROM 4 THOUGH 8

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ABSTRACT

IDENTIFICATION OF FACTORS AFFECTING INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES IN BASIC EDUCATION SCHOOLS GRADES FROM 4 THROUGH 8

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The purpose of the study was to identify the factors affecting the information and communication technologies. integration in the basic education schools. Mixed Model Research Design was utilized to find out the factors directly affecting integration of ICT integration in schools of K-8. Three different research methods were use sequentially. In the first step, new curricula used for Math, Social Studies and Science and Technology courses were examined to draw the pattern of ICT use defined by these curricula. In the light of the information gained through examination of curricula, 20 teachers were interviewed to understand whether they can put ICT based activities defined by curricula into practice or not. Simultaneously, they also identified common problems preventing them to integrate educational technology in their lessons and possible solutions to have a better ICT and education relationship. The literature and the information gained through first two step of the study suggested computer self-efficacy of teachers is very important factor within the integration of ICT. To assess teachers' computer self-efficacy, a questionnaire was

designed by the researcher and necessary pilot studies were completed to conduct exploratory and confirmatory factor analyses. Final form of the questionnaire was distributed to K-8 schools' teachers from 12 predefined cities of Turkey according to statistical information provided by EUROSTAT (Statistical Office of European Union). 1025 correctly filled questionnaire forms were returned and the data were analyzed by descriptive and inferential statistics techniques.

Result of the study suggested that, Internet is the most vital technology to successfully apply the curricula. Use of Office programs and different educational software also constitute considerable part of the curricula. But teachers indicated that they cannot apply curricular ICT based activities in school setting because of lack of access to technology, literacy, training, time and confidence/self-efficacy. It is also found that, teachers' age/ and teaching experience negatively contributed to their level of computer self-efficacy when their personal or home computer use was contributing very positively. On the other hand, existing computer training programs were found less effective than expected in terms of ICT integration. Based on these results, some basic improvements and modifications in curricula, training programs, and technology infrastructure of schools were suggested.

Keywords: Computer Self-Efficacy, Information and Communication Technologies, ICT Integration.

ÖZ

TEMEL EĞİTİM OKULLARI 4-8 SINIFLARDA BİLGİ VE İLETİŞİM TEKNOLOJİLERİNİN ENTEGRASYONUNU ETKİLEYEN FAKTÖRLERİN BELİRLENMESİ

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Bu çalışmanın amacı, temel eğitim okullarında bilgi ve iletişim teknolojilerinin entegrasyonunu etkileyen faktörleri açıklamaktır. Çalışmada ilköğretim okullarındaki teknoloji bütünleştirmesini doğrudan etkileyen faktörleri tanımlamak amacı ile karma araştırma yöntemi kullanılmıştır. Üç farklı araştırma yöntemi ile sırasıyla veri toplanmıştır. Birinci aşamada 4, 5, 6, 7 ve 8. sınıf Matematik, Sosyal Bilgiler ve Fen Teknoloji dersleri müfredatları incelenip, müfredatlarda var olan bilgisayar ve teknoloji destekli eğitim uygulamalarının yapısı belirlenmiştir. Birinci aşamada elde edilen bilgiler ışığında, öğretmenlerin bu bilgisayar ve teknoloji destekli eğitim uygulamalarını ne ölçüde yerine getirebildiklerini anlamak amacı ile 20 ilköğretim öğretmeni ile görüşmeler yapılmıştır. Buna ek olarak, öğretmenlerden bilgisayar ve bilişim teknolojilerinin bütünleştirilmesi etkileyen problemler ve bu problemlerin çözümü hakkında görüşleri alınmıştır. İlk iki aşama ve alanyazı aracılığı elde edilen

bilgiler doğrultusunda öğretmenlerin bilgisayar öz yeterlilik algılarının teknoloji-eğitim bütünleşmesi açısından önemli bir faktör olduğu ortaya çıkarılmıştır. Bu bağlamda, öğretmenlerin bilgisayar öz-yeterlilik algılarını ölçmek için araştırmacı tarafından bir ölçek geliştirilmiş ve gerekli ön çalışmaları yapılmıştır. Geliştirilen ölçeğin son hali EUROSTAT (Avrupa Birliği İstatistik Ofisi) tarafından sağlanan bilgiler doğrultusunda belirlenen 12 ilde öğretmenlere dağıtılmıştır. Uygun şekilde doldurulmuş 1025 anket formu geri dönmüş ve elde edilen veri betimleyici ve çıkarımsal olarak analiz edilmiştir.

Çalışmanın sonuçlarına göre, İnternet'in müfredatların uygun şekilde hayata geçmesi açısından çok önemli olduğu bulunuştur. Office programlarının ve diğer eğitim yazılımlarının da müfredatlar açısından önemli bir yare sahip olduğu gözlemlenmiştir. Fakat teknolojik kaynaklar, bilgisayar okur-yazarlığı, hizmet içi eğitim, zaman ve bilgisayar öz-yeterliliği anlamındaki yetersizlikler nedeniyle öğretmenlerin müfredatlardaki bilgisayar ve teknoloji destekli uygulamaları yeterince yerine getiremedikleri anlaşılmıştır. Aynı zamanda öğretmenlerin yaşlarının ve öğretmelik mesleğinde geçirdikleri sürenin bilgisayar öz-yeterlilik algılarının olumsuz yönde, ancak kişisel bilgisayar kullanımının da olumlu yönde etkilediği bulunmuştur. Diğer bir yandan, hizmet için eğitimlerin öğretmenlerin bilgisayar öz-yeterlilik algıları üzerine yeterli derecede olumlu etki yapamadığı ortaya çıkmıştır. Çalışma sonunda, ulaşılan bulgulara dayanılarak bir takım müfredatlarda, hizmet içi eğitimlerin yapısında ve okulların teknoloji altyapılarında yapılabilecek değişiklik ve düzeltmeler için bazı öneriler sunulmuştur.

Anahtar Kelimeler: Bilgisayar Öz-Yeterlilik Algısı, Bilgi ve İletişim Teknolojileri, BİT entegrasyonu.

To my son, Alkım

To my wife, Emine

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INTRODUCTION

1.1. Background of the Problem

Throughout my one year experience as a teacher, I witnessed too many educational problems. One of the most frequent issues I observed during this experience was complaints of the teachers about integration of information and communication technologies into educational settings. Although they did not use the word of *integration* directly, the problems to be solved were all related to this issue. As a computer and technology teacher and an unofficial technology consultant of the school, I could only offer external and practical solutions. No matter how instant and effective solutions they were, these were all temporary and therefore I realized that more fundamental and structural interventions were needed as permanent solutions. As I elaborated the problems, it seemed that some of the teachers felt incompetent in using computer technologies in or out of the classroom, and some others complained about the lack of technological devices in their classrooms even though they attended long term trainings. Current situation of in-service teacher trainings, relationship between curriculum and ICT, and perceptions of students and parents on the use of technology in schools were some other crucial issues which were put into words by teachers.

Today, higher order cognitive skills as critical thinking, problem solving and decision making skills are seen as important factors that should be included in the programs of schools from elementary to tertiary level (Akkoyunlu & Kurbanoglu, 2004). These skills also constitute the fundamentals of lifelong learning, but there is

another important skill which is being able to reach necessary information to achieve lifelong learning. According to Bawden (2001), complex and broad form of literacy is necessary in order to deal with the difficulties of the current information age. These skills should not be restricted to a particular technology or set of technologies. Therefore, if learning is not limited to classroom from now on; teachers have to be competent enough to make use of information and related technologies in order to reach, modify and present this information effectively either inside or outside of the teaching environment.

The main prerequisite of using ICT in educational activities is the existence or accessibility of technology. The lack of access is the primary barrier to successful integration of technology (Norris, Sullivan, Poirot, & Soloway, 2003). In other words, defining what the adequate access to technology and providing this access to stakeholders of education in schools has potential to dissolve the issues in integration of educational technology. After the 50 year old prediction of McLuhan (1964) about the increase in the importance of technology and media which are not only in education but also in every pieces of life of human, improvement of learners' outcome carried by the use of technology has become a major topic to discuss among researchers like in the famous media debate between Clark and Kozma (Clark, 1991, 1994; Kozma, 1991, 1994). There are specific studies indicating that technology alone cannot improve learning by itself (Cuban, 1986), or that there are many other barriers affecting technology integration except for technology itself (Ertmer, 1999).

According to the report published by OECD (2004), teachers play an important role to educate people as information and technology literate and in-service training programs should be designed by concerning this issue. It is very difficult to expect that technology illiterate teachers can educate information literate students, but being literate in computer, in technology, or information is not enough to educate such literate students; teachers also feel they are efficient and competent in using technology for educational activities. According to Bandura (1993, p. 144), "people with low self efficacy in a given domain, get shy away from difficult tasks", which

they perceive as personal threats. As a result, if integration of information and communication technologies (ICTs) into classrooms makes contribution to the quality of education, there is a need to train computer literate teachers with the feeling of self-efficacy.

According to the strategic planning of the Turkish Ministry of National Education (2010) for the years between 2010 and 2014, basic steps were defined to integrate ICT into Turkish educational system. Some of the steps are;

- Providing students, teachers, parents, and school principles and other stakeholders with necessary hardware and software, high speed internet connection, and equal access to these technologies to prevent digital divide.
- Educating teachers, students, parents, school principles, and other stakeholders to use ICTs, and;
- With student-centered education programs, educating students to reach information by themselves via these ICTs.

Availability of technology cannot always lead high integration of ICT into teaching practices by improving students' learning outcomes (Lim & Chai, 2008; Lowther, Inan, Strahl & Ross, 2008), and it is visible in the strategic planning of Ministry of Education. Tracing the technology integration in schools is not a linear way following only the availability of technology. Rather, it is a more complex and nonlinear structure including many other variables which might be interrelated or contingent upon one another.

1.2. Purpose of the Study

There are many factors affecting technology integration whether they are visible or not. The aim of this study is;

(1) To define the factors directly related to the technology integration in the basic education schools. Investigation of defined technology use by the Math, Science and Technology and Social Studies courses constituted the initial step of the study.

(2) To reflect the teachers' perceptions about technology integration with the inclusion of possible barriers and enablers.

(3) To investigate the factors affecting teachers' self-efficacy beliefs to integrate ICTs.

1.3. Significance of the Study

Due to the rapid development in technology, computers and their integration into classrooms have been started to one of the main issues of educators and related institutions in the last decades. For this reason, importance of training computer literate teachers who are also able to design technology integrated lessons has been increasing continuously.

This study is significant because it defines the real and expected uses of ICT by teachers. The curricula used in basic education schools provide information to understand the technology usage, so they were examined by the researcher with related document analysis techniques. By this way, the patterns and density of technology use were tried to be extracted to compare and find out the gaps and deficiencies in practices. In order to trace the patterns and reasons of gaps in practical use, teachers from different subject matters were interviewed and surveyed. In this sense, this study provided significant findings to design more effective in-service training programs, better technological infrastructure, more appropriate curricula, and more efficient policies.

In 2011, Turkish Ministry of National Education with proposed a project named as FATIH (Egitimde FATIH Projesi, 2012). This project aims to provide equal

opportunities in schools for use of information and communication technologies through providing tablet PCs and smart boards. In addition, in-service trainings will be given to about 600 thousands teachers in the system to use these technologies effectively by the end of 2013. Enormous amount of financial support is devoted for the project.

From this point of view, a careful planning for each step in FATIH project is necessary to achieve the aim of "making technology one of the most important tools used in education by students and teachers" defined in the strategic planning of The State Planning Organization (2010). It is conclusive in the literature that integration of educational technology is very complex with the sophisticated mutual relationship of different variables. From this point of view, this research may provide valuable information for policymakers and institutions responsible for Turkish system of education to make long term plans, and to put these plans in action. Besides, the interviews can shed light on what to be focused while introducing teachers such new and relatively advanced technologies as smartboards. This study can be considered as significant in a way that teachers' concerns were examined. This can help both policy makers and stakeholders who is participating the transition from PCs to tablet PCs by providing the specific barriers as well as enablers. Especially, for the integration of smart boards, tablet PCs, and high speed internet connections in schools, the support for teachers are needed. This study can provide an outline in terms of teachers' role in this innovation in Turkish educational system.

There are a number of different instruments measuring IT self efficacy perceptions of teachers both in Turkish and in other languages. However, none of them was as specific as this instrument developed by the researcher since it specifically focused on self efficacy perceptions of teachers about ICT integration. In this way, a useful instrument which can be used for different purposes contribute to the literature.

1.4. Research Questions

Research questions with sub questions of the study are;

1. What is the pattern of ICT use in K-8 schools' Math, Social Studies, and Science and Technology courses' curricula?

1.1. Which parts of the related curricula do require ICT use?

1.2. Does ICT use change in the related curricula based on the grade level and subject matter?

2. What are the teachers' perceptions of ICT use in schools?

2.1. What is the place of computers in teachers' professional and daily lives?

2.2. What is the teachers' source of ICT literacy?

2.3. What is the teachers' ICT use for curricular activities?

2.3. What are the barriers to ICT use?

2.4. What are the enablers to ICT use?

2.5. What are the teachers' suggestions pertaining to effective ICT integration?

3. What is the teachers' perceived instructional technology self-efficacy?

3.1. What is the teachers' perceived instructional technology self-efficacy in terms of use of internet and computer to support teaching and learning?

3.2. What is the teachers' perceived instructional technology self-efficacy in terms of technical knowledge?

3.3. What is the teachers' perceived instructional technology self-efficacy in terms of Office programs and their applications?

3.4. What is the teachers' perceived instructional technology self-efficacy in terms of classroom applications?

3.5. What is the teachers' perceived instructional technology self-efficacy in terms of advance computer use?

3.6. What is the teachers' perceived instructional technology self-efficacy in terms of total self-efficacy scores?

1.5. Definition of Terms

Self Efficacy is "concerned with judgments of personal capability" (Bandura, 1997, p. 11). It is also defined as the belief that one has the capability to perform a particular behavior, and it effects decisions about behaviors, the effort, motivation and persistence in attempting those behaviors, the emotions and responses during performing the behaviors, and the actual performance attainments of the individual with respect to the behavior (Compeau & Higgins, 1995, p. 189).

Computer Self-Efficacy in terms of ICT integration is the perception of self-efficacy belief specifically for ICT integration into educational settings.

IT Self-Efficacy is self efficacy perceptions of teachers for instructional technology use. It includes both use of technology and using it for educational purposes.

In-service Teachers are teachers who completed teacher education program given by a faculty of education and still working as teacher after completing probation.

Computer Training Programs are the training programs designed to teach basic computer skills (such as using word processors, spreadsheets, presentation tools, internet and basic web design tools) teachers to make them computer literate.

1.6. Assumptions

In this study the followings were accepted as assumptions:

1. The cities were represented other cities in its region defined by EUROSTAT.

2. All participants responded to the data collection instruments accurately.

3. Data were collected accurately.

4. Collected data were analyzed correctly.

5. Measures used in this study were reliable and valid.

1.7. Limitations

Limitations of the study are;

1. Only primary school teachers were in the scope of the study, so it cannot be generalized to whole teacher population.

2. Validity and reliability of collected data depend on reliability of the instruments used and on the assumption that teachers respond to the items correctly.

3. Contextual factors could influence responses of the participants

4. The cities in same region defined by EUROSTAT could show different properties which was a thread to the generalization.

1.8. Delimitations

Delimitations of the study are;

1. The sample of the study is limited to in-service K-8 school teachers,

2. The results can be generalized to only Turkish context, not other countries.

1.9. Abbreviations

EUROSTAT: Statistical office of European Union.

MoNE: Ministry of National Education

UICS: Subscale of computer self-efficacy questionnaire in terms of use of internet and computers to support teaching.

TK: Subscale of computer self-efficacy questionnaire in terms of technical knowledge.

OPA: Subscale of computer self-efficacy questionnaire in terms of Office applications.

CA: Subscale of computer self-efficacy questionnaire in terms of classroom applications.

ACU: Subscale of computer self-efficacy questionnaire in terms of Advance computer use.

TSE: Total score of computer self-efficacy.

IT: Instructional Technology.

CHAPTER 2

LITERATURE REVIEW

"Upon those who step into the same rivers, different and ever different waters flow down"

Heraclitus

As Heraclitus stated hundreds years ago, we live in a continuously changing world. Education and its stakeholders are also changing. Its existing components will not be useful for the future needs of people. So, everything in education should be adjusted these changing needs of human. Teachers constitute one and most important factor playing in the successful adaptation to change, but there are also other factors other than the teachers' boundary. In this chapter, information from related literature about factors enabling and preventing ICT integration in schools was presented. .

In the literature, many barriers to integration of ICT into educational setting were identified through different studies (Ertmer, 2001; Pelgrum and Law, 2003; Hew and Brush, 2007). In this section, these barriers and possible enablers were discusses with the help of available literature.

2.1. Technology and Learning

Emergence of digital technologies in education was seen as teaching machines first by Behaviorist approach (Jonassen, 1991). From the behaviorist perspective, learning could only be evaluated through measuring changes in behavior. Technological

innovations shaped such changes in behavior. That type of technology use was named as Computer Assisted Instruction (CAI). CAI in Behaviorist approach can replace teacher by enabling to reach intended learning outcomes (Honebein, 1996). Skinner's teaching machine was one of the most important examples of CAI (Demiranda et al, 2000).

On the other hand, changes in society from 20th century to 21st century increased the importance of authentication for learning. Especially in the last couple of decades, we have faced with a remarkable increase in the use of technology for teaching and learning. So change of technology use in education has shaped functions of 21st century schools. Industrial age schools educated students for the work places of the industrial age. On the other hand, gaining knowledge and information have started to become more important for people to have a better job or career in 20th century. But today, not only information itself, but also access to the information turned into a vital issue to survive in 21st century. Therefore, our schools have to update themselves to keep pace with the development of information and communication technologies (Asses, 1999). According to Thorburg (1999), schools will not be places that students attend to learn, rather they will become set of activities to reach and select the information necessary among the huge information chunks.

2.2. School - ICT Integration

With the dramatic increase in the use of technology in every single part of our lives, integration of ICT in education has been a major requirement. According to the meta-analysis results which was about comparison of computer assisted instruction and traditional instruction (Liao, 2004), the effect of computers is positive on instruction. Therefore, schools have to be equipped with necessary technology to provide students with means to access information, and to train student for gaining ICT skills necessary for adaptation to changing world. But providing access to technology is not always sufficient to have a successful ICT integration in schools (Gulbahar & Guven, 2008). In addition to establishing high technology

infrastructures, innovation must reside in the approach to creation of ICT and teaching-learning relationship (Kington, Harris, & Leask, 2002). According to Ertmer (1999), the level of technology use cannot be estimated by reporting the amount of the technological tool in the classroom, but the extent of technology use for teaching and learning must be observed to understand success of technology integration.

In the study of Karaca (2011), a path model was tested to understand the factors associated with the ICT integration in elementary school settings in Turkey. Results of the study suggested that integration of ICT in elementary schools is a very complex procedure and there are a number of factors affecting not only ICT integration in elementary schools but also affecting other factors. In other words, approaching to each factor with isolation from others may hinder the effect of mutual relationship between factors. For this reason, researcher suggested that a detailed vision plan indicating how technology should be integrated is necessary.

There are a number of studies in the literature indicating the positive effect of ICT on teaching and learning (Lee et al., 2009; NCES, 2001; Papanastasiou et al., 2003; Kim, & Chang 2010; Attewell, & Battle, 1999; Delen, & Bulut, 2011). However, Baylor and Ritcie (2002) summarized the way of technology use in classroom by enhancing teachers' role as;

> "When students and teachers perceive computers as a separate subject, unassociated with the context of the lesson or classroom, the content or concepts studied are often left fragmented in the learner's mind. But if a technology-enhanced lesson is integrated into the larger curriculum with direct tie-ins, students are more likely to infuse the knowledge into existing cognitive structures. Technology integration requires teachers to alter their teaching processes, no longer being the sole distributor of information. This change in role requires support from many sources in order for the teacher to make the transition" (p.401).

For this reason, how teachers incorporate the technology into the lesson has to be investigated in order to understand whether ICT integration is succeeded or not. According to Bebell et al., majority of teachers do not only use ICT for lesson preparation, or grading. When the researchers was trying to find out the way in which teachers use technology, they realized that instructional use of ICT may appear in many different ways and only observing classroom applications or investigating the relationship between ICT use and students' achievement might yield inaccurate conclusions.

2.3. Teachers' Role in ICT integration

Schools started to place information and communication technologies during 1980s. These technologies were expressed by several researchers as the crucial role player for the education of new generations by offering different learning and teaching opportunities (Bransford et al, 2000; Grimus, 2000, Yelland, 2001), but where is the place of teachers in ICT integration? According to The ICT Impact Report of European Schoolnet, teacher level barriers are one of the major barriers preventing ICT integration (Balanskat, Blamire, Kefela, 2006). In addition, lack of necessary ICT skills and lack of continuous development of these skills negatively affects the specific ICT choices that teachers make.

Teachers' role in education have been started to change, and new roles were defined such as facilitator, coach, mentor, instructor, and etc. One of the reasons to this change is the use of ICT in our lives. We need technology in education as in other parts of the life and teachers are important enablers for the diffusion of ICT into our lives. According to Collis (1996), teachers are the most important stakeholders to ICT integration, and so they have to use these technologies first.

Acun, Tarman and Mete (2010) conducted a study to investigate teachers' ICT integration stages and the factors effecting the integration. 200 teachers were

surveyed in Turkey. Results indicated that gender, experience, attitudes, knowledge, and feeling incompetent to use ICT were found highly correlated with ICT integration. Among all these variables, ICT knowledge and gender were the variables directly affecting third stage ICT integration which is the highest level that a teacher can reach with the technology use in classroom. On the other hand, initial stage of ICT integration was explained significantly by the attitude and belief variables. Therefore, positive attitudes and beliefs of teachers are necessary to comprise initial ICT integration in classroom although advance knowledge is necessary for higher ICT integration.

A study conducted by a large number of participants from Turkey indicated these positive attitudes are available among Turkish teachers (Goktas, Yildirim, & Yildirim, 2008). With a representative convenience sampling method to increase the power of generalization, researchers collected qualitative and quantitative data from 1435 teachers located different cities with the aim of investigating current status of teachers' ICT integration. Results demonstrated that K-12 school teachers believe in the benefits of computer and other technologies to teaching and learning processes although there are several restrictions as barriers to ICT integration. Similar positive attitudes of Turkish teachers were also found by Gulbahar and Guven (2008) with some similar considerations. 326 surveyed teachers in that study indicated that teachers are enthusiastic to use educational technology in school circumstances. But it is also found that teachers' are not aware of the available technology to use teaching and learning. Insufficient knowledge, lack of technology access, and lack training were found primary barriers to ICT integration.

As much as the amount, the way of ICT use is also a crucial sign of successful ICT integration. To explore these ways in which teachers use technology, Babell, Russell and O'Dwyer conducted a 3-year study with teachers from 22 school districts. About three thousands teachers from different subject matters were participated. At the end of the study, they summarized the findings as;

1. Separate measures that represent distinct categories of technology use can be formed,

2. Although these measures are correlated positively with each other, the strength of the relationships is weak enough to suggest that each category represents a separate and distinct type of use,

3. The use of distinct measures versus a generic measure provides a richer, more nuanced understanding of how technology use differs across factors such as teacher tenure, school type, and subject area taught (p.59).

In summary, among variety of factors affecting ICT integration in schools, teachers are the key gate keepers for diffusion of ICT in education. Their beliefs can both enable or prevent this diffusion. The literature suggests that teachers' beliefs and attitudes should be investigated in detail by focusing on different aspects.

2.4. Barriers and Enablers to ICT Integration

2.4.1. Lack of Technology Access

One of the most frequently expressed barrier for ICT integration in schools is lack of access to necessary technological tools (Wells & Lewis, 2006; Bingimlas, 2009). According to the results of survey study conducted by Becker and Ravitz (2001) with 4100 teachers' pedagogy, computer use, and teaching environment, it was found that majority of teachers with 5 to 8 computers in their classrooms regularly use computers for academic purposes. Another survey conducted with 3,665 K-12 school teachers to learn the way of students classroom computer use in their classroom (Norris, Sullivan, Poirot, & Soloway, 2003), they pointed out the use of ICT for educational purposes is completely related with their access to that technology.

In some cases, poor organization of technology in schools can also constitute a barrier. According to Becta (2004), lack of access to technology does not always mean lack of technology. Instead, inappropriate organization of available technology,

low quality of hardware, insufficient educational software, or lack of technology support for teachers can reduce the technology access.

There are many other studies defining lack of technology access and one of the biggest barriers in the literature (Pelgrum, 2001; Toprakci 2006; Gomes 2005). On the other hand, access to technology may not be the only reason preventing effective ICT integration in schools.

2.4.2. Lack of ICT Literacy

According to ICT Competency Frameworks for Teacher published by UNESCO (2011), teachers should have basic competencies related with ICT literacy and they should also be able to use these skills to manage curricula and support classroom activities. In other words, without necessary ICT literacy skills, access to technology may not lead to successful integration. Witfelt (2000) grouped the necessary ICT skills into two; ICT literacy and multimedia didactical skills. The former is related with technical competency which everyone should have. The later is necessary for teachers to use technology for educational purposes. Similar grouping was also made by different authors. In the literature, ICT competencies were divided into two as basic ICT skills to use computers and other technologies for general purposes, and advance ICT skills to promote teaching and learning processes in schools (Tınmaz, 2004; Toker, 2004; Markauskaite, 2007).

Tondeur et al. (2007) conducted a survey study with 570 teachers from 53 Flemish schools to investigate whether teachers use ICT as proposed by Flemish Government. Results indicated that when teachers were mostly trying to improve their technical skills in terms of ICT, they tried to build curricula on the use of ICT for teaching and learning process.

Lack of ICT literacy was found as a significant barrier to ICT integration by different studies. One them was conducted by Stolle (2008). The researcher collected

qualitative data from 16 teachers via different methods to understand the relationship between teachers and technology integration. At the end, she concluded with that insufficient ICT knowledge is a barrier for teachers and teachers do not believe in that they were not trained enough to integrate technology into classroom setting.

Perceptions of classroom teachers and school principals in Turkey on ICT integration into teaching and learning were investigated by Yalin et al (2007). 1039 public school teachers and 145 school principals were surveyed. 106 of principals and 722 of teachers were indicated that lack of ICT literacy and skills is an important barrier to ICT integration.

2.4.3 Lack of time and Technical Support

In some cases, teachers still do not use ICT for educational purposes even though they have enough technology access and literacy. In such situations lack of time were discussed as a barrier for ICT integration in schools. Beggs (2000) conducted a study with 348 full time faculty members at a university in USA to investigate barriers and influences to adaptation of technology into instruction. The results indicated that lack of time was at the top of list including the barriers defined by the participants.

Similar results were published for the teachers from Saudi Arabia (Alwani et al., 2005). Researchers asked teachers to list the barriers to integrate information technologies in science education in public schools.284 science teachers participated in the study showed that lack of time for ICT related activities in school is the fifth most important barrier in the top ten-list. Lack of time is also a barrier to ICT integration for Turkish schools. For example, a study which was conducted in 227 elementary schools with 1039 teachers and 145 school principles showed that lack of time to develop ICT based activities is a barrier for not only teacher but also school principles (Yalin, Karadeniz & Sahin, 2007).

Lack of technical support is also one of the most mentioned barriers in the literature. In some cases, technical support was not seen as crucial. For example, results of a study conducted with Scottish elementary school teachers, technical support were not found as a major barrier (Conlon & Simpson, 2003). Although such studies exist in the literature, considerable part of literature related with barriers to ICT integration indicates that technical support is a must for successful integration of information and communication technologies in school circumstances (Zhao et al., 2002; Bitner & Bitner, 2002; Yalin et al, 2007, Kote & Hüsing; 2007, Toprakci, 2006).

Success of ICT integration in school determined by many different factors and it is understood that there is no place for any exception remained unsolved. In other words, there may be mutual relationship among these barriers and it is necessary to approach to the problem as a whole.

2.4.4. Teacher Training/In-service ICT training

There is a strong belief on that increasing content knowledge and pedagogical expertise of teachers by the help of pre-service and in-service training is the most efficient way to get healthy development in education (Chapman, Chen & Postiglione, 2000). It is very natural that there is such a belief because we have too many variables influencing the quality of education but we as educators may not control most of them. Teacher training is one of the rare components of education that can be manipulated. If our aim is to increase students' performance, and if teacher training is one of the tools that can be used for this purpose, there is a need for governmental support or regulation on content and context of teacher training programs as stated by Evans (2002) and Chapman et al (2000).

The main aim lying behind all of the teacher training practices is the need for change to catch up with the dynamic nature of the world. Therefore it is easy to understand the relationship between training programs and curriculum reforms. Teachers' perceptions are also in this direction according to the study held by Ha, Lee, Chan

and Sum in 2004. In that study, survey data were collected from 183 primary school teachers after and before 15-hour training program aiming to prepare teachers to the curriculum reform. In general the training program was successful in achieving its objectives, but teachers indicated that in-service teacher training was needed to enable them. Other school personal responsible for the implementing new curriculum because changes in curriculum, and teacher training does not alone guarantee the achievement in change.

A lot of possible treatment of governments can be counted to increase quality of teacher training programs such as establishing professional teacher training institutions, increasing the fund of training programs, and so on. But whatever governmental policies brings new expansions, schools always play the leading role in-service teacher training since teaching competencies of teachers can be observed and solved in school context (Carney, 2003).

Although there are many admirable efforts by governments, schools and other institutions on this issue, it cannot be claimed that all of them are successful. According to the meta-analysis of Kennedy in 1998 on 93 studies that were about effect of teacher development on student performance, only 12 of them demonstrated constructive results. Consistent with the study of Kennedy, Jacob and Lefgren (2002) could not find significant effect of teacher training program on students' achievement. In this study, the effect of teacher training on reading performances of students from Chicago were assessed during three-year-period from 1996 to 1999, and they stated that teacher training provided to schools in Chicago appears completely ineffective. Moreover, the perceptions of 464 teachers from primary and secondary schools after national ICT training programs shows that few the ingredients and features of the program is successful although the government spent £230 million for this purpose (Galanouli, Murphy, Gardner, 2004).

Generally, it is not possible to be sure about the overall success of the teacher training activities. And it is also clear that there is a need to focus on the issue from

different perspectives. Training programs should not only be designed for the demands of the educational policy, students, schools and new curricula. A study which was presented at the Annual Conference of the Australian Association for Research in Education in Sydney emphasizes on the importance of teacher needs in designing training programs (Fok, Chan, Sin, Ng & Yeung, 2005). In this survey study, 150 teachers from different primary schools were asked to rate their current competencies and training needs after completing 5-week-in-service training course. According to the results, teachers feel competent in their special field but they also stated their strong needs for in-service teacher training programs in different subjects. In addition, nearly all of the teachers involved in this study meet consensus on the point that curriculum designs of training programs should not only consider the competencies but also needs of the teachers together with their stage of professional development.

There are some factors influencing the success of the teacher training programs. One of them is that these programs should have to consider teachers' needs as well as needs in the system of education. Training teachers is not the only solution of all educational problems. Therefore all institutions should work collaboratively to create beneficial training programs for adaptation to changing world.

Today, integration of computer technologies into classroom is an important issue that stakeholders of education focus on. At this point, teachers should equip themselves with the skills related to computer and technology use, and they should learn how to use these skills in the classroom circumstances (Goodison, 2003). In other words, with the increasing number of the schools that have technological infrastructure, educating teachers to use technology, especially to use computers become a priority. According to Guhlin (2002), teacher training and empowerment are the key factors to increase the quality of education, and it is also valid for the successfully integration of technology into classroom (as cited by Bedard, 2002). Majority of the related literature supports that teacher training can help to develop positive attitudes toward ICT

integration for teachers (U.S. Department of Education, 2005; Reynolds & Morgan, 2001; Yildirim & Kiraz, 1999; Yildirim, 2000; Berson, 1996).

But there is a need to distinguish being able to integrate computers into classroom setting from being able to use computers. As a matter of fact, a study conducted to find out whether teachers from Sivas-Turkey use their home computers for educational purposes or not showed that most of the teachers from the sample (n=402) do not use their home computers for preparation to classroom activities (Toprakci, 2005). Mayo, Kajs and Tanguma (2005) also found out with the help of three year longitudinal study that although most of the teachers feel comfortable with computers, just half of them use computers or internet in their classrooms. Therefore it is essential to emphasize on integration of computers into lessons as much as using computers.

According to the results of the survey conducted by Bedard (2002) on the sample from various rural and urban public schools, the amount of in-service computer training leads difference in the use of computers in classroom. Teachers with more computer training use computers and other technologies more effectively, and in more various ways. Similarly, the study of Smerdon and Cronen (2000) shows that the number of hours that teacher gets computer training is the more use of computers and other technologies for academic purposes in classroom.

Trained teachers on the computer literacy leads improvement in the use of computers for classroom activities, but attitudes of teachers are also efficient on this issue. In order to investigate attitudes of Turkish teachers who had computer training programs towards the utilizing computers into regular lessons, Varank (2001) assess teachers' attitudes before and after 30-hour computer training. Results showed that teachers changed their attitudes after training by showing higher scores on the attitude questionnaire than the teacher who were not trained.

The studies that we examined up to now focus on the importance of computer training programs to achieve technology integration into education. But it is still an unanswered question whether all of computer training programs are effective and efficient. Bose (2004) conducted a research in order to investigate the status and effectiveness of computer training programs for primary school teachers given by three teacher training institution in southern regions of Botswana. According to the results of the study, only 44% of the teachers trained in these institutions could use computers for teaching and learning purposes. This means that majority of computer trained teachers cannot use integrate computers into classrooms efficiently.

Another study was done by Medvin, Reed and Behr (2002) in order to explore teacher characteristics affecting the computer use in pre-school classrooms. 38 pre-school teachers were involved in a workshop which is about using computers to facilitate social skills of children, and after the workshop, they were asked about computer usage in classroom. According to the results, although all of the participants had access to computers at home or at school, they felt that more training is necessary for them. In addition, results indicated that frequency of computer use in classroom was positively related with the number and types of training that teachers took before. So both the statements of teachers and analysis of the survey showed training plays an important role in technology integration in classrooms.

Bedard (2002) found out similar results with the previous study. In that study, effect of in-service computer training on the computer use of third grade students in Illinois was investigated. The sample was chosen from rural, urban and sub-urban public schools in order to represent whole third grade teachers from Illinois. Results showed that teachers with more hours of computer training used computers for classroom activities more often. Teachers also stated that they feel more prepared when they get more computer and technology training. Therefore overall results of this study propose that teachers with more training are more comfortable with computers in different ways and situations.

Fracces and Bryant (2005) investigated the effect of compulsory technology integration training on teaches qualitatively. Data were collected from elementary teachers and Social Studies teachers through interviews. Results of the study indicated that technology training cannot able teachers to realize higher level of ICT integration although it is effective to gain basic level of integration. Follow up trainings and continuous support was expressed as the main prerequisites for successful ICT integration by teachers. In other words,

In conclusion, integration of computers and technology into classroom in an important issue, and computer training for teachers is a one of the ways to achieve this goal. Literature reaches a consensus on more that training leads more use of computers in classroom. But it can be also inferred that quality of these training programs and continuous support with trainings is crucial since being able to use technology is not always enough for technology integration. Teachers should be also trained in order to increase the role of computers in their instruction.

2.5. Self Efficacy

Regardless of their teaching field, self-efficacy is a key factor influencing the effectiveness of the teachers in the classroom. According to Bandura (1993) efficacy beliefs affect our thinking, self-motivation, feelings and behaviors, so self-efficacy beliefs are dominant on cognitive, affective, motivational and selection processes. In other words, without believing carrying on these four main processes, teachers or any other professionals cannot achieve their objective as Kurbanoglu (2004) stated.

Self-efficacy was derived first from the Social Cognitive Theory of Bandura (1982; 1986; 1989). According to the Social Cognitive Theory, there is a mutual relationship between personal, behavioral and environmental factors. That is; a person, for example, can determine the environment and affect it, and also he/she is also affected from it. From this perspective, perceived self-efficacy was determined by the individual according to the personal, social and environmental sources.

Bandura (1997) indicated that personal self-efficacy beliefs of a person are built upon four major blocks;

- Enactive mastery experiences,
- Vicarious experiences,
- Verbal persuasion and,
- Psychological and affective states.

He continued as evaluating one's capabilities is not a simple process. There is a distinction between the information conveyed and the knowledge "integrated into self-efficacy judgments (p.79)." In line with the Social Cognitive Theory, to evaluate self-efficacy, experiences with environmental, behavioral and personal information should be taken into account.

Today, we are witnessing important transformations in the system of education. In this new form of education, creating interactive and student-centered learning environments constitutes an important part of this system, so teachers should be able to construct such environments. This requires mainly computer, technology and information literacy skills. But being computer, technology and information literate is not enough to equip students with these same skills. According to Deng, Doll, and Truong (2004), using computers effective in the work place is determined by many different variables, and one of them is computer self-efficacy, and context, user autonomy, and learning capabilities are some of the determinants of computer self-efficacy.

In order to adapt students as adaptive to the changes in Information Age, new technological tools were started to be installed to schools, for example most of the schools have computer laboratories in Turkey. According to Albion (1999), there are many factors affecting teachers' technology use in classroom, such as accessibility to hardware and software, and technical support. However teachers' beliefs about the

tasks that they will perform, in other words their self-efficacy perceptions, may be an important element determining the level of successful classroom technology integration (Wang, Ertmer, & Newby, 2004). In the study, researchers tried to explore the effect of vicarious experiences and goal setting on the self-efficacy beliefs of pre-service teachers in technology integration. 337 students from the Introduction to Educational Technology course accepted to participate in the study. 2X2 (Vicarious Experiences X Goal Setting) factorial design were used as research design and students were randomly assigned to one of these four groups. An online Likert-type self-efficacy scale which was developed by the first author was applied before and after the course. Results indicated that students who were exposed to vicarious experiences showed better increase in self-efficacy independently from goal setting. The vicarious experiences were provided via CD-ROMs, and this CD-ROMs eliminated logistical problems related with classroom applications. In addition students who used specific goals showed similar higher increases in self-efficacy beliefs.

In the study of Vannatta and Fordham (2004), different K-12 teachers' dispositions as the predictors of technology use in classroom were examined. They tried to answer the research question "which combination of factors best predict classroom technology use among K-12 teachers: teacher self-efficacy, teacher philosophy, openness to change, amount of professional development, amount of technology training, years of teaching, hours worked, an willingness to complete graduate courses without salary incentive?"(p. 254). 177 teacher from six different schools participated to the study by filling The Teacher Attribute Survey. The results indicated that teachers who get self-efficacy scores higher than average preferred more constructivist and student-centered environments. In addition, openness to change increased parallel to the self-efficacy according to the analysis. As a result, self-efficacy was found one of the important predictors of technology use in classrooms for K-12 teachers.

In another study, Simonson (2003) tried to discover bilingual teachers' belief about technology integration, general attitudes toward technology and self efficacy toward utilization of technology, and their perceptions about peers' technology utilization by using a survey. 103 bilingual teachers filled the survey correctly. At the end of the analysis, as the other beliefs, technology self-efficacy beliefs of bilingual teachers was found one of the important predictors of technology use in classrooms.

Shiue (2007) conducted a study in the aim of discovering the objective, subjective and contextual factors affecting teacher's use of educational technology. A survey was developed in order to measure teacher's perceptions that influence use of educational technology by teachers. 242 school teachers from different district of Taiwan responded to the survey. According to the results, it was found that teachers' computer self-efficacy influences their ease of technology use and their perceived control perception on computers. On the other hand, professional development was found effective on this self-belief. Computer access and administrational and technical support are other factors influencing computer self-efficacy.

In order to examine views of pre-service teachers who took an information technology course, Watson (1997) asked open ended questions to these pre-service teachers, and he supported these data with age, gender and computer competence questions. These answers of free-response questions were coded by Open Coding Method. Results indicated that male pre-service teachers had higher self-efficacy beliefs than females. Age was also found as a determinant of computer self-efficacy in these teachers candidates; younger students had higher computer self-efficacy.

Individual characteristics of secondary school teachers and computer self-efficacy were examined in another study (Paraskeva, Bouta, & Papagianni, 2008). The participants of the study were 286 secondary education teachers, and they attended a training program about technology and instruction design. 4 different instruments about general self-efficacy, self-esteem, computer self-efficacy, and demographics were used to collect data. Results showed that general self-efficacy and computer

self-efficacy had significant positive correlation, but computer self-efficacy did not show any correlation with self-esteem. In addition, subject area, prior experience in computer and software use showed strong correlations with computer self-efficacy.

168 K-12 teachers completed the questionnaire which was designed to measure classroom technology use (Littrell, Zagumny, & Zagumny, 2005). This collected data were used in the study which was aimed to evaluate pre-service computer experiences, modeling, or other personal experiences that can predict use of instructional technology in classrooms by K-12 teachers. One of the measured predictor variables in the study was the computer self-efficacy. Researchers discussed the results as computer self-efficacy of teachers is an important predictor of classroom instructional technology use. Although there is enough access to technology, teachers may not use this technology because of lack of computer self-efficacy. In order to overcome this problem, authors suggested that computer literacy training program should be integrated into pre-service and in-service teacher education programs.

In another study, the effectiveness of long duration professional development academy on teachers' self assessed technology skills, computer self-efficacy and technology integration beliefs and practices was tried to be explored by Brinkerhoff (2006). A four semester academy was designed by considering the barriers limiting the technology professional development of teachers. Effectiveness of this academy was assessed by use of a survey which is about self-assessed technology skills, beliefs regarding the use of technology in classrooms, feelings concerning technology integration in instruction, and computer self-efficacy. In addition, additional data was also collected via teacher interviews. Analysis of the data highlighted that there was a significant increase in computer self-efficacy beliefs of teachers from end of first semester to end of the academy.

In the study of Anderson and Maninger (2007), effects of pre-service teachers' attitudes, beliefs and intentions on technology integration were investigated.

Especially factors related with the degree to which pre-service teachers intent to use technology in their future classrooms were explored. 76 pre-service teachers responded a questionnaire before and after an educational technology course. A significant improvement in self-efficacy beliefs of participants was observed from beginning to end of this course. In addition it was also observed that self-efficacy is significantly correlated with ability, gender and value beliefs.

The study of Medvin et al. examined effect of teacher characteristics, such as experience, computer values, anxiety, and self efficacy, on frequency of computer use in preschool classrooms (2004). It also explored effectiveness of 3-hour computer workshop on enhancing teacher perceptions. A questionnaire which includes items assessing these teacher characteristics were used to collect data. A strong relationship between prior experiences, anxiety and computer self-efficacy were found. It was also found that the 3-hour workshop resulted in increase in teachers' self-efficacy perceptions.

Akkoyunlu studied on the computer self-efficacy perceptions of the teachers in 2004. 374 teachers participated in this study and filled a self-efficacy survey. The results showed that teachers were not sure about their computer self-efficacy. The researcher explained this result as inadequate knowledge and experience on using computers. When the teachers were asked about whether they want trainings to improve the skills involved in the survey or not, 84% said "yes" because of in-efficiency in computer literacy. Another interesting result was when the age of teachers is increasing; their self efficacy beliefs are decreasing. Despite the fact that experience in teaching profession is directly related with self-efficacy beliefs in every field, it is not valid for computer self-efficacy because being younger can be regarded as an important factor for technology adaptation. But computer training history is still important. Medvin, Reed, and Behr (2002) found out previous experiences like computer training influence computer self-efficacy.

In conclusion, most of the studies indicated that computer self-efficacy can be interpreted as very strong predictor of technology integration and computer use in classrooms. Therefore there is a necessity to increase this type of self-efficacy beliefs of teachers. For this aim, other researches highlighted the factors that should be considered. First of all well designed computer training and professional development programs can be effective on this increase. Gender and age also were indicated as effective predictors of computer self-efficacy. In addition, amount of experience with computer is one of the important factors that should be taken into account in working on teachers' computer self-efficacy.

Although there are not too many studies investigating computer self-efficacy beliefs of teachers and their relations with the training, it is obvious that new endeavors are necessary to increase computer literacy and self-efficacy of teachers. At this point, newly designed computer education programs for in-service teachers can be helpful.

2.6. ICT Integration/Acceptance Models

Technology itself cannot improve the educational activities in schools. The acceptance of technology is an important issue to understand and develop technology integration in schools. For these reason, different technology acceptance models (TAM) were developed for educational environments. One of them is developed by Hu et al. (2003). The researchers were tested a TAM longitudinally with 130 teachers. These teachers attended a 4-week MS PowerPoint in-service training program. They tested the model presented by Figure 3.1 The results indicated that perceived ease of use and usefulness of the technology, which was the MS PowerePoint in this case, were found as the most important considerations of teaches among different variables. In addition, teachers' computer self-efficacy was found significant on both intention to use technology and perceived ease of use.

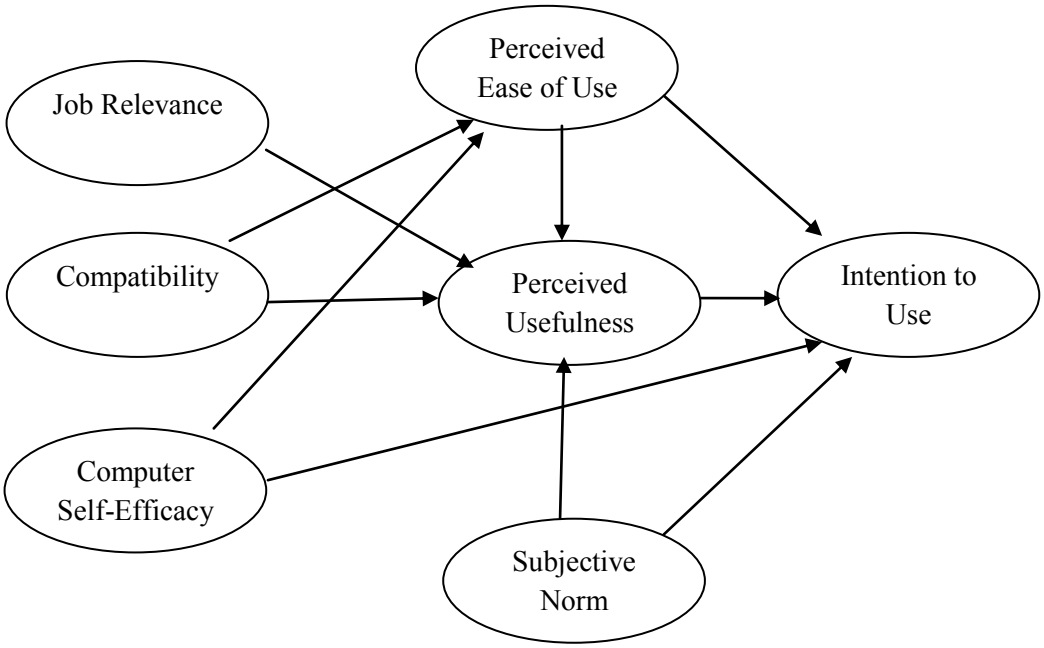

Figure 2. 1 Tested Technology Acceptance model by Hu et al. (2003, p. 229**)**

Teo (2009) tested technology acceptance of pre-service teachers by developing a model (Figure 3.2). Researcher collected data from 475 teachers from a teacher training institute in Singapore. Six independent variables (perceived usefulness, attitude towards computer use, computer self-efficacy, perceived ease of use, technological complexity, facilitating conditions) were included in the model. At the end of the study, it was found that computer self-efficacy, attitude towards computers, and perceived usefulness of computers showed direct effect on technology acceptance. Other three independent variables affected technology acceptance variable indirectly. Total 27% of the variance was explained with these six independent variables.

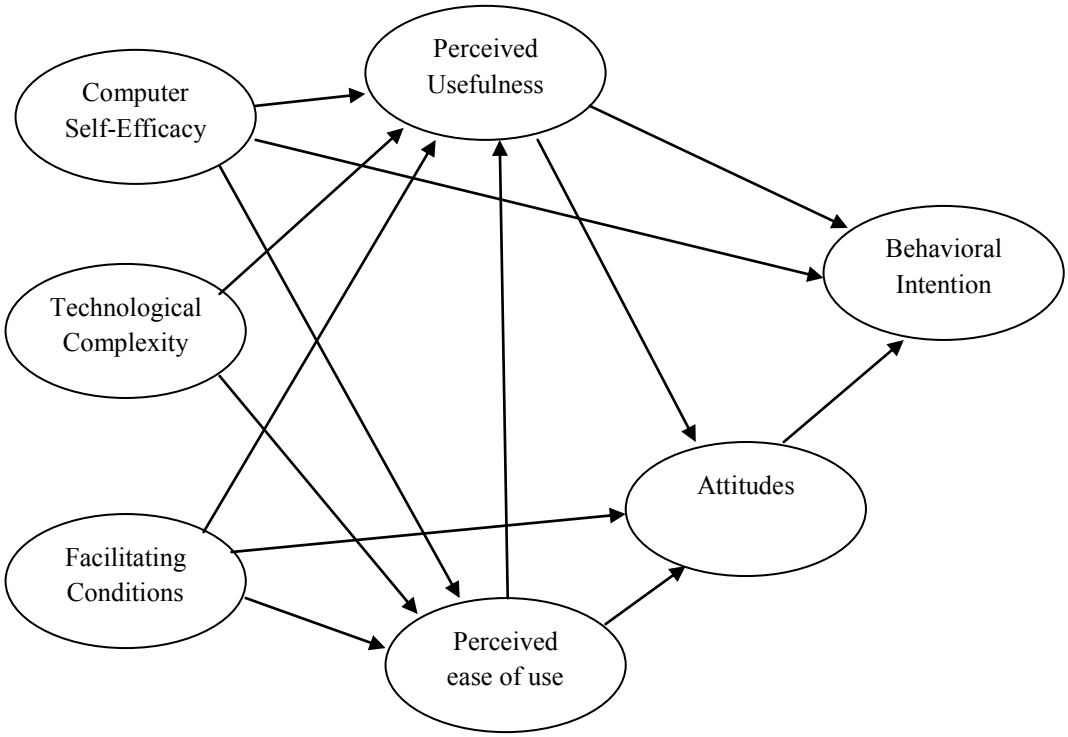

Figure 2. 2 Modeling Technology Acceptance in Education (Teo, 2009, p.305)

Another model was tested by Inan and Lowther (2009) to figure out effects of teacher characteristic on technology integration in classroom. They collected data 1382 public school teachers. Figure 2.3 shows the tested path model. Results showed that technology access, beliefs, and readiness have direct effect on the technology integration. In addition, computer proficiency, age, and support were found other significant variables affecting technology integration indirectly.

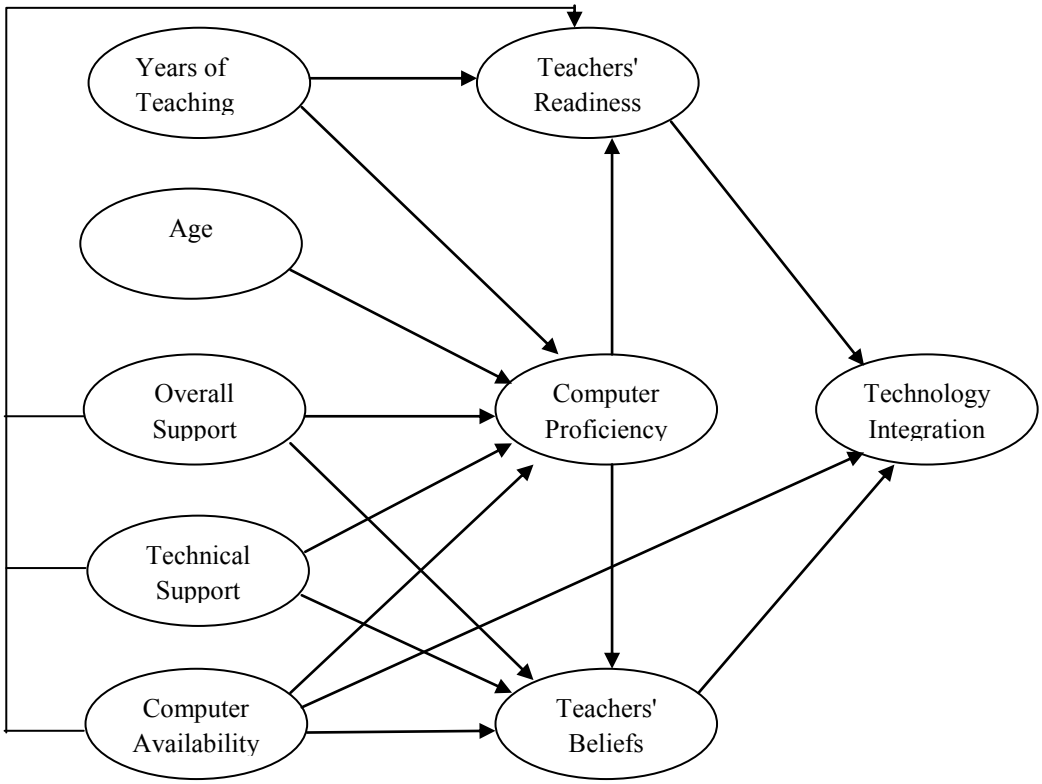

Figure 2. 3 Path Model for Technology Integration in K-12 classrooms (Inan & Lowher, 2009, p. 141)

Primary school teachers' demographic information, computer experience (computer trainings, and intensity to use computer), and attitudes were tested to understand their effects on classroom computer use and supportive computer use with a path model (Van Braak et al, 2004). 486 primary school teachers participated in the study. Among all, teachers' attitudes were found as the strongest predictor of supportive computer use. Computer experience was also found significant on the supportive computer use. Teachers' attitudes and gender were found significant on classroom use of computers.

There are also other studies trying to investigate factors affecting technology integration or technology acceptance in schools by testing paths or models (Robinson, 2003; Mathews & Guarino, 2000; Karaca, 2010). In all these models, teachers' attitudes were found a significant predictor. Technology access and basic

demographics, such as age and experience, are other significant factors for determining ICT integration.

2.7. Summary of Literature Review

As understood from the previous studies, there is a multi dimensional relationship among the factors affecting use of educational technology by teachers. When some of the barrier and enablers are at the teacher level such as lack of literacy and self-efficacy, some others are outside of the teacher level like lack of technology access or tight schedules brought by curricula. On the other hand, there are also factors lying in the cross sectional area of both sets, for example teacher training.

Access to technology is the basic prerequisite for technology use in schools. It is also related with many other key factors. Lack of technology sometimes can obscure other factors. Although there are many other barriers hindering ICT use, if the technology is not available in the school, teachers and other stakeholders in schools blame lack of technology as the primary guilty of the problem. Similar condition is valid for the barrier which is lack of time to use and prepare ICT based activities. Even though technology available in schools and teachers are qualified enough to use, lack of time and lack of necessary technical support may not allow them to integrate ICT in educational activities. These barriers are outside of the teachers and they may be grouped as the environmental factors for ICT integration in schools. If the environment is not ready to use educational technology, there may not be need to investigate other variables.

In some cases, to define enough access, enough support, and enough time may not be easy. For example, same availability of technology could be enough or could be insufficient for different teachers. This obviously produces a necessity to describe the term "enough" for each one of these barriers. By the way, effect of other teacher dependent factors can be investigated in a more correct way. In the case of Turkey, a kind of standard may be established in the near future by the FATIH project. Unless

the project will be a failure, in following two years, a standard technology which includes tablet computers for each student, smart boards for each classroom, digital course content for teachers, and high speed internet connection for each school will be ready. At this point, teacher based barriers may have an increased importance and teacher training will play a key role in this big change.

Teacher training plays a key role in changing educational system. If teachers adapt this change, they can educate children equipped with the skills necessary for living in the information age. Computers and related technologies constitute the base of the information age, so firstly teachers should be able to use these technologies in order to be aware of flow of the information.

One of the most effective ways to make teachers information and technology literate is well designed computer training programs. But the design should be done carefully, because literature indicates that being able to use computers is not enough alone to integrate technology into classrooms. Teachers should have the skills and self-beliefs about this integration, and without computer-self-efficacy of teacher, it can be just a dream to educate students adapted to the change in the world. In every technology acceptance models mentioned in the literature review, computer self-efficacy beliefs of teachers have direct effect on the technology integration or acceptance in schools and this makes it a crucial factor that needs to be identified. Factors influential on computer self-efficacy did not investigated in majority on the technology acceptance models for teachers (Hu et al., 2003; Teo, 2009; Robinson, 2003; Mathews & Guarino, 2000). Inan and Lowther (2009) discussed that availability of computers could have relation with the teachers' beliefs, but the relationship they investigated was not specific to computer self-efficacy of teachers. In addition, all these studies focus on the self-efficacy belief of teachers in terms of computer use. On the other hand, how they feel confident about ICT integration into classroom instead of ability to use these technologies did not gain necessary attention.

As discussed in the previous sections, ICT literacy can be examined under two headings; technical literacy and pedagogical literacy. The current regulations of Turkish MoNE forces teachers to have a certificate indicating their ICT literacy after completing at least a computer training program. Therefore, nearly all of the teachers are officially ICT literate people. But it is an unanswered question whether these trainings programs can prepare teachers in terms of both technically and pedagogically. This question is one of the fundamental questions of this research. Table 2.1 presents a brief summary of literature review part of the research.

Table 2. 1

Definitions and possible implementations of barriers and enablers to ICT integration

Barrier/Enabler	Definition	Implementation for Teachers
Lack of Access	-Access to ICT resources -Hardware and software	-Main prerequisite for ICT integration -Can cause emergence of other barriers -A definition of adequate access is necessary
Lack of Time	-Tight schedule of teachers -No time for ICT based activities	-May affect negatively even ICT is available -Necessity to review curricula and schedule of in-service trainings
Lack of Technical Support	-Availability of technical staff to overcome technical problems	-ICT coordinator is necessary for continuity of ICT integration
Training	-Both a barrier and enabler. -Providing teachers with education to deal with technological devices both technically and pedagogically	-Training for only technical skills in not enough for ICT integration -Pedagogical technological training is a must.
Computer Self-Efficacy	-Belief in the teachers' competence to use ICT in educational activities	-Highly related with amount of experience with computers -Training is an effective way to improve

CHAPTER 3

METHODOLOGY

Design of the study, selection and properties of the subjects, the instruments which were used to collect both qualitative and quantitative data, the way how to analyze this data, and validity and reliability issues were discussed in this chapter. In the end, a brief summary providing an overall look to the chapter was also presented.

3.1. Design of the study

The main aim of this research is to investigate the factors affecting the use of information and communication technologies in the schools of K-8. Phases of the study are available through Table 3.1.

Table 3. 1

Phases of the study

	Phase	*Sample*	*Instrument*	*Purpose*
1st	Curriculum examination	Math, Social Studies, and Science and Technology courses curricula from 4th to 8th grade	Curriculum checklist	Identifying types of ICT use in related curricula over grade levels and subject matter
2nd	Teacher interview	K-8 school teachers	Interview guideline	Identifying teachers perceptions of ICT use in schools
3th	Survey	K-8 school teachers	Computer Self-Efficacy questionnaire	Define the perceived computer self-efficacy of teachers and its relationship with other factors.

By conducting these steps, the following research questions were answered in order to reach an understanding at the end of the study:

1. What is the pattern of ICT use in K-8 schools' Math, Social Studies, and Science and Technology courses' curricula?

1.1. Which parts of the related curricula do require ICT use?

1.2. Does ICT use change in the related curricula based on the grade level and subject matter

2. What are the teachers' perceptions of ICT use in schools?

2.1. What is the place of computers in teachers' professional and daily lives?

2.2. What is the teachers' source of ICT literacy?

2.3. What is the teachers' ICT use for curricular activities?

2.4. What are the barriers to ICT use?

2.5. What are the enablers to ICT use?

2.6. What are the teachers' suggestions pertaining to effective ICT integration?

3. What is level of the teachers' perceived instructional technology self-efficacy?

3.1. What is the level of teachers' perceived instructional technology self-efficacy in terms of use of internet and computer to support teaching and learning?

3.2. What is the level of teachers' perceived instructional technology self-efficacy in terms of technical knowledge?

3.3. What is the level of teachers' perceived instructional technology self-efficacy in terms of office programs and their applications?

3.4. What is the level of teachers' perceived instructional technology self-efficacy in terms of classroom applications?

3.5. What is the level of teachers' perceived instructional technology self-efficacy in terms of advance computer use?

3.6. What is the level of teachers' perceived instructional technology self-fficacy in terms of total self-efficacy scores?

According to Johnson and Christensen (2004), researchers can answer a broader and wide range of different research questions with mixed research since researchers are not limited to use a single research. From this perspective, three different researches were under this study. Document Analysis was conducted on the related curricula, and it was followed by semi-structures teacher interviews. Finally, teachers were asked to assess their perceived instructional technology self-efficacy via IT self-efficacy questionnaire.

Nature of the research design leaded researcher to interpret the data which was coming from different sources sequentially. According to Creswell (2012), *exploratory sequential design* (p.543) requires first collecting qualitative data in order to explain a phenomenon, and then building a quantitative data collection based on the information obtained from initial steps. Creswell visualizes this type of research design as in Figure 3.1.

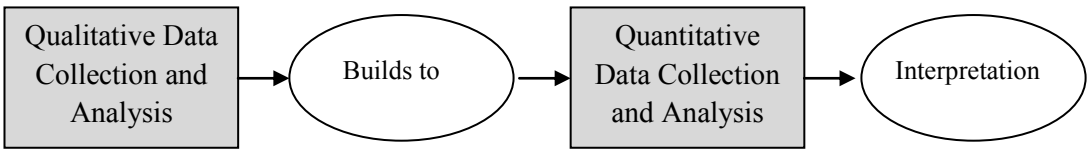

Figure 3. 1 Exploratory Sequential Design (Creswell, 2012, p. 541)

In this study, the sequential research design was used with one additional step at the beginning. In other words, this research has three different data collection processes which were lined up sequentially. Figure 3.2 summarized the research design.

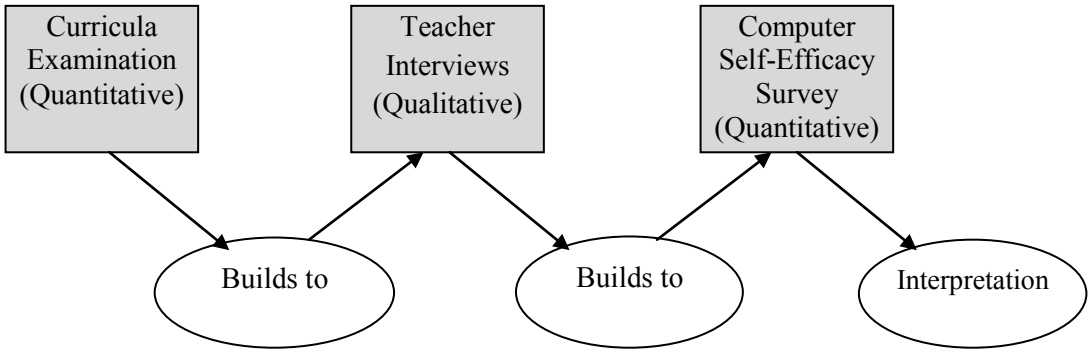

Figure 3. 2 Research Design

First endeavor to realize the main goal of the study was to picture the presence of ICT in the curricula of K-8 schools. Curricula of Mathematics, Science and Technology and Social Studies courses from 4th grade to 8th grade were analyzed by use of document analysis procedures to trace the pattern of ICT use. According to Anderson (2003), document analysis or content analysis is composed of methods to construct inferences from "human communications" such as printed texts, letters, cartoons, stories, pictures, radio and TV shows. It includes several steps like identifying universe, defining categories, determining units for analysis, and quantification when the author focuses on that actually content or document analyses do not differ from other educational research methods completely. Information obtained through this analysis provides a base and meaning for the other efforts to understand the effects of the success of ICT in school circumstances.

Curricula of the courses analyzed provide different areas for teachers to put the ICT into the practical use. It is clear that each school has different conditions in terms of technological infrastructure, and ICT background of teachers and students. These factors might cause some differences in the use of ICTs in schools. Therefore, there is a necessity for this research to clarify how teachers feel about the use of ICT which is defined by the curricula they use in their classes. In that point, interviews with open-ended questions might provide to collect more in-depth from teachers. Answers of teachers to these open-ended questions allow the researchers to reach underpinning information regarding to the condition of ICT integration in schools

from teachers' perspectives. In addition, utilizing the interview data in relation with the other data collection methods used in this study allows data triangulation to enhance validity and reliability of the research. Therefore, selected teachers were interviewed to understand the difference between the ICT in the curricula and practical use of teachers.

According to Self-Efficacy theory of Bandura, there is a difference between information gained by different experiences and information integrated into self-efficacy judgments (1997). In other words, even if specific information is learned with all the details included, it might not be used effectively without necessary development of self-efficacy belief. Today nearly all of the teachers in K-8 schools participated at least one ICT related training course. This means that, these teachers are expected to be ICT literate persons. For this reason, instead of assessing this type of literacy, the researcher distributed a survey assessing IT self-efficacy of teacher. To make healthier generalizations, this survey, which was developed by the researcher, distributed in different locations having different socio-economic structure.

3.2. Participants

Today, significant endeavors have been in progress to increase the portion of educational technologies in education. “FATIH Project” could be given as a clear example for strong will of the government about this issue. At the end of the “FATIH Project”, majority of the schools under the administration of the Turkish MoNE have been planned to be equipped with tablet computers, internet connection and smart boards. It is very clear that an enormous amount of money coming from citizens’ taxes has to be devoted to this project. Here, the most important question is lying under the thoughts of teachers who are expected to use these technologies in their classrooms. So, increasing their technology skills and self-efficacy perceptions and beliefs toward use of educational technology has vital importance to reach a meaningful success with technology integration endeavors.

Teachers are the primary practitioners facing with all new initiatives. This fact is also true for the ICT integration in K-8 schools. Furnishing these teachers with necessary skills to use and integrate the ICTs into educational circumstances constitutes a vital prerequisite for successful education and ICT composition. That is, teachers should be investigated before going further by conducting any initiative to increase use of ICT in schools. For this reason, K-8 school teachers were decided to be chosen as the target population for the research.

3.2.1. Selection of Participants for Interviews

Teachers interviewed in the study were selected purposefully with convenience and purposeful sampling approach. Firstly, all teachers were coming from Ankara (capital city of Turkey). 10 schools from different districts were chosen. These districts have different socio-economic properties. In addition, the researcher tried to include teachers from different fields of profession. Other criterion for selection of participants for interviews was at least 5 years teaching experience. Previous studies indicated that at least three to five years teaching experience is necessary to be able to effectively integrate technology (Byrom & Bingham, 1998). 20 teachers, who have at least 5 year teaching experience, were interviewed in order to reveal their thoughts and opinions about technology integration in education. Before conducting interviews, teachers were informed about the purpose of the interviews and type of the questions. In addition, they were allowed the read consent form and asked whether they are voluntary to participate or not. 20 teachers who were voluntary to be interviewed under explained conditions were included in the study.

3.2.2 Selection of Participants for Survey

Primary school in-service teachers constituted scope of the survey study. In order to reflect profile of the teachers from whole country, subjects were selected according to statistical information provided by EUROSTAT. EUROSTAT is an institution

under the body of European communities and responsible for providing reliable statistical information for EU (Eurostat, 2008). This statistical information is used for conducting comparisons between countries and regions. In order to serve for this aim, these European countries were divided into statistical regions under three levels. For Turkey, Level 1 stands for statistical regions; Level 2 represents the sub-regions; and Level-3 constitutes the cities of the country (See Appendix-A).

Table 3. 2

Selected cities, number of K-8 teachers and number of sample

Code	*City*	*# of population*
TR100	Istanbul	62211
TR211	Tekirdag	3933
TR310	Izmir	22337
TR412	Eskisehir	4467
TR510	Ankara	29041
TR611	Antalya	11719
TR711	Kirikkale	2081
TR822	Cankiri	1207
TR901	Trabzon	6075
TRA11	Erzurum	7469
TRB12	Elazig	4390
TRC21	Urfa	11657
	Total	166587

According to EUROSTAT, there are 12 statistical regions in Turkey. To mirror county-wide results, all these regions were included in the study. One city was selected from every region. For convenience of questionnaire distribution, travel opportunities of cities were taken into account. IT self-efficacy survey was distributed to teachers from these 12 cities as much as possible. Every questionnaire was distributed by the researcher, and he was present to make necessary explanations in cases of misunderstanding during the filling out the questionnaire forms. Table 3.2 presents the cities included in the study and the number of teacher population in these cities. Table 3.3 indicated the gender distribution of teachers.

Table 3. 3

Gender distribution

	f	%
Female	705	68.7
Male	320	31.3
Total	1025	

Table 3. 4

Distribution of teachers' field of profession

	f	%
Classroom Teacher	483	47.1
Math Teacher	65	6.3
Social Studies Teacher	46	4.5
Science and Technology Teacher	121	11.8
Others	310	30.2

When 483 classroom teachers (47.1%) participated in the study, 65 Math teachers (6.3%) and 46 Social Studies teachers (4.5%) teachers returned questionnaire (Table 3.3). In addition, number of teachers who are from other subject matters was 310 (30.2%).

3.3. Variables of the Study

There are 13 variables in the study. These were; IT self-efficacy (TSE), use of internet and computer support (UICS), technical knowledge (TK), Office programs and their applications (OPA), classroom applications (CA), advance computers (ACU), age, gender, teaching experience, field of profession, use of home computer, number of in-service training, and total hours of training. Table 3.4 presents detailed information about types of variables.

Table 3. 5

Variables of the study

Variable Name	*Dependent/ Independent*	*Type of Variable*	*Explanation*
IT Self-Efficacy (TSE)	Dependent	Continuous	It is a continuous variable measured by IT Self-Efficacy Scale. It was constructed by summation of all items in the questionnaire.
Use Of Internet and Computer Support (UICS),	Dependent	Continuous	Continuous variable. It was measured by the IT Self-Efficacy Scale items 6, 9, 10, 12, and 13.
Technical Knowledge (TK),	Dependent	Continuous	Continuous variable. It was measured by the IT Self-Efficacy Scale items 17, 18, 20, 21, 22, 24, and 25.
Micro Soft Office Programs and Their Applications (OPA),	Dependent	Continuous	Continuous variable. It was measured by the IT Self-Efficacy Scale items 1, 2, 3, 5, and 8.
Classroom Applications (CA),	Dependent	Continuous	Continuous variable. It was measured by the IT Self-Efficacy Scale items 30, 31, 32, 34, 35, and 36.
Advance Computers (ACU)	Dependent	Continuous	Continuous variable. It was measured by the IT Self-Efficacy Scale items 30, 31, 32, 34, 35, and 36.
Age	Independent	Continuous	
Gender	Independent	Categorical	
Teaching Experience	Independent	Continuous	
Field of Profession	Independent	Categorical	It is a categorical variable. It includes 5 categories; classroom teachers, Math teachers, Social Studies teachers, Science and Technology teachers, and teachers from other subject matter.
Use of Home Computer	Independent	Categorical	It is a categorical variable about use of home/personal computers with two levels (0=No, 1=Yes)
Number of In-Service Training,	Independent	Continuous	It is a continuous variable indicating the number of different computer training programs that teachers attended.
Total Hours of Training	Independent	Continuous	It is a continuous variable indicating the total hours of computer training that teachers attended.

3.3. Instruments of the Study

During the study data were collected by the help of three different instruments which were curriculum checklist, IT self-efficacy questionnaire and interview guidelines.

3.3.1. Curriculum Evaluation Checklist

Two basic steps were applied to create curriculum evaluation checklist. In the first step, related curricula of Math, Social Studies, and Science and Technology courses were examined to defined different types of ICT use. In order to do this, researcher noted all different types of ICT applications defined in the curricula, and also decided whether these applications defined directly or indirectly. In other words, some of ICT uses in curricula were visible with concrete directions given, on the other hand, some others very appropriate to be handled with use of ICT. After that step, a peer review was conducted to understand whether there were other types of ICT use that the researcher did not noted. A set of different types of ICT uses was created after peer review conducted by a subject matter expert and a teacher. Items in this set were used to create Curriculum evaluation checklist (Appendix B).

3.3.2. Interview Guidelines

Qualitative techniques provide rich understanding of an event and interviews are most commonly used method to collect qualitative data (Vivar, McQueen, Whyte, Armayor, 2007). Although, quantitative data collected via questionnaires resides in the middle of the research, results coming through interviews and document analyses strengthen the place of the quantitative part. For this aim, teachers from schools of K-8 were interviewed to construct a base for the research and explain the results from IT Self-Efficacy Survey.

Semi-structures interviews with K-8 teachers were arranged with pre-determined open-ended questions. Some basic procedures were implemented to develop

interview guidelines. Before creating a pool for interview questions, related literature were investigated and basic topics for interviews were determined. In order to clarify the questions planned to be included in the question pool, two cognitive interviews were conducted with a Math teacher and a Classroom teacher. With the information gained from these two cognitive interviews, the question pool was created.

All these questions coming from the pool were examined by a 4 content expert (3 graduate students and 1 faculty member). After the examination, a final version of the interview (Appendix-C) guideline was refined. Before conducting interviews, a language expert (a Turkish Language teacher) controlled the questions to be sure about lack of mistakes in terms of language.

Interview guideline for K-8 teachers consists of three parts. In the first part, teacher were asked to gain their demographic information and perceptions about field of profession, experience, place of the computers in their life, background knowledge of computer use, and the way they had gained that knowledge. The second part is to learn their perceptions about the current situation of educational technologies in their schools. In detail, technological infrastructure, computer aided instruction applications in the curricula, and availability of technical support when they need constituted main topics in the second part. And the last part focuses on the problems according to teachers' point of view. In addition, they were also asked about their suggestion to overcome with these problems.

3.3.3. IT Self-Efficacy Questionnaire

In the literature, there are some instruments that are used to assess self-efficacy beliefs. The studies of Murphy, Cover and Owen (1989), Compeau and Higgins (1995), Eastin and LaRose (2000), Wang, Ertmer and Newby (2004) are some examples of the self-efficacy scales. But most of these tools developed before 2000 and some features are not appropriate today's condition. In addition the language of these scales makes them useless to assess self-efficacy beliefs of teachers in Turkey.

Nearly all of the scales have a broad scope. But one of my aims in this study as a researcher was to develop a self-efficacy scale specific for teachers' computer use for educational purposes. On the other hand I could only find one study about developing such a scale for Turkish teachers which was created by Akkoyunlu, Orhan and Umay in 2005. Although it is up to date and written in Turkish, it was prepared for specifically for computer teachers. Therefore it is aimed to develop a scale to assess in-service teachers' perceived self-efficacy beliefs in Turkey.

3.3.3.1. Exploratory Factor Analysis

Selection of participants for the pilot study

Because of some restrictions such as time and accessible population, pre-service teachers contributed to the study. Faculty of Education students from Middle East Technical University (METU) were selected as the target population for this study. All of these students took at least one computer related course because of the formal curriculum of METU Faculty of Education. Therefore students from first year to fifth were regarded as appropriate for this study. Although all departments of METU Faculty of Education could be included, only five departments which were Department of Foreign Language Education (FLE), Department of Chemistry Education (CHED), Department of Physics Education (PHED), Department of Early Childhood Education (ECE) and Department of Elementary Math Education (EME) were accessible.

Table 3. 6

Distribution of the sample over departments

	Frequency	Percent
Chemistry Education	16	14.5
Early Childhood Education	11	10.0
Elementary Math Education	11	10.0
Foreign Language Education	60	54.5
Physics Education	12	10.9
Total	110	100.0

110 students filled the IT Self Efficacy Survey and the distribution of the sample over the departments is presented in Table 3.4. 10 (9.1 %) first grade, 14 (12.7 %) second grade, 63 (57.3 %) third grade, 19 (17.3 %) fourth grade, and 4 (3.6 %) fifth grade students participated in this study. 34.5 % (38) of students were male and 65.4 % (72) of them were female students.

Pool of Items

The pool of items (Appendix D) for this self-efficacy scale were developed by generating new computer related statements in support of this particular survey, and gathered from existing computer self-efficacy scales (Murphy, Cover & Owen, 1989; Compeau & Higgins, 1995; Eastin & LaRose, 2000; Wang, Ertmer & Newby, 2004). These gathered items were translated into Turkish. By this way, 39 items were developed and these items covered statements about "educational software and material development", "Internet and Internet applications", "technical information", "general knowledge and individual development", and "in-door and out-door activities".

Review of Items and Cognitive Interview

The items of the IT Self Efficacy Survey were reviewed and edited by colleagues and experts. One of the reviewers was an expert about computer education, and he

checked items to be sure about the content validity. After this review, three items were eliminated from the item pool, and many of them were also edited because of the linguistic errors, complexity in understanding, and content issues. In addition, it was seen that presenting statements in question form would be better, so all statements were converted into question form. At last, 36 revised items were decided to be included in the survey. To assess efficacy levels of pre-service teacher candidates, 9 point scale were used; 1 shows lowest efficacy and 9 shows highest efficacy. Students were asked to rate their efficacy levels between 1 and 9 for each question. It was aimed to get a total grade for efficacy levels of students, which ranges from 36 to 324.

A cognitive interview (Appendix-E) was conducted with the final form of the survey. A 3rd grade FLE student joined voluntarily to the interview. This interview showed that all questions were clear and easy to understand. She did not express any difficulty to rate her efficacy level for the questions. Only order of the items was re-organizes according to the information gained by this interview.

Administration of Questionnaire

All participants were administered paper-pencil based questionnaires. The survey was composed of two parts. The first part was to gather demographic information, and the second part is for self-efficacy beliefs. In addition, necessary instructions were also written at the beginning of the instrument. Three people were worked for administration of the survey, and all of them had necessary and detailed information to make explanations and to answer questions of students about the survey.

Assumption Check for Exploratory Factor Analysis

Before conducting factor analyses, the data was corrected. According to Tabachnick (2001, p. 59), if there is only a few data points about 5% are missing in a data set, handling of these missing points yields similar results. Frequency distribution for each item showed that there was not any missing data or any input outside the range

of codes. The next assumption checked in the study was the appropriateness of the sample size. According to Tabachnick (2001, p. 588), sample size between 100 and 200 is fair for factor analysis. Therefore sample size assumption for the study was provided because 110 participants were filled the IT Self Efficacy survey correctly.

In order to check the multivariate normality, univariate and bivariate normality assumptions must be checked. For univariate normality, normality histograms, Q-Q plots, skewness and kurtosis, and Shapiro-Wilk and Kolomogrov-Smirnow analyses were examined. Results did not violate univariate normality.

During the analyses, two items were eliminated. The data gained from the item correlation matrix revealed that item-4 shows small correlations with the other items of the instrument. According to Palland (2001), for factor analysis, correlations below the value 0.3 are not appropriate. For this reason item-4 was not included in the further analyses. In addition item-23 also loaded more than one factor with the similar values, so it was also eliminated.

Exploratory Factor Analysis

After checking assumptions, factor analysis was conducted to test whether the items of the computer-self-efficacy survey were factorable or not. The Kaiser-Meyer-Olkin Measure of sampling adequacy tests whether partial correlations among variables are small or not. The sample size is 110, and KMO value is 0.928, (Table 3.3) and this guaranties the adequacy of the sample size. Bartlett's test of sphericity was also significant ($\chi^2 = 3283.688$, df=639, $p < .001$).

Table 3. 7

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,93
Bartlett's Test of Sphericity	Approx. Chi-Square	3283.688
	Df	630
	Sig.	.000

Maximum likelihood factor analysis was used to determine the sub-dimensions of the scale. After checking the assumptions for the factor analysis, scree plot and eigen-values were studied to decide number of factors. Interpretation of the scree-plot showed that number of factors should be four or five. According to total variance explained, 5 of the factors showed an eigen value greater than 1. According to initial eigen values, the first factor explained 55.86% of the variance, the second factor 6.30% of the variance, the third factor 4.44% of the variance, the fourth factor 3.62% of the variance, and fifth factor explained 3.34% of the total variance. These five factors also explained 73.56% of the total variance. A maximum likelihood factor analysis was conducted on the remaining 34 items, using oblimin rotations, with the five factors explaining 73.56% of the variance. Pattern matrix for these 5 factors was presented in the Table 3.4.

Table 3. 8

Pattern Matrix

	Factor				
	1	2	3	4	5
ITEM12	**.647**	.181	.186		
ITEM16	**.617**	.108		-.132	-.189
ITEM6	**.513**		.236	-.143	-.120
ITEM9	**.467**	.184	.360		-.171
ITEM10	**.434**		.106	-.185	-.173
ITEM13	**.327**		.221	-.244	
ITEM21		**.811**	.238		
ITEM22		**.687**			
ITEM24		**.653**		-.105	-.198
ITEM20		**.612**	.115	-.220	-.104
ITEM18	.338	**.489**	.184	-.118	.115
ITEM17	.277	**.453**			-.219
ITEM25	.215	**.442**		-.105	
ITEM1	-.128	.105	**.779**	.109	-.278
ITEM2	.223		**.653**		
ITEM3	.277		**.563**	-.106	
ITEM5	.376		**.505**	-.121	
ITEM8	.150	.325	**.472**	-.179	.105
ITEM30	.186		.486	**-.787**	-.103
ITEM35		.102	-.160	**-.685**	
ITEM36	-.146	.183	.307	**-.616**	
ITEM31	.138	.302	-.104	**-.587**	-.121
ITEM34	-.244	.247	.306	**-.571**	-.134
ITEM32	.137	.238		**-.491**	-.312
ITEM33				-.299	**-.663**
ITEM15		.189		.190	**-.645**
ITEM28	.115			-.125	**-.619**
ITEM26					**-.618**
ITEM27		.103		-.175	**-.600**
ITEM19		.383			**-.595**
ITEM11	.103	-.161	.261		**-.513**
ITEM7			.176	-.141	**-.504**
ITEM14	.312		.104	-.144	**-.479**
ITEM29	.231		.225	-.204	**-.442**

As seen from the Table 3.6, nearly all of the items have primary loadings over 0.4 and about half of them also have more than 0.5 primary factor loadings. Total variance explained after rotation is 70.37% (Appendix F). Items 6, 9, 10, 12, 13, and16 were loaded into the factor one and it was labeled as "use of internet and computer for support". Items 17, 18, 20, 21, 22, 24 and 25 were loaded into factor two and it was labeled as "technical knowledge". Factor three, which was labeled as "Office programs and their applications", included the items 1, 2, 3, 5, and 8. The items, 30, 31, 32, 34, 35 and 36 were loaded into the factor 4, and this factor was named as "classroom applications". The last factor was named as "advance computer use" and this factor was loaded by the items 7, 11, 14, 15, 19, 26, 27, 28, 29 and 33. Ass seen form the factor correlation matrix (table-4), all factors were found correlated with each other. The information from the pattern matrix also revealed that item 13 and item 34 needs revisions.

Table 3. 9

Factor Correlation Matrix

Factor	1	2	3	4	5
1	1.000	.304	.451	-.434	-.389
2	.304	1.000	.403	-.437	-.575
3	.451	.403	1.000	-.429	-.447
4	-.434	-.437	-.429	1.000	.490
5	-.389	-.575	-.447	.490	1.000

Note. Maximum Likelihood, Oblimin with Kaiser Normalization

Cronbach alpha coefficient, which ranges from 0 to 1, was used to check the reliability of the factor of IT self-efficacy scale (Tabachnick & Fidel 2001; Frankel and Wallen, 2004). If the Cronbach alpha coefficient is close to 1, it indicates high reliability and .7 is the lower limit for reliability (Hair et al, 2005). For this reason, for each subscale and each item, Cronbach alpha coefficient was calculated and presented in the following tables.

Examination of the tables 5, 6, 7, 8, and 9 showed that there is no need to delete any item because for each sub-scale, the column “alpha if item deleted” does not contain any value grater that the alpha value of the sub-scale itself. The alpha values of the sub-scales are respectively 0.90, 0.91, 0.90, 0.92, and 0.91 and all these values are indicates acceptable reliability values, which was defined as 0.70 by Palland (2001).

Table 3. 10

Item-total statistics of factor-1: "Use of internet and computer support"

	Scale mean if item deleted	Squared multiple correlation	Alpha if item deleted
Item 6	35.7182	.5959	.8791
Item 9	35.8182	.6554	.8748
Item 10	36.6182	.5510	.8927
Item 12	35.3273	.6485	.8757
Item 13	34.5091	.3680	.9052
Item 16	35.6909	.6753	.8698

Note. Reliability Coefficients, Alpha = .9010, Standardized item alpha = .9076

Table 3. 11

Item-total statistics of factor-2: “Technical Knowledge”

	Scale mean if item deleted	Squared multiple correlation	Alpha if item deleted
Item 17	45.5000	.5936	.9023
Item 18	45.0818	.5584	.9082
Item 20	45.8818	.7029	.8970
Item 21	46.4364	.6991	.9000
Item 22	45.5364	.6198	.9017
Item 24	44.8182	.6637	.9106
Item 25	44.8182	.4131	.9023

Note. Reliability Coefficients, Alpha = .9139, Standardized item alpha = .9147

Table 3. 12

Item-total statistics of factor-3: "Office programs and their applications"

	Scale mean if item deleted	Squared multiple correlation	Alpha if item deleted
Item 1	29.0091	.5687	.8789
Item 2	27.0364	.6253	.8764
Item 3	27.2182	.6451	.8724
Item 5	27.6364	.6256	.8704
Item 8	27.3909	.5112	.8895

Note. Reliability Coefficients, Alpha = .8995, Standardized item alpha = .9027

Table 3. 13

Item-total statistics of factor-4: "classroom applications"

	Scale mean if item deleted	Squared multiple correlation	Alpha if item deleted
Item 30	34.5455	.5522	.9154
Item 31	34.8636	.7417	.9026
Item 32	35.3545	.7586	.9006
Item 34	34.8455	.6521	.9069
Item 35	34.0455	.5964	.9118
Item 36	34.8000	.6474	.9050

Note. Reliability Coefficients, Alpha = .9215, Standardized item alpha = .9229

Table 3. 14

Item-total statistics of factor-5: "advance computer use"

	Scale mean if item deleted	Squared multiple correlation	Alpha if item deleted
Item 7	45.5000	.4614	.9016
Item 11	43.8000	.6266	.8963
Item 14	44.4818	.4579	.9048
Item 25	45.8182	.3615	.9094
Item 26	43.8727	.6114	.8946
Item 27	44.6818	.6660	.8945
Item 28	43.6455	.6719	.8940
Item 29	43.9545	.6653	.8937
Item 33	45.3364	.4560	.9068

Note. Reliability Coefficients, Alpha = .9097, Standardized item alpha = .9135

Confirmatory Factor Analysis

Since exploratory factor analysis were conducted with the data gathered from pre-service teachers, the researcher also managed a confirmatory factor analysis (CFA) to be sure about whether previously explored structure of the IT Self-Efficacy Survey preserves this structure when collecting data from in-service teachers who are in the scope f the study. For this reason, final form of the IT Self Efficacy Survey Questionnaire was distributed to 134 in-service teachers. 115 of IT Self-Efficacy Survey form were filled correctly and they were coded into a SPSS file.

LISREL 8.51 was used to conduct confirmatory factor analysis. The five factors ("*use of internet and computer for support", "technical knowledge", "Office programs and their applications", "classroom applications",* and *"advance computer use")* explored through EFA were coded into LISREL as latent variables, and necessary relations between items and latent variables were established and then the model was run.

Analysis yielded satisfactory results indicating acceptable fit of the questionnaire. According to Hair et al. (2006) there are more than one guidelines to determine whether a model fits or not and using three or four fit indices is adequate to decide if a model has acceptable fit or not. Values of $\chi 2$, Confirmatory Fit Index (CFI), Standardized Root Mean Square Residual Index (SRMR), and Root Mean Square Error of Approximation (RMSEA) are sufficient for evaluation of a model. In the light of this information, χ^2, CFI and RMSEA values were reported as evidences. RMSEA and SRMR were found as .076 and .051 respectively and these values are satisfactory if you have more than 30 items and less than 250 participants (Hair et al., 2005). In addition, χ^2 value (with df=550) was significant ($p<.01$). Lastly, CFI (.96) confirmed the model fit.

Final form of the questionnaire included 35 questions. Table 3.14 presents the questions included in the IT Self Efficacy Survey.

Table 3. 15

IT Self Efficacy Survey questions

Item No	Item
1.	How effective can you use spreadsheet programs (ex. MS Excel)?
2.	How effective can you use word processor programs (ex. MS Word)?
3.	How effective can you use presentation programs (ex. MS PowerPoint)?
4.	How effective can you use database programs (ex. MS Access)?
5.	Can you prepare course materials with the use of computer?
6.	Can you benefit from computers to support your instruction?
7.	Can you use new educational software without receiving any help?
8.	Can you archive students' records (attendance, grades, etc.) on the computer environment?
9.	Can you benefit from the computer to its maximum whenever the lesson flow is appropriate?
10.	Can you make use of discussion platforms (forums, e-mail groups, etc.) for educational purposes?
11.	Can you design a web page to use either in class or out of class activities?

Table 3.15 (Continued)

12.	Can you distinguish the useful information within a group of Internet resources?
13.	Can you use search engines (Google, Yahoo, etc.) efficiently?
14.	Can you plan technology-based projects or homework effectively?
17.	Can you use different operating systems (Windows 98, Windows 2000, Windows XP, Windows Vista, etc.) effectively?
18.	Can you give lectures through the effective use of projector?
19.	Can you find the source of the computer related problems?
20.	Can you use such tools as printer and scanner to prepare your course materials effectively?
21.	Can you solve basic problems of printer, scanner, and so forth (such as paper jam, cable connection loss)?
22.	Can you connect monitor, keyboard, and mouse to the case without receiving any help?
23.	Can you solve technical problems (such as operational problems of computers or the projector) faced in the classroom?
24.	Can you understand the computer related technical terms (such as formatting, copy-paste)?
25.	Can you develop educational applications that will help instruction?
26.	Can you benefit from the different features of computers in different situations?
27.	Can you follow the educational technology advances in your subject area?
28.	Can you make use of visual design methods while preparing materials on computer?
29.	Can you distinguish the conditions that are likely to contribute your lessons?
30.	Can you help students having trouble with using the computers in your class?
31.	Can you guide students during the computer-based activities?
32.	Can you guide students about which programs or software to be used during technology-based projects?
33.	Can you analyze (such as basic statistical calculations, average, median, frequency) the records of students (attendance, grades, etc.) on computer environments?
34.	Can you benefit enough from the Internet while preparing the course materials?
35.	Can you practice the available computer-aided applications defined in the curriculum?

3.4. Procedure

This research was composed of seven steps;

1. Developing Curriculum evaluation checklist and peer review
2. Curricula examination and peer review
3. Developing Interview guideline and pilot interviews
4. Actual interviews
5. Developing IT Self-Efficacy (exploratory and confirmatory factor analyses)
6. Distribution of final form of IT Self-Efficacy Survey
7. Analysis and interpretation of the data

Initial steps (1st and 2nd steps) of the study were related with the examination of the K-8 schools curricula and developing the checklist to conduct these examinations. Fourth, fifth, sixth, seventh and eighth grade Math, Social Studies and Science and Technology curricula were chosen to find out the patter of technology aided instruction in K-8 school. All technology related in and out of school activities were pictured to guide further steps of the research. This picture had been used for both developing the instruments interpretation of the collected data throughout the research.

Integration of technology to the instruction in schools is vitally important in the days that we are witnessing rapid changes and developments. Teachers' adaptation to these changes and developments is as much as important the adaptation of schools (in terms of technological infrastructure) and the curricula. To have a clear vision about teachers' position in such an environment, they were interviewed about their thoughts and beliefs on technology-school interaction. An interview guideline was developed to gain an answer for this question. This guideline was checked by content and language experts. Then pilot studies were conducted. Two teachers were voluntarily participated in the pilot interviews (3rd step). After construction of final

version of interview guideline, data were collected 20 K-8 school teachers. These teachers participated voluntarily in actual interviews (4th step). Collected data was transcribed and coded. Similar coding process was held by two other volunteers to increase validity. Refined data were analyzed and interpreted by use of related qualitative data analysis methods.

By the training programs provided by the Turkish MoNE, almost all of the teachers have a certificate shoving their computer literacy. So, instead of assessing teachers' computer literacy, researcher worked on the self-efficacy perceptions of teachers about use of computers. For this aim, IT Self-Efficacy Survey was developed by following the steps: (1) creation of pool, (2) cognitive interview, (3) review of content and language experts, (4) pilot study and (5) confirmation of the survey (5th step). Final version of survey was distributed to teachers from 12 different cities defined by the statistical data provided by EuroStat and collected data were coded into and analyzed by use of SPSS (6th step).

In the final step of the study, information gained through document analyses on related curricula, qualitative analysis of interview data, and inferential statistical analyses on quantitative data collected via IT Self Efficacy Survey were presented into results chapter, and interpreted into conclusion, discussion and implications chapter.

Summary and sequence of the research process were summarized through the Figure 3.3.

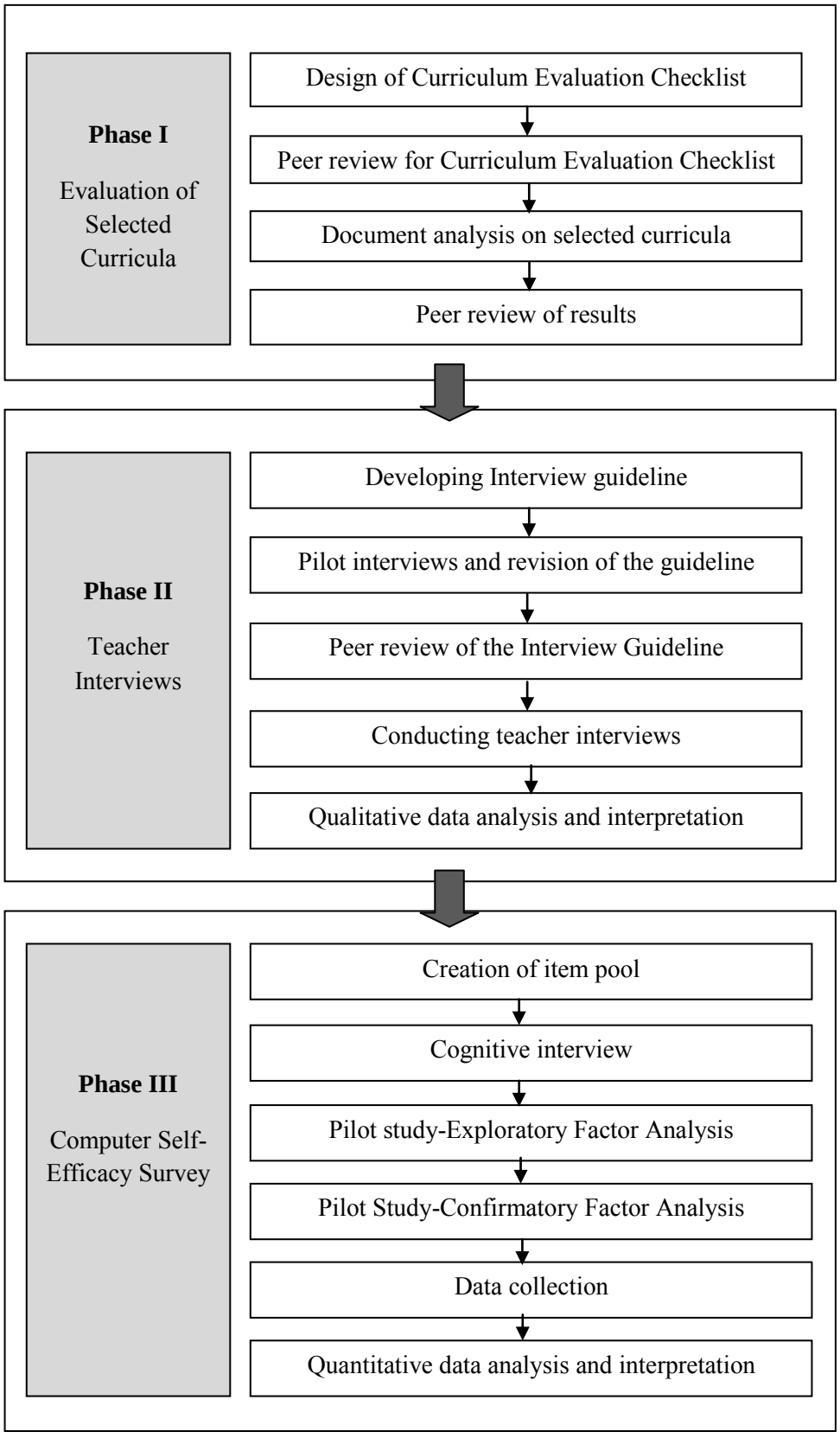

Figure 3. 3 Research process of the study

3.5. Analysis of the Data

Because data for this research were collected through both qualitative and quantitative methods, qualitative and quantitative data analyze techniques were used to triangulate the results. Cohen and Manion (1989) mention two fundamental advantages of triangulation or using multi-method approach in social studies. Firstly, relaying on one method may cause some biases and prevents researcher to reach reality at the end of the research. For this reason, using more than one method, yield different types o data and increases researcher's confidence about the results. Secondly, using different methods by not believing superiority of one of them helps the researcher to overcome his/her boundaries in research. In this study, researcher tried to use different ways of in not only research design and data collection but also data analyses.

Mathematic, Social Studies and Science and Technology course curricula (from 4th to 8th grade) were analyzed simply by use of content analysis techniques. Main purpose of content analysis is to acquire quantitative data from non-quantitative sources and documents (Cohen & Manion, 1989). In the light of this, basic CAI applications were counted under different categories by use of curriculum evaluation checklist created by the researcher. Derived information was presented with necessary interactions with other parts of the study.

According to Steinberg (2004), most commonly used qualitative analysis steps are intra-transcript analysis (making meaning to each transcript), inter-transcript (comparing and contrasting respondents) and developing a story (answering the question how this sample respond to the research questions).

Statistical analyses were performed on the data collected with IT Self-Efficacy. Descriptive information was presented for the first part of research question 3. Analysis of multiple regressions was performed on the variables defined after presenting descriptive information about participants. There are 6 dependent

variable, and each one was used in a different multiple regression analysis. Field of profession variable was the only categorical variable including more than two categories. Therefore dummy coding procedure was applied on this variable for multiple regressions. Since teaching experience and age variables are highly correlated, teaching experience variable were excluded from multiple regression analysis and only reported as descriptively. The following table presents information about the type of analysis for each research question.

Table 3. 16

Research question, related data source and instrument, and analyze method

Research Question		*Instrument*	*Data source*	*Data Analysis*
1.	*1.*	Curriculum evaluation checklist	4^{th} to 8^{th} grade Math, Social Studies, and Science and Technology course curricula	Document analysis
	2.	Curriculum evaluation checklist	4^{th} to 8^{th} grade Math, Social Studies, and Science and Technology course curricula	Document analysis
	3.	Curriculum evaluation checklist	4^{th} to 8^{th} grade Math, Social Studies, and Science and Technology course curricula	Document analysis
2.	*1.*	Interview guideline	Teachers from K-8 schools	Content Analysis
	2.	Interview guideline	Teachers from K-8 schools	Content Analysis
	3.	Interview guideline	Teachers from K-8 schools	Content Analysis
	4.	Interview guideline	Teachers from K-8 schools	Content Analysis
	5.	Interview guideline	Teachers from K-8 schools	Content Analysis
3.	*1.*	IT Self Efficacy Survey	Teachers from K-8 schools	Descriptive statistic + Multiple Regression
	2.	IT Self Efficacy Survey	Teachers from K-8 schools	Descriptive statistic + Multiple Regression
	3.	IT Self-Efficacy Survey	Teachers from K-8 schools	Descriptive statistic + Multiple Regression
	4.	IT Self Efficacy Survey	Teachers from K-8 schools	Descriptive statistic + Multiple Regression
	5.	IT Self Efficacy Survey	Teachers from K-8 schools	Descriptive statistic + Multiple Regression
	6.	IT Self-Efficacy Survey	Teachers from K-8 schools	Descriptive statistic + Multiple Regression

3.6. Validity and Reliability

This study has a mixed nature including qualitative and quantitative characteristics. To ensure internal validity of the study, four basic criteria were applied. These are triangulation, member checking, peer checking, and elimination of researcher biases.

Triangulation of the results with different methods used in the research is also serving for validation as Denzin (2007) said. In this study, triangulation of qualitative and quantitative methods was used as a basic way to validate the study. In this study, data from curricula examination, teacher interviews, and survey were used to verify each other. In addition, related literature was also taken into consideration to confirm accuracy of the results a triangulation method. Transcriptions of the interviews were checked by interviewees.

Peer examination was assigned in each step of the research. For document analysis part of the study, peers and experts were checked the accuracy of the data collected via curriculum evaluation checklist. Transcriptions of interviews and coding schema created by the researcher were confirmed by peers. Additionally, every analysis used for both qualitative and quantitative data were confirmed by peers and experts.

Some strategies were used to select the participants for external validity. To make generalization on the population targeted by this research, the definition and selection procedures of participants were explained in detail. In addition to the explanation of participant selection, ways to reach generalizable results were explained in methodology chapter.

According to Zeller et al. (1980), there is a one-to-one relationship between exact reality and its description in a valid and reliable study. In addition, a valid measurement tool needs to measure reliably as intended. Questions in both interview guidelines and IT Self-Efficacy Survey were checked by subject matter experts and language experts for confirmation of internal validity, and credibility and also

reliability. Instruments were developed with the help of related literature and expert opinions. In addition, pilot studies were conducted for both interview guideline and IT Self-Efficacy Survey. After completing data collection, the data were analyzed by ensuring necessary assumptions to have reliable statistical results. During the data collection, analysis of data, and interpretation of the results process, experts and peers were included to be sure about the synthesis gained after completing the research to have objectivity and conformatibility. Table 3.17 presents the conducted strategies to have a valid and reliable study.

Table 3. 17

Strategies to ensure validity and reliability of the study.

Phases	Criteria	Strategy
1. Curricula Evaluation	**1.1**. Internal Validity	**1.1.1.** Same data collector created Curriculum Evaluation Checklist and evaluated the related curricula.
		1.1.2. Same peers reviewed the checklists and the collected data.
	1.2. External Validity	**1.2.1** Major courses were selected as representatives.
		1.2.2. Peer reviews were conducted on the results.
		1.2.3. Results were triangulated with teacher interviews
	1.3. Reliability	**1.3.1.** Items in the checklist were defined with pre examinations of curricula.
		1.3.2. Peers, researcher and advisor reached a consensus on the interpretation of results

Table 3.16 (Continued)

Strategies to ensure validity and reliability of the study.

2.Teacher Interviews	**2.1.** Credibility	**2.1.1.** Pilot interviews were conducted.
		2.1.2. Similar locations and same interviewers were used for data collection.
		2.1.3. Participants examined the transcriptions.
	2.2. Transferability	**2.2.1.** Maximal variation technique was used to define the number of the interviewees.
		2.2.2. Heterogeneity among interviewees in terms of age, experience, field, and gender were taken into consideration.
	2.3. Dependability	**2.3.1.** Questions of interview were created after conducting pilot interviews and literature review.
		2.3.2. Verbatim transcriptions of the interview were checked by listening to the tape records by researcher and a peer.
		2.3.3. A table including codes and themes about teacher interviews were checked by peers.
	2.4. Conformability	**2.4.1.** Interpretations were controlled by peers and advisor.
3. Computer Self- Efficacy Survey	**3.1.**Internal Validity	**3.1.1.** Exploratory, confirmatory factor analyses, cognitive interviews, peer reviews and literature reviews were conducted to create the IT Self Efficacy Survey.
		3.1.2. Data were collected by same person, with same format (paper-based), in similar conditions.
	3.2. External Validity	**3.2.1.** EUROSTAT statistics were used to select participants.
	3.3. Reliability	**3.3.1.** Cognitive interviews, peer reviews and literature review were conducted to create the IT Self-Efficacy Survey.
		3.3.2. Reliability coefficients for factors of the questionnaire were provided.

CHAPTER 4

RESULTS

In this chapter, all findings to answer research questions with their sub-questions were presented respectfully. Main purpose behind answering these questions is to identify structure of technology integration in K-8 schools and to present a clear view of successfulness of this structure.

4.1. What is the pattern of use of ICT in K-8 schools' Math, Social Studies, and Science and Technology courses' curricula? (Research Question-1)

First research question of the study is about the curricula in terms of ICT use. The data to reach an answer to this question were held through examination of previously defined curricula of K-8 classes. Math, Social Studies, and Science and Technology courses of the grades from 4 to 7 and Math, Science and Technology courses curricula for 8-grade were included in the research.

4.1.1. Which Parts of the Related Curricula Do Require ICT Use (Research Question 1.1)

From a broad view, availability of ICT in the curricula is seen as *direct use* and *indirect use*. Direct use can be defined as "teachers or students are clearly defined about how to use the computers or related technologies". For example, in the science and technology curriculum of six grades, they were asked to find pictures of viruses

and bacteria from internet, and present these pictures in the classroom. In this example, curriculum suggests direct use of internet.

On the other hand, indirect use of ICT does not mention about use of technological tools. But the nature of this kind of activities makes ICT technologies the most appropriate tools for students and teachers to complete these activities in an effective and efficient way. For instance, fifth-grade students are expected to design and present a poster about transformation of solar energy by using different visuals. Since computers and Internet presents capabilities of searching information and visuals, and creating posters in an all-in-one manner, this type of activities were labeled as indirect use. From this point of view, 91 direct uses of ICT were counted. On the other hand, indirect uses of ICT (N=122) outnumbered the direct uses.

Applications of ICT in the curricula examined in this research were accumulated under four main categories that are (i) Internet, (ii) videos and animations, (iii) poster design, and (iv) office tools. Use of Internet was observed in three different formats. One of them is Internet for a search tool. In these curricula, students were expected to conduct series of searches for different subjects and Internet was defined as the primary tool for most of these searches.

Field trips constitute an important part of the courses of K-8 schools, especially for social studies and science and technology courses. With the increasing use of internet in schools, some of these field trips have turned into a virtual form. For example, in the curriculum of 7^{th} grade Social Studies, students visit the web-sites of Turkish Grand National Assembly, Supreme Court, Council of State, and Ministry of Justice. Instead of going to these governmental institutions by obtaining necessary permissions, transportations, and etc., students gain valuable information from web-sites of these institutions. For these reasons, Virtual trips are seen more efficient than real virtual trips in many ways. So the researcher included virtual trips as a separate form of Internet use.

Obtaining visuals is another use of Internet. Not only students but also teachers use visuals in regular school circumstances. Curricula in the scope of the study induce teachers and students to use visuals in their presentations, projects, homework, posters and so forth. With the power of available technologies, they can reach to variety of visuals via a simple computer and internet connection and demonstrate them in classroom by printing out or by projecting.

Video demonstration is second main use of ICT. Instead of videotapes, VCDs and Internet are defined as video demonstration tools by the curricula. Since computers have the capability to play VCDs, computers are the most common tools for this type of activities.

Poster design and use of office tool are other basic uses of ICTs presented by curricula. Posters are powerful ways to present the progress for students and computers provide simple tools to create posters. Office tools also serve to similar goals for students. Preparing homework or classroom presentations are easy with office tools. Therefore curricula support teachers for directing their students to use computers to express their learning in computerized environments. Table 4.1 presents the distribution of ICT use over curricula and grade level.

Table 4. 1

Distribution of ICT use over curricula and grade levels.

Course		*Internet Search*	*Videos / Animations*	*Poster Design*	*Use of Office Tools*	*Other*	*Total*
Direct Use							
Social Studies							24
	4th	5	2	1	0	0	8
	5th	5	4	1	0	0	10
	6th	0	2	0	0	0	2
	7th	2	2	0	0	0	4
Science and Technology							55
	4th	5	5	0	0	0	10
	5th	0	3	2	0	0	5
	6th	6	1	0	0	0	7
	7th	13	3	2	0	0	18
	8th	8	3	3	1	0	15
Math							12
	4th	1	1	0	2	0	4
	5th	1	0	0	1	1	3
	6th	1	0	0	1	0	2
	7th	1	0	0	0	0	1
	8th	1	0	0	1	0	2
Indirect Use							
Social Studies							23
	4th	2	1	1	0	0	4
	5th	4	1	0	0	0	5
	6th	7	0	0	0	0	7
	7th	7	0	0	0	0	7
Science and Technology							58
	4th	11	0	2	3	0	16
	5th	4	0	6	1	0	11
	6th	7	0	4	1	0	12
	7th	6	0	2	1	0	9
	8th	8	0	1	1	0	10
Math							41
	4th	3	0	0	3	0	6
	5th	6	0	0	1	0	7
	6th	8	0	0	5	0	13
	7th	6	0	0	0	0	6
	8th	7	0	0	2	0	9

Number of direct use of ICT in Science and Technology course (N=55) is greater than number of uses in both Mathematics (N=12) and Social Studies (N=24) courses. Similar condition is available for indirect use of ICT in the same courses as presented by Table 4.2.

Table 4. 2

ICT Use in terms of Courses

	Direct Use	Indirect Use	Total
Social Studies	24	23	47
Science and Technology	55	58	113
Mathematics	12	41	53
Total	91	122	213

Variation among courses according to number of ICT use in the curricula cannot be observed between grade-levels in terms of both direct and indirect use (Table 4.3). 6th grade students and their teachers are exposed to use of ICT mostly indirectly, although other grade levels have similar number of direct and indirect ICT use. In addition, there is not any linear pattern (increasing, or decreasing) in the numbers of ICT use between grade levels.

Table 4. 3

ICT Use in terms of Grade Levels

	Direct Use	Indirect Use	Total
4th grade	22	26	48
5th grade	17	23	40
6th grade	12	32	44
7th grade	23	22	45
8th grade	17	19	36
Total	91	122	213

4.1.2. Does ICT Use Change in Related Curricula Based on the Grade Level and Subject Matter? (Research Question 1.2)

Table 4.4 presents the distribution of different types of ICT use, which are directly available, over grade levels. In terms of total ICT use, 6th grade curriculum falls behind among all the curricula examined. Other four curricula have similar density of ICT use. More than half of the direct ICT use in the curricula was included as internet search. 7th grade curricula have the most number of internet search activities (N=16). On the other hand, 5th and 6th curricula come last in this field (N=6, and N=7 respectively).

Table 4. 4

Distribution of Types of Direct ICT Use over Grade Levels

	Internet Search	Videos and Animations	Poster Design	Use of Office Tools	Other	Total
4th grade	11	8	1	2	0	22
5th grade	6	7	3	1	0	17
6th grade	7	3	0	1	1	12
7th grade	16	5	2	0	0	23
8th grade	9	3	3	2	0	17
Total	49	26	9	6	1	91

Videos and animations are common ways of integrating technology into lessons for fourth (N=8) and fifth (N=7) grade classrooms. Sixth and eighth grade curricula consist the least number of video or animation type of activities (N=3 for both grades). Seventh grade curricula stand in the middle of all other (N=5). On the other hand, there is not huge difference or a pattern among different grades although there is not a pre-conducted statistical analysis to put emphasis on the existence a pattern or mean difference.

Distribution of different types of indirect ICT use in curriculum was presented on Table 4.5. Internet search have many possible practice spaces in the curricula of

different grades when it is compared with other applications. Although Internet Search seems more common among 6 grade classrooms, there are not big differences among the number of the Internet Search of different grades. Videos and animations nearly do not exist indirectly in any grades' curricula.

Table 4. 5

Distribution of Types of Indirect ICT Use over Grade Levels

	Internet Search	Videos and Animations	Poster Design	Use of Office Tools	Other	Total
4th grade	16	1	3	6	0	26
5th grade	14	1	6	2	0	23
6th grade	22	0	4	6	0	32
7th grade	19	0	2	1	0	22
8th grade	15	0	1	3	0	19
Total	86	2	16	18	0	122

Even though the number of Poster Design and Use of Office Tools were not as much as the number of Internet Search, they exist with a considerable amount. In terms Poster Design, 5th, and 6th grades demonstrated more dense structure. On the other hand, Use of Office Tools is richer in 4th and 6th grade curricula. 6th grade curricula and 4th grade curricula are higher in terms of total ICT use. But there are not big differences among them.

Among all curricula, Science and Technology course comes forward in terms of amount of direct ICT use (Table 4.6) More than half of total ICT use appears under Science and Technology curriculum. Internet constitutes major part of this usage. While Internet is highlighted with the highest number of usage (N=32), Videos and Animations also appear as notable use of ICT (N=15) for Science and Technology curriculum. But Poster Design and Use of Office tools are not preferred as a frequent direct use of ICTs in the curriculum.

Similar to the Science and Technology curriculum, Internet plays a dominant role for Social Studies course (N=12). In addition, Videos and Animations are also common ways to use technology in the Social Studies classrooms (N=10). However there was almost no usage of ICTs in the form of Poster Design and Office Tools.

Mathematics curriculum was the poorest one among the three curricula investigated in this research. Only 12 direct ICT use are available in the curriculum. Half of the number of ICT usage in Mathematics curriculum belongs to Use of Office Tools. Internet has the second biggest portion (N=5).

In terms of types of direct ICT usage in these three types of courses, there was a kind of difference about accumulation points. That is, each course has showed different patterns in the use of these technologies. In science and technology course there is a definite tendency to use of Internet. On the other hand, there is a balance among use of Internet, Videos and Animations in Social Studies course. For both of these courses, Poster Design and Use of Office Tools do not find a considerable amount of place in the curricula. Mathematics course differed from this point of view. Office Tools are the most preferred option for the teachers to integrate ICT into the curriculum as direct use.

Table 4. 6

Type of Direct ICT Use in Courses

	Internet	Videos and Animations	Poster Design	Use of Office Tools	Total
Social Studies	12	10	2	0	24
Science and Technology	32	15	7	1	55
Mathematics	5	1	0	6	12
Total	49	26	9	6	91

As summarized by Table 4.7, Internet was the most preferred option for all these courses. About %70 of all Indirect ICT use in the three selected courses is composed of Internet. Poster Design is another way to use ICT in Science and Technology

courses while it is not a favored option for Mathematics and Social Studies courses. As indicated by results presented through the previous table for direct use, Use of Office Tools is a frequently encountered technology use in Mathematics curricula in an indirect way. On the other hand, all these curricula do not accommodate any indirect use of Videos and Animation except for two instances in Social Studies course.

Table 4. 7

Type of Indirect ICT Use in Courses

	Internet	Videos and Animations	Poster Design	Use of Office Tools	Total
Social Studies	20	2	1	0	23
Science and Technology	36	0	15	7	58
Mathematics	30	0	0	11	41
Total	86	2	16	18	122

4.2 What are the Teachers' Perceptions of ICT Use in Schools? (Research Question 2)

In order the answer second major research question, data gathered through semi-structured interviews with 20 in-service teachers were analyzed in order to present the emergence of the themes as defined by Corbin and Strauss (2008). Table 4.8 provides basic demographic information of the teachers involved in these interviews with the index codes.

Table 4. 8

Interviewee's demographics

Teacher ID	Subject/Field of Profession	Teaching Experiences	Experience with computer
T-001	Classroom teacher	30 years	5 years
T-002	Classroom teacher	22 years	5 years
T-003	Classroom teacher	36 years	6 years
T-004	Classroom teacher	32 years	4 years
T-005	Classroom teacher	22 years	1 year
T-006	Classroom teacher	31 years	5 years
T-007	Classroom teacher	24 years	5 years
T-008	Math teacher	25 years	7 years
T-009	Classroom teacher	25 years	3 years
T-010	Science and technology teacher	15 years	> 10 years
T-011	Classroom teacher	5 years	> 10 years
T-012	Classroom teacher	15 years	6 years
T-013	Classroom teacher	24 years	6 years
T-014	Science and technology teacher	16 years	8 years
T-015	Science and technology teacher	35 years	5 years
T-016	Social Studies teacher	21 years	4 years
T-017	Classroom teacher	32 years	5 years
T-018	Classroom teacher	10 years	> 10 years
T-019	Science and technology teacher	15 years	6 years
T-020	Classroom Teacher	9 years	> 10 years

Among the 20 teachers interviewed, classroom teachers constituted majority (N=14). Since the courses included in the study by examining related curricula are Math, Social Studies, and Science and Technology; classroom teachers are very appropriate group to collect data. They are responsible to teach these courses from first to fifth grade students. Therefore they were expected to be informed and had thoughts about ICT practices and the curriculum structures of these courses. Four of the remaining teachers were Science and Technology teacher, one of them Math, and one of them Social Studies teachers. Their experiences in their fields ranged from 5 years to 36 years.

Fundamental aim of interviewing with teachers was to clearly define place of the computers and related technologies both in their daily life and professional life. In detail, how often and in what ways they use computers and their thoughts, comments, recommendations for K-8 schools' past, present and future about technology integration issues. Interview guideline; therefore, were designed to gather information to explain the situation from the views of teachers. Via analyzing the data collected through questions in the interview guideline, five basic themes were identified and these are sources of computer and technology literacy of teachers, place of computers in their life, their ICT practices in curricular applications, possible problems preventing them to increase ICT use, and their proposals to have better technology integration in schools.

4.2.1. Place of Computers in Teachers' Professional and Daily Lives (Research Question 2.1)

Five common statements were derived from participants' responses under the theme professional and daily use of computers. The ways teachers use computers in a regular day were presented by Table 4.9.

Table 4. 9

Teachers' daily use of computers

Way of computer use	*# of teachers*
Reading daily news;	6
Entering students' grades to e-okul	4
Preparing for school works	6
Entertaining	2
Communication	4

Reading daily news from Internet is a popular activity among experienced teachers. Except one teacher, all the teachers specifically stating reading daily news as their regular activity with computers have more than 25 years experience in teaching.

Similarly, specifically defining entering students' grades to e-okul is common among mostly experienced teachers who are defining themselves low level computer users. In other words, teachers who are good at using computers did not define entering students' grades to the online systems as a separate computer based activity.

Preparing for school work is not common among a specific group of teachers such among as high experienced teacher or among classroom teachers. Six teachers indicated that they use computers, in fact, their personal computers for classroom activities, for searching subjects of a regular school day, or for creating course materials. These teachers also indicated that they do not have enough technology access in their classrooms. Therefore it can be inferred that this type of computer use mostly limited to preparation lesson plans, or typing the exam questions.

Entertaining and communicational aims of computers mostly expressed by the teachers who feel considerably high computer self-efficacy or by the teachers have teaching experience below the average. Participant T019, who has been working as a teacher for 10 years and one of the youngest teachers among all participants, indicated that he can use computer very effectively and added the following thoughts;

> I use computers actively in my life. I am not only using in my classrooms for educational aims, but also for other things that I need, such as communicate with friends and family. Since I was an undergraduate student I have been using computers actively in fact. I mean from 1996. I gained my computer knowledge mostly on my own. I have never attended any course. And I think I can say I am an advance computer user.
>
> Günlük yaşamda aktif olarak bilgisayar kullanıyorum. Sadece sınıfta ya da eğitim amaçlı değil, ihtiyaç duyduğum başka şeyler için de, mesela ailemle ve arkadaşlarımla iletişim kurmak için kullanıyorum. Aslında üniversiteden beri aktif olarak kullanıyorum. Yani 1996'dan beri. Bilgisayar bilgimi daha çok kendim öğrendim. Hiç bir eğitime katılmadım. Ve iyi bilgisayar kullandığımı düşünüyorum.

In addition to the statements about the ways of daily computer use cited by the teachers, some of them also indicated that they are not using computers or rarely use.

Only obligation that forces them to use computers is the necessity to enter the grades to the electronic system which is e-okul or preparing exam sheets by using office programs. In fact being computer illiterate is not disturbing for some teachers. The participant T016 sad that;

> I do not regularly use computers. Most of the time, I do not need computers. If I need to use computers, I ask for help from computer teacher or colleges. Technological devices are not available in our classroom so we do not use computers in lessons. But the reason could be also our deficiency in using them.
>
> Düzenli olarak bilgisayar kullanmıyorum. Çoğu zaman bilgisayara ihtiyaç duymuyorum. Eğer ihtiyaç hissedersem bilgisayar öğretmenine ya da diğer öğretmen arkadaşlara danışıyorum. Sınıfımızda teknolojik gereçler mevcut değil bu yüzden de derlerse kullanmıyoruz. Ama sorun bizdeki eksiklikten de kaynaklanıyor olabilir.

4.2.2 Sources of ICT Literacy (Research Question 2.2)

Teachers' sources of literacy were accumulated under 5 different statements. These are (i) in-service training programs, (ii) personal efforts, (iii) help from colleagues, (iv) undergraduate education, and (v) help from family members. In addition, teachers expressed how much they learned from these sources. Four of the teachers indicated that they had not attended any in-service training about computer and technology literacy. On the other hand, considerable amount of the remaining teachers said that they learned little or nothing from in-service trainings. One of the six teachers sharing the same perception said; I attended a training 4 or 5 years ago. I was from teachers who attended in-service trainings first.

> I didn't care these trainings much in those days. I think I didn't learn much from them. But I took the certificate with a high degree. It was so superficial. And I think they were not appropriate for our needs.
>
> Bu günlerde böyle şeyleri çok dert etmiyorum. Bence onlardan (hizmet içi eğitimlerden) çok bir şey öğrenmedim. Fakat yüksek dereceyle sertifika sahibi oldum. Aslında bu eğitimlerin bizim ihtiyaçlarımıza yönelik olmadığını düşünüyorum.

Need for computer related knowledge and skills were shared nearly by all the participants. To find solutions to these needs, 17 teachers expressed their personal efforts to have these knowledge and skills. Asking for help from colleagues who are expected better at computer use is another way for teachers to solve technology related problems. Similarly, family members are also an option to gain technology knowledge and skills. In addition, the courses that two of the participants took during their undergraduate education were emerged as an option to gain ICT literacy.

Among all the ICT literacy sources, teachers' personal efforts are the most common and effective way. Although majority of the teachers have ICT user certificate, they think that these trainings were not effective as they expected. For example the participant T008 summarizes this situation as follow;

> I learned to use computer with my own efforts. I didn't learn much from in-service trainings. I can say that I only learned how to turn on and of the computer from these trainings. But, in time, I have started to use computers better by do my work on my own. Everything has started to become better.
>
> Bilgisayar kullanmayı kendi çabalarımla öğrendim. Hizmet için eğitimlerden çok fazla bir şey öğrenmedim. Hatta söyleyebilirim ki bu eğitimlerden sadece bilgisayar nasıl açılır nasıl kapanır onu öğrendim. Fakat zamanla kendi işimi kendim yaparak öğrenmeye başladım. Herşey daha iyi olmaya başladı.

Participant T012 also highlighted her personal efforts to learn how to use computers. In addition, the family members also better sources to improve the literacy for her. She summarized her thoughts with the following words;

> I learned to use computers on my own. My husband is interested in computers. Therefore, I mostly ask for help from him. I have never attended a regular computer training program. Sometimes ago, there was an online computer training program of Ministry of Education. They would give a certificate. I joined but probably I made a mistake. I couldn't get a result actually. There was nothing good for me.
>
> Bilgisayar kullanmayı kendi kendime öğrendim. Kocam bilgisayarlarla ilgilidir. Bu yüzden çoğu zaman ondan yardım istiyorum. Hiçbir düzenli

> bilgisayar eğitimine katılmadım. Bir zaman önce Milli Eğitim Bakanlığı'nın online bir eğitimi vardı. Sertifika vereceklerdi. Ben de katıldım ama, sanırım hata yapmışım. Hiç bir sonuç elde edemedim. Benim için iyi hiç bir şey yoktu.

4.2.3 Curricular Activities (Research Question 2.3)

Two sub themes were extracted under curricular activities. Teachers mainly divided curricular activities into two as *indoor* and *outdoor*. More than half of the participants (N=11) indicated that they do not conduct any ICT based curricular applications in classroom setting. Main reason for this situation was defined by them as lack of necessary technological infrastructure although there is at least one computer laboratory available for them in scheduled times in each school. There are also teachers who are trying to give some computer aided instructions although they do not have necessary technology in their class (N=9). According to one of the participants (T005), who was one of the teachers using computer laboratory for some activities, there are plenty of ICT based activities defined by the curriculum but lack of computers and projectors in the classroom makes these applications inappropriate to conduct in classroom setting. She expresses her beliefs as "actually all of the curriculum can be built on computer related activities but we, as teachers, do not positive enough towards that for some reasons." Despite there are not enough opportunities to use computer laboratory, she forces to take advantage of the available schedule of this laboratory because she believe that using visuals, presentations or other multimedia materials positively affect many aspects of classroom practices.

Beside teachers using computer laboratories for indoor activities, teachers (N=3) who have computers and other related equipments like projectors and internet connection in their presented examples for indoor ICT based curricular activities. Among all, only three of the participants have opportunity to use computers in classroom. Two of them, participants T011 and T0012, are classroom teachers and they mostly use computers to make PowerPoint presentations. Both of them focused on the importance of the visuals to equip lessons with more motivational elements for

students. Participant T011, who is working her 5th year in teaching as classroom teacher, believes that the content of the curriculum is not a barrier against to use computer and its multimedia abilities. She said that "there are many opportunities to blend the lessons with computers and these opportunities are depended on the teachers' choices."

Opposite to the indoor activities, outdoor activities were very popular among teachers. All of the participants expressed that they are preparing activities enabling at least students to use computers and internet out of the school boundaries. These activities mostly based on Internet searches to complete homework or a project. Participant T010 explains the inevitability of using computers by students to use Internet and computers out of the school with the following thoughts;

> There are a lot of ICT based applications in the curriculum. For example, assume that I mentioned students following week's subject and ask them to make a search for introductory information about the subject, they always make an Internet research. Internet is infinite. I can only use encyclopedias as resources and we do not have enough chances to go to libraries. So, I can say, I am very supportive for using Internet. I think students can produce better homework if they use technology.
>
> Müfredatta birçok bilgisayar tabanlı uygulama var. Örneğin öğrencilere bir sonraki haftanın konusu hakkında bahsetsem ve araştırma yapmalarını istesem, her zaman internetten araştırırlar. İnternet sonsuz. Ben sadece ansiklopedileri kullanabiliyorum e kütüphaneye yeterli erişim olanağımız da yok. Bu yüzden söyleyebilirim ki İnternet kullanımını çok destekliyorum. Bence öğrenciler teknoloji kullanarak daha iyi ödevler çıkarabilirler.

But teachers indicated that there is a negative effect of computers and internet on the students' homework performances. The problem is that students do not use their own thoughts to prepare homework projects. Instead, they mostly copy the Internet sources and bring them as a complete homework or the information in their homework is not appropriate for their level as the teacher T014. He adds that students use technology because it makes everything easier for them and then he described situation as "students bring their homework with completing 4 step: search, copy-paste, print out, and bring to the classroom." Although this opinion is shared by

majority, some of these teachers still believe that this situation has beneficial points for students. For example, participant T013 indicates that computers have many motivational elements and "students do not like tampering books. In fact, no matter they get the information from internet or a book, they write and bring without adding their own interpretation."

In lower grades, this situation turns into a different format. Participant T017 moves the focus to the inclusion of the parents in this type homework and continues;

> Generally I work with lover grades, and we see that parents' inclusion in Internet based homework or projects are so visible. I wish these types of works can be done in schools, in classrooms or computer laboratories. I wish students only meet their daily needs and play games in their homes, or read books. But school infrastructure is not is not sufficient to do this. But parents are also unconscious. They complete the homework, and print out it, and then sent it to school with the students. It is not obvious who does the homework. It is a bit complicated.
>
> Genel olarak alt sınıflarla çalışıyorum ve bu sınıflarda velilerin öğrencilerin ödevleri üzerindeki etkisi çok açık görünebiliyor. Aslında keşke bu tip ödevler sadece sınıf ortamında yapılabilseydi. Keşke öğrenciler evde sadece ihtiyaçlarını karşılayıp oyun oynayabilseydi, ya da kitap okusalardı. Fakat okul altyapısı buna müsait değil. Veliler de bilinçsiz. Ödevleri yapıyorlar ve çıktı alıyorlar. Sonra okula öğrencilerle gönderiyorlar. Ödevi kimin yaptığı açık değil. Birazcık karışık.

To overcome with this issue, teachers created some ways. One of them is expecting homework with hand writing. The other one is limiting the number of the homework which can be done through Internet search. Besides all teachers use outdoor ICT applications somehow, there is not a common opinion whether these type of activities are beneficial or not.

4.2.4. Enablers to ICT Integration (Research Question 2.4)

Technology access

All of the teachers were not satisfied with the technology provided them. Only three of the participants have a computer in their classroom. In fact, these teachers also do

not have an internet connection available through these computers. But participant T009 indicated that some teachers can supply necessary technological devices by cooperating with the parents. Actually parents are willing to increase the quality of the education for their children; therefore it is not hard to provide at least a computer to classrooms. He adds that it depends on the teacher's willingness for technology integration.

Opposite to the insufficient technological infrastructure of the classrooms, each participant without any exception said that there is at least one computer laboratory equipped with projector is available for their use. As mentioned before, there are some teachers (N=3) who are using these computer laboratories efficiently. Even if the schedules of these laboratories may not appropriate every time that a teacher wants to use it, a teacher can arrange his or her timetable according to the availability of computer laboratories. A common thing among these teachers was that they are considerably younger teachers among all. It might be said that benefitting from technological resources is highly depend on the age of the teacher. If a teacher is older than other, he/she possibly tends to ignore available technology access to flourish the classroom instruction.

Resource

Schools, from the teachers point of view, are quite poor in terms of availability any technological resources or materials that teachers can use to support their instructions. 13 of 20 participant interviewed said that their school does not provide them with any technological resources. On the other hand, two of the participants expressed that there are some materials such as VCDs related with the content they teach, some educational software, or some other resources supplied by Turkish Ministry of Education, but they added that they do not use them because of lack of computers in their classrooms. When one of these two teachers (participant T014) said "I have not used these resources, but actually there is not any obstacle preventing me to use them", the other teacher (participant T003) claimed that lack of a classroom computer is an enough reason for not using these resources.

Only five of the participants are aware of the resources in their schools and using them to improve their instruction. Participant T004 shared her thought about these resources;

> There are some educational resources in our school. With the VCD player and television in our classroom, we can watch them with students. Sometimes we take advantage of these CDs to support classroom activities. In fact, a computer could make better results, but still these resources sometimes could be very beneficial for my classroom. Definitely they increase student motivation.
>
> Okulumuzda bazı kaynaklar var. Sınıfımızdaki VCD player ve televizyonla bunları öğrencilerle birlikte izleyebiliyoruz. Aslında bilgisayar daha güzel sonuçlar doğurabilirdi fakat bu durumda bile bu kaynaklar çok yararlı olabiliyor. Kesinlikle öğrencilerin motivasyonunu arttırıyor.

At this point, participant T011 focused on teacher-school relationship to have a good resource repertoire in the school. In her school, teachers search and chose necessary resources, like VCDs and software for science and Math, then school administration buys these resources from the school's own budget. She adds that, Turkish Ministry of Education provides financial support to school, and it's the schools' decision to use this support to buy educational materials or not. In summary, if teachers can be enthusiastic about this issue, actually schools can have better resources.

Support

Under the theme support, teachers' answers basically were accumulated to two questions. These questions were to learn about their ability to support students when they have trouble with using computers of they need advice to prepare better homework or projects. The second question was to gain information about teachers' own technological support needs from third party.

Five of the participants indicated that they were not qualified enough to support students about technology related issues. Participant T002, one of these teachers, did not attend any computer training and expresses himself as a basic computer user. Similarly participant T005 also said that he has low efficacy in using computers.

Other three teachers who are not see themselves able to give technological advice to students also told about their low technology literacy and self-efficacy.

In addition to the teachers who think they are not able to give technological support to students, there were seven other teachers who expressed that there are not any situation students need technological advices or support. Common thought among them was the lack of technological infrastructure or classroom computers makes hard to conduct ICT based curricular activities in classroom, so students do not need any kind of support related with technology use.

The other side of the support issue is the teachers' technological support needs from the third party. Eight of the participants indicated that they do not need technology related support. But having necessary technology skills was not the common reason among the teachers. Three of them actually expressed that they do not need support because they do not use computers.

Computer teachers were defined as the main technological support source for participants. Except for the teachers who do not need support, all the remaining participants ask for help from computer teachers when they need computer and technology related advices. Although there are some other options for teachers like colleagues, friends, family members, and formator teachers who are the teachers from different areas and have computer educator certificates, computer teachers are the best and easy to reach source for the participants.

4.2.5 Barriers to ICT Integration (Research Question 2.5)

Throughout the interviews with the teachers, 6 basic problems which are connected with other were investigated with regards to preventing an effective ICT integration is schools of K-8. These are;

1. Inappropriate use of ICT by students, parents, and teachers (N=15)

2. Not enough technological infrastructures (N=20)
3. In-service trainings' insufficiency and low quality (N=10)
4. Teachers' fear of using technology / Low self-efficacy levels (N=9)

15 teachers among all participants pointed out that inappropriate use of computers by students, parents and teachers is a crucial problem in front of the success of technology integration in schools. The problems, actually, is not about knowing how to use computers, but about how to use them for educational purposes. The most common example given by the participants is "students do not read what they have prepared as homework." Like other participants, participant T012 summarizes this situation as;

> There is a problem when students use internet to prepare their homework. This problem exists in the class that I teach today, and also I have some previous similar experiences. Students bring a printout as a homework most of the time. This is not true. Students should gain the necessary information from Internet, but also make his or her own editing and arrangement on the information. Sometimes a third grader can bring something that university students can hardly understand. We, as teachers, have to prevent this situation. Internet is very valuable source. Therefore students have to be taught how they should use the Internet as the source of information.
>
> Öğrencilerin internet kullanarak ödev hazırlaması konusunda bir problem var. bu problemi bu günkü sınıfımda yaşadım, benzer şeyleri daha önce de yaşamıştım. Öğrenciler çoğu zaman ödev olarak çıktı getiriyorlar. Bu doğru değil. Öğrenciler internetten gerekli bilgileri bulmalı ancak kendileri gerekli düzenlemeleri yapmalı. Bazen 3. Sınıf öğrencisi üniversite öğrencisinin zorla anlayacağı şeyler getiriyor. Bizler, öğretmenler olarak, bu durumu engellemeliyiz. Internet çok değerli bir kaynak. Bu yüzden öğrenciler internetin nasıl bilgi kaynağı olarak kullanılacağı konusunda eğitilmeli.

At this point it, it was seen that younger teachers (N=5) defining themselves as high level computer users mostly did not blame students in such manner. The reason might be that they can provide enough guidance students about how to use computers properly. Therefore, direction of the teacher defined problems is changing from teacher to student in relation with the level of computer literacy and self-efficacy.

Inappropriate use of computers is not only specific to students. According to participant T011, Teachers are not give enough attention to the ICT use in education although they aware of the possible improvements in their instruction if they use ICT. She added that some teachers consider using computer in school as a waste of time. Participant T017 looked the problem from the parents' side. According to him, parents, especially parents of the students from lover grades, prepare the homework or projects and teachers cannot differentiate how much effort student made. It makes difficult to monitor students' progress.

Another problem statement deducted from interviews was the insufficient technological infrastructure of the school. All of the teachers indicated that their school is not equipped with necessary technological tool. Most of the classrooms do not have any computer or projectors. Therefore the ICT based activities defined by the curriculum cannot be appropriate for classroom setting in general. For example participant T010 said that it is not possible to use computers during class hours. By giving her belief that "since we are lack of necessary technological equipments, students tend to interact with computers outside of the school," participant T010 focused on the undesired side effects of interacting with computers outside of school without any scaffolding.

Although all of the participants considered technological insufficiencies as major problem against successful technology integration, their insufficient computer self-efficacy in relation with technology integration also appears as another problem. Some of the teachers (N=2) named this situation as the fear of computer use and some others names as insufficient computer literacy. Interestingly all of the teachers have computer literacy to some extent whether they have attended a training course or not. But they are not willing to use this computer literacy for educational purposes to flourish their instruction. Participant T014 tried to explain this from her point of view;

> A teacher has to know how to use computers. I saw some colleagues who hesitate to use computers. I am not sure whether they hesitate to learn, or they do not feel the need use. Actually, learning is independent from the age, so everyone [teachers] should use computers to an extent. Everyone [teachers] should catch up with the development and change. People have to be open to change. But I see that there is unwillingness among teachers. They keep away from computer. They just want to learn as much as they need. No more than that.
>
> Öğretmen bilgisayarı nasıl kullanacağını bilmek zorunda. Bazı öğretmen arkadaşlar görüyorum bilgisayar kullanmaktan çekiniyorlar. Bilgisayar kullanmaktan çekiniyorlar mı yoksa ihtiyaç mı duymuyorlar emin değilim. Aslında öğrenmenin yaşı yoktur., o yüzden herkes [öğretmenler] bir noktaya kadar bilgisayar kullanmayı öğrenmeli. Herkes [öğretmenler] değişime ve gelişime ayak uydurmalı. Fakat öğretmenler arasında bir isteksizlik görüyorum. Bilgisayardan uzak duruyorlar. Sadece ihtiyaçları kadar öğreniyorlar. Daha fazlasını değil.

Fear of computer issue or low self-efficacy issue was mostly mentioned in a connection with the teachers' perceptions about the technology in-service trainings. Except for two participants, teachers pointed the structure of in-service training programs as responsible for their inefficacies of the technology integration. Teachers' unhappiness with training emerged in different ways. One of them is insufficiency in the number of trainings. According to participant T003, he was not given necessary amount of computer training, and he explained further;

> I did not attend a satisfying training about computer use. The trainings I got so far lasted in a couple of weeks and their content were also sloppy. Yes, I got a certificate but I can definitely say that I did not learn anything.
>
> Tatmin edici hiç bir eğitime katılmadım. Bu güne kadar aldığım eğitimler bir iki haftada sona erdi ve içerikleri çok yüzeyseldi. Ever, sertifikam var ama şu kesin olarak söyleyebilirim ki hiç bir şey öğrenmedim.

Another complain about the in-service trainings was that teachers have not been grouped according to their level of literacy, their age, or their specific needs. Participant T010, who is considerably better at computer use, explained this situation as follow;

> I attended 160-hour computer training. After that, I was obligated to attend another training program. They said that I had to attend to this training. But I knew all the things they were planning to teach me. But they gave the same training as they say to me "you have to step back and start over." I am good at MS Word. What was the reason to teach me the MS Word again? For example, I need to learn MS PowerPoint. Why should I waste my time by leaning MS Word?
>
> 160 saat bilgisayar eğitimine katıldım. Bundan sonra, zorla tekrar bir eğitime katılmam gerekti. Bu eğitime katılmam gerektiği söylendi. Ama öğretecekleri her şeyi ben zaten çok iyi biliyordum. Sanki sen çok biliyorsun biraz geriye gelmelisin der gibi aynı şeyleri tekrar verdiler. Word'de iyiyim. Bana tekrar Word öğretmenin gereği ne? Mesela PorwerPoint öğrenmeye ihtiyacım var. Niye zamanımı tekrar Word öğrenerek harcayayım?

Quality of the training and trainers were also described by the participants as a major problem. When participant T008 indicated that in-service trainings are not up-to-date, participant T005 focused on the lack of practical application opportunities given to the trainees. In addition to these claims, other participants also added that trainings' schedules are not appropriate most of the time.

4.2.6. Teachers' Suggestion Pertaining to Effective ICT integration (Research Question 2.6)

Via the analysis of interviews with teachers, five main problems which are preventing successful integration of ICT in schools of K-8 were identified. Teachers were also asked to make define the areas on which some possible interventions can be made to solve these problems that are listed and explained in detail in the previous section. Two main themes were extracted as the possible solution areas to improve current ICT integration in these schools. These areas are;

1. Teacher training programs (17),
2. Technological infrastructure (N=19);

Among these two areas defined as possible to improve, the most cited and solution proposed area is teacher training programs. The proposed suggestions of teachers were accumulated under 2 groups, and the groups are;

1. Amount of in-service training,
2. Meaningfulness
    a. Qualification of trainers
    b. Schedule of in-service trainings
    c. Delivery methods used in in-service trainings
    d. Variety among available in-service trainings

Five of the participants indicated that more available in-service training programs can increase teachers' capability to use technology in their classrooms. Participants T001, T002, T011, T015, and T016 initially proposed increase in the number of hour's computer trainings. According to participant T015, Technology related in-service training is a must for all teachers regardless of their fields otherwise teachers cannot learn how to benefit from technology. On the other hand, he added that the amount of the training is not only criteria to increase technology integration capabilities of teachers as many of other participants indicated. Meaningfulness of in-service trainings is another fundamental requirement expressed by the participants. The meaningfulness appeared as qualification of trainers, schedule, delivery method, and variety.

According to participant T011 who perceived himself as advance computer user, Turkish Ministry of Education has to change the way to choose the trainers to educate teachers in terms of computer literacy:

> Number of trainings could be increased. But high quality in-service trainings should be given. For example, they [directors from Turkish Ministry of Education] could ask me to give training but I think I am not qualified enough for this. In Turkish Ministry of Education, there is a something like that: everyone thinks that "I am very good at computers," but they cannot teach

> anything actually. They teach computers like a user manual. This is not true. I think this is the biggest problem.
>
> Verilen eğitimlerin sayısı arttırılabilir. Fakat yüksek kalitede eğitimler verilmeli. Örneğin [Milli Eğitim Baklanlığı'ndan yöneticiler] eğitim vermem için bana gelebilirler fakat ben böyle bir eğitim verebilecek düzeyde olduğumu düşünmüyorum. Milli Eğitim Bakanlığı'nda böyle bir durum var: herkes bilgisayarda ben çok iyiyim diyor, fakat hiç bir şey öğretemiyorlar. Kullanım klavuzu öğretir gibi bilgisayar öğretiyorlar. Bu doğru değil. Bence bu en büyük problem.

Schedule of in-service trainings was also problematic according to the participants and need for more attention for scheduling was expressed by them. Participant T004, for example, said that these trainings can be arranged in summer and in this way, teachers' concentration may not be distracted by other school responsibilities. Similarly participant T006 proposed seminar period which is the two weeks before each school semester starts are the best time for trainings.

The methods used to deliver the instructions in in-service trainings were also complained by the participants. Some of the participants expressed that more practice opportunities has to be provided. Participant T005 said that gathering teachers in a classroom and presenting the content with classical methods is not working if there is not practicing. In fact, a strong connection between delivery method and variety of in-service trainings were pointed out by the participants. Teachers spoke out that they were expecting trainings not only for learning how to use computers, but also how to use computer to fulfill educational activities. For example, participant T003 indicated that all teachers should have a common ICT knowledge but every field or every course have own specific features; therefore field specific trainings should be taken into consideration. There are many participants expecting field specific trainings. In addition, age and level of computer literacy were defined other variables. Participant T009 summarized his proposal about this issue as;

> Teachers who have different level of computer literacy should not attend the same training. Teachers with high computer literacy may be given different advance trainings and be taught different software and etc. But teachers with

> low computer literacy as we are could be taught how to use available resources. We might pass to the next level after this.
>
> Farklı düzeyde bilgisayar bilen öğretmenler aynı eğitimlere katılmamalı. Bilgisayar bilgisi yüksek olan öğretmenler farklı ileri düzey eğitimlere katılabilirler ve onlara değişik yazılımlar vs. öğretilebilir. Bizim gibi bilgisayarda daha alt düzeyde olan öğretmenlere mevcut kaynakların nasıl etkili kullanılabileceği öğretilebilir. Bundan sonra bir sonraki aşamaya geçebiliriz.

In addition to teacher training, improvements in technological infrastructures of classrooms and schools were seen another major area that can positively affect ICT integration in schools of K-8. Half of the participants shared a common thought about improving technological equipments of school could encourage teachers to use ICT more effectively. Participant T006 focused on the necessity of classroom computers:"We need more inclusion of computers in our classrooms. Not just one computer for a classroom, actually there should be plenty of computers in classroom and not teachers but also students should be able to use computers in classroom environment."

4.2.7. Summary of Teachers' Perceptions of ICT Use in Schools

20 teachers were interviewed to understand their perception about current condition of the ICT integration in K-8 schools. Their thoughts were accumulated and analyzed under six different categories. These categories are;

- Place of computers in teachers' life,
- Source of ICT literacy,
- Curricular activities,
- Enables to ICT integration,
- Barriers to ICT integration, and;
- Teachers' suggestions for better ICT integration.

For all these six categories, several variables were found as important factors affecting teachers' answers to the questions. One and the most effective variable was age of the teachers. Since teaching experience is highly correlated with age, these two variables were observed with similar effects on teachers' answers. Older teachers with higher teaching experience do not allocate space for computers as much as younger teachers. Computers do not mean much for them not only for daily purposes but also educational activities. Therefore they mostly use computers for compulsory school works or very simple personal needs. On the contrary, younger teachers spent much more time with computers. Computers are parts of their life and inevitably they use them for educational activities whenever it is possible. Age or teaching experience also found significant on teachers' definition of the barriers to ICT integration. While teachers' age is increasing, the direction of the problems preventing technology integration is turning from teachers to outside sources. For example, teachers who are under the average age mostly mentioned teachers' negative attitudes and low literacy as the primary barriers to the integration. On the other hand, other teachers generally complained about students' inappropriate computer use, unintended parent inclusion, or lack of technology access.

Another significant point inferred from teacher interview is the amount of the interaction with the computers. In other words, teachers who spend more time with computers answered questions differently. This difference caused by the amount of computer use actually parallel with the effect of age. The link between these two variables can be explained as lower age leads more use of computers, and more use of computers naturally increases ICT literacy and computer self-efficacy. It also reduces the fear of ICT use for educational purposes. In such a situation, teachers tend to solve ICT related problems by themselves. If they cannot, they mostly blame themselves, not other stakeholders.

A little or no effect of the teachers' subject matter and the in-service training as the source of ICT literacy was observed on the results. No matter teachers attended much in-service training or not, it was expresses as a barrier to ICT integration instead an

enabler. Teachers complained the amount, the quality, and the schedule of in-service trainings. Improvements in in-service trainings to solve mentioned problems were proposed as one of the important enabler to increase ICT integration.

Necessity to build a definition for technology access was observed from teacher interviews. For the same or similar opportunities for technology access was expressed differently by teachers. For example, computer laboratories or classrooms were used by some teachers for different curricular activities. On the other hand, some other teachers found these computer classrooms completely useless because of the tight schedules. Of course, a single computer laboratory cannot be regarded as enough technology access, but it can still serve for some kind of ICT based curricular activities. As a result, an official definition is necessary to conduct more trustful inferences from teachers' opinions to understand successfulness of ICT integration.

For the further steps of this study, it is found that teachers' age and experiences were found important variables. In addition, teachers' interaction with computers also identified as important to understand different aspects of ICT integration in K-8 schools. Being defined as barrier but not enabler makes in-service training histories of teachers another important variable for the research.

4.3. Teachers' Perceived IT Self Efficacy (Research Question 3)

In this section, basic demographic information of the teachers who participated in the quantitative parts of this research by filling the IT Self Efficacy questionnaire.

4.3.1. Computer and Technology Background of Teachers

As provided by the Table 4.10, 92% of the teachers who participated in the study indicated that they have access to computer out of the school. Only 7.8% of the teachers do not use computers out of the school boundaries.

Table 4. 10

Use of home computers

	f	%
Yes	945	92.2
No	80	7.8
Total	1025	100.0

Numbers of trainings that teachers attended were presented by Table 4.11. Among all 1025 teachers, 165 of them (16%) had not attended or completed any computer and technology training. 83.9% of them completed at least one computer and technology in-service training course. 379 (37%) teachers took 1, and 257 teachers took 2 different in-service training. On the other hand, there are 3 or more in-service training in the computer and technology education background of each one of 224 (21.9%) teachers.

Table 4. 11

Descriptive information for the number of computer trainings teachers attended

	f	%	Cumulative %
0	165	16.1	16.1
1	379	37.0	53.1
2	257	25.1	78.1
3 or more	224	21.9	100.0
Total	1025	100.0	

Table 4.12 briefly presents the information about the total number of hours that teachers attended computer and technology in-service trainings. Although 165 teachers indicated that they have never attended a training course, this number was seen in 147 in the Table 4.12 because of the 106 non respondent teachers to the question about number of training hours. Among the teachers who have an answer to this question, 130 (14.1%) of them had less than 30 hours training, 210 (22.9%) of

them had between 30 and 59 hours training. 15.8 % attended 60-89 hours training, and 6.4% attended 90 to 119 hours training. On the other hand, considerable amount of teachers (228) attended more than 120 hours computer and technology training.

Table 4. 12

Hours of training teachers took

Hours	*f*	%	Valid %	Cumulative %
0	147	14.3	16.0	16.0
1-29	130	12.7	14.1	30.1
30-59	210	20.5	22.9	53.0
60-89	145	14.1	15.8	68.8
90-119	59	5.8	6.4	75.2
120<=	228	22.2	24.8	100.0
No response	106	10.3		
Total	1025	100.0		

Descriptive information about IT Self Efficacy scores in terms of gender, field, age, and experience

Teachers' Total IT Self Efficacy Scores (TSE) was provided through Table 4.13. There is a slight difference between the mean scores of females (M=178.05, SD=70.69) and males (M=201.98, SD=67.15) in favor of males. This slight difference between females and males can also be observed under specific comparison of genders in terms of fields. For example, when female classroom teachers' mean score is 173.65 (SD=74.50), male classroom teachers' mean score is 200.60 (67.78). The least mean TSE score among female teachers is belong to Math teachers (M=161.11, SD=71.84), and the TSE mean scores are increasing in the order of Social Studies teachers (M=172.96, SD=66.95), Classroom teachers (M=173.65, SD=74.50), Science and Technology teachers (M=182.87, SD=72.14), and other fields (M=186.49, SD=63.42). This order is not same for male teachers. Although male Math teachers have the least TSE mean score (M=186.04, SD=64.93) as females and, male Social Studies teachers scored lower (M=191.12, SD=73.69)

than Classroom teachers (M=200.60, SD=74.50), male Science and Technology teachers mean score (M=218.27, SD=67.78) is higher than the mean score (M=205.56, SD=66.97) of the teachers from other fields as opposed to female teachers.

Table 4. 13

TSE scores of teachers in terms of gender and field

			N	M	SD
Female	Field	Classroom Teacher	331	173.65	74.50
		Math Teacher	40	161.11	71.84
		Social Studies Teacher	28	172.96	66.95
		Science and Technology Teacher	89	182.87	72.14
		Others	217	186.49	63.42
	Total		705	178.05	70.69
Male	Field	Classroom Teacher	152	200.60	67.78
		Math Teacher	25	186.04	64.93
		Social Studies Teacher	18	191.12	73.69
		Science and Technology Teacher	30	218.27	62.69
		Others	95	205.56	66.97
	Total		320	201.96	67.15

The pattern of TSE mean scores among male and female teachers, and among teachers from different fields is observable in the subscales of IT Self Efficacy questionnaire except for few instances. Tables from 4.14 to 4.18 summarize teachers' IT Self Efficacy subscale mean scores in terms of gender and field.

Table 4. 14

UICS scores of teachers in terms of gender and field

			N	M	SD
Female	Field	Classroom Teacher	331	34.24	13.82
		Math Teacher	40	32.72	12.89
		Social Studies Teacher	28	35.50	12.35
		Science and Technology Teacher	89	36.53	13.06
		Others	217	38.53	11.91
	Total		705	35.61	13.31
Male	Field	Classroom Teacher	152	38.90	12,18
		Math Teacher	25	36.92	12.15
		Social Studies Teacher	18	37.18	9.92
		Science and Technology Teacher	30	41.63	10.79
		Others	95	39.28	12.43
	Total		320	38.64	11.74

Table 4. 15

TK scores of teachers in terms of gender and field

			N	M	SD
Female	Field	Classroom Teacher	331	37.34	16.84
		Math Teacher	40	32.80	16.70
		Social Studies Teacher	28	36.08	14.00
		Science and Technology Teacher	89	38.18	16.30
		Others	217	38.81	15.43
	Total		705	37.37	16.31
Male	Field	Classroom Teacher	152	44.41	14.99
		Math Teacher	25	42.12	14.64
		Social Studies Teacher	18	41.72	19.74
		Science and Technology Teacher	30	47.77	13.55
		Others	95	43.87	15.85
	Total		320	44.06	15.05

Table 4. 16

OPA scores of teachers in terms of gender and field

			N	M	SD
Female	Field	Classroom Teacher	331	28.34	12.03
		Math Teacher	40	27.08	12.02
		Social Studies Teacher	28	28.73	11.14
		Science and Technology Teacher	89	29.63	12.01
		Others	217	30.82	10.75
	Total		705	28.86	11.72
Male	Field	Classroom Teacher	152	31.44	11.65
		Math Teacher	25	30.84	11.97
		Social Studies Teacher	18	30.89	11.87
		Science and Technology Teacher	30	36.24	11.26
		Others	95	32.20	11.37
	Total		320	31.76	11.30

Table 4. 17

CA scores of teachers in terms of gender and field

			N	M	SD
Female	Field	Classroom Teacher	331	32.56	14.28
		Math Teacher	40	30.15	14.08
		Social Studies Teacher	28	31.89	12.62
		Science and Technology Teacher	89	34.57	13.34
		Others	217	34.82	12.03
	Total		705	33.01	13.49
Male	Field	Classroom Teacher	152	37.22	12.46
		Math Teacher	25	33.63	12.32
		Social Studies Teacher	18	32.89	14.36
		Science and Technology Teacher	30	40.50	10.14
		Others	95	36.87	13.41
	Total		320	36.71	12.33

Table 4. 18

ACU scores of teachers in terms of gender and field

			N	M	SD
Female	Field	Classroom Teacher	331	43.07	20.84
		Math Teacher	40	40.54	20.25
		Social Studies Teacher	28	41.24	18.57
		Science and Technology Teacher	89	44.59	21.80
		Others	217	44.62	18.27
	Total		705	43.19	20.07
Male	Field	Classroom Teacher	152	50.56	20.18
		Math Teacher	25	46.64	21.00
		Social Studies Teacher	18	48.13	22.29
		Science and Technology Teacher	30	56.65	19.98
		Others	95	52.18	21.67
	Total		320	50.80	20.63

Descriptive information about IT Self Efficacy scores in terms of age and experience

Teachers' ages were coded under four groups. First cut point of the groups is age of 30 and the teachers whose age are lover than 30 were coded under first age group. The following cut points were sequenced with 30-year gaps and 4 age groups were generated. In the light of these, as stated in Table 4.19, teachers from the first group scored higher in all the subscales of IT self efficacy survey. As a consequence, teacher whose age is lover that 30 also have higher mean score in TSE (M=224.73, SD=50.38) as indicated in Table 4.20.

Table 4. 19

IT self efficacy survey sub-scale scores over age groups of teachers

		UICS		TK		OPA		CA		ACU	
Age	N	M	SD	M	SD	M	SD	M	SD	M	SD
< 30	109	43.78	8.58	48.39	11.28	36.20	8.62	40.46	9.24	55.90	17.68
30 - 40	296	40.32	11.39	43.49	14.72	32.61	10.76	37.73	11.96	50.08	20.13
41 - 50	419	35.03	12.95	37.44	16.67	28.09	11.82	32.67	13.60	43.13	20.49
50 <	201	30.34	13.30	32.97	16.04	25.59	11.64	28.70	13.32	38.40	18.96

For each subscale, decrease in mean scores was observed while ages of the teachers are increasing. In terms of TSE, second age group (between 30 and 40) have 204.25 (SD=64.57) as the mean score, and third group (between 41 and 50) and fourth group (higher that 50) has 176.37 (SD071.17) and 156.00 (69.62) as mean scores respectively.

Table 4. 20

Teachers' IT self efficacy scores over age groups of teachers

		TSE	
Age	N	M	SD
< 30	109	224.73	50.38
30 - 40	296	204.25	64.57
41 - 50	419	176.37	71.17
50 <	201	156.00	69.62

Table 4.21 and Table 4.22 presents mean and standard deviation scores of teachers' IT Self Efficacy scores in terms of their teaching experience. To understand the change, teachers were grouped under four groups according to their years of experience. Similar to age, teachers' self-efficacy scores under five subscales are decreasing when their experience is increasing. Therefore TSE scores showed same pattern.

Table 4. 21

IT self efficacy survey sub-scale scores over experience groups of teachers

		UICS		TK		OPA		CA		ACU	
Experience	N	M	SD	M	SD	M	SD	M	SD	M	SD
< 7	112	42.41	10.08	47.66	12.52	35.73	9.36	39.82	10.29	55.75	18.33
17 - 27	368	39.41	12.00	42.50	14.32	31.80	11.08	36.73	12.64	48.58	20.61
28 - 37	312	35.35	12.51	37.46	16.17	28.52	11.47	33.12	13.03	43.70	19.48
37 <	203	29.54	13.35	32.02	16.29	24.34	11.76	27.58	13.35	36.78	19.31

Table 4. 22

Teachers' IT self efficacy scores over experience groups of teachers

		TSE	
Experience	N	M	SD
< 7	112	221.38	56.19
17 - 27	368	199.02	67.39
28 - 37	312	178.16	68.14
37 <	203	150.28	70.18

Descriptive information about IT Self Efficacy scores in terms of amount of computer training

Teachers who attended computer and technology 120 hour or more have higher IT Self Efficacy in each sub-scale than other teachers. As understood from Table 4.23, there is not an exact pattern indicating that higher amount of training is higher IT Self Efficacy except for the last group of teachers who attended 120 hours or more computer training.

Table 4. 23

IT self efficacy survey sub-scale scores over training hours groups of teachers

		UICS		TK		OPA		CA		ACU	
Training Hours	N	M	SD	M	SD	M	SD	M	SD	M	SD
0	147	32.63	15.20	33.74	17.98	25.16	13.27	29.32	15.19	39.23	22.93
< 30	130	35.20	13.60	38.94	15.79	28.06	11.84	32.97	13.54	41.94	19.63
30 - 59	210	34.48	13.31	36.81	16.14	27.67	11.12	32.23	13.60	42.89	19.79
60 - 89	145	34.62	11.32	36.60	15.22	27.72	10.72	32.31	11.78	41.28	17.52
90 - 119	59	37.85	11.78	41.44	15.51	32.33	10.95	36.53	12.12	49.15	20.45
119 <	228	42.91	9.83	48.42	13.11	36.18	9.62	41.06	10.26	57.77	18.10

The situation observed by examination of IT Self Efficacy sub-scales was also visible on TSE scores of teachers. TSE mean score of teachers with no training is 160.08 (SD=80.02) and this group has the least score among all groups. On the other

hand teachers from the second group (with less than 30 hours computer training) have higher mean TSE score (M=177.13) than second (with 30-59 hours computer training, M=174.08) and third group (with 60-89 group hours computer training, M=172.50). Table 4.24 presents information about all these groups' means and standard deviations.

Table 4. 24

Teachers' IT self efficacy scores over experience training hours groups of teachers

		TSE	
Training Hours	N	M	SD
0	147	160.08	80.82
< 30	130	177.13	69.73
30 - 59	210	174.08	69.73
60 - 89	145	172.52	61.74
90 - 119	59	197.29	65.74
119 <	228	226.33	56.97

Investigation of Factors Affecting Teachers' IT Self Efficacy Perceptions

During the process of data collection to investigate teachers' IT Self Efficacy perceptions, a number of variables which has potential to affect this perception were also asked to teachers. Their gender and age, field of profession, experience, use of home computer, number of computer and technology related training and total hours they attended to these training courses were taken as the factors to investigate their IT Self Efficacy beliefs. Although age, experience and number of attended training hours were presented as categorical variables in the previous sections, they are also available as continuous variables. Therefore continuous states of these variables were used in analyses.

Five subscale and one total IT Self Efficacy scores were taken as dependent variables. Hierarchical Multiple Regression Analysis was conducted on these dependent variables. For this analysis, two groups of independent variables were

structured. In the first group, variables for basic demographic information of teachers were accumulated. These variables were gender, age, experience, and field of profession. Since age and experience are highly correlated in natural, age variable were removed from the analysis. Dummy coding procedure was conducted on the categorical independent variable field of profession. Table 4.25 provides information about new variables created via dummy coding.

Table 4. 25

Dummy Coding of the Variable "Field"

Original Variable "Field"	First New Variable "MT"	Second New Variable "SS"	Third New Variable "ST"	Fourth New Variable "OT"
1= "Classroom Teacher"	0	0	0	0
2= "Math Teacher"	1	0	0	0
3= "Social Studies Teacher	0	1	0	0
4= "Science and Technology Teacher"	0	0	1	0
5= "Other"	0	0	0	1

Since Classroom Teachers constitute the biggest percentage among the teachers participated in the study, they were taken as the reference for dummy coding procedure. Four variables were created for the remaining four categories of the field variable.

Second group of variables entered to hierarchical multiple regression analysis is the predictor about computer related history of teachers. These variables are home computer use, number of computer trainings they were attended and total number of hours of these trainings.

4.3.2. Perceived Computer Self- Efficacy in terms of Use of Internet and Computer to Support Teaching and Learning (UICS) (Research Question 3.1)

Before conducting multiple regression analysis, necessary assumptions were checked. There is enough observation for each of eight independent variables including four variables coming out of dummy coding. Normal distribution of residuals is another assumption to conduct multiple regression analysis. Figure 4.1 and Figure 4.2 guarantee the normal distribution of residuals for the dependent variable UICS. The normal curve in Figure 4.1 does not show any skewed structure to left or right and Figure 4.2 presents a liner line.

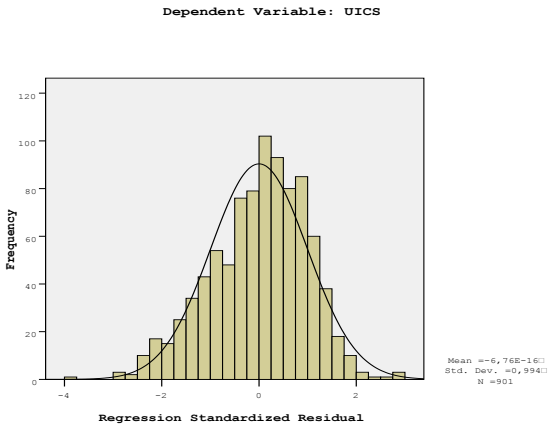

Figure 4. 1 Histogram of UICS's residuals with normal curve

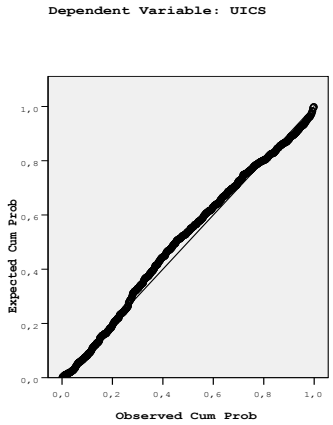

Figure 4. 2 P-P plots of UICS

To confirm independence of observation, Durbin Watson test results were controlled. The test yielded appropriate value (d=1.87) which is between 1.50 and 2.50. Figure 4.3 is the scatter plot of UICS and it does not show any pattern. Therefore homoscedasticity assumption was gained.

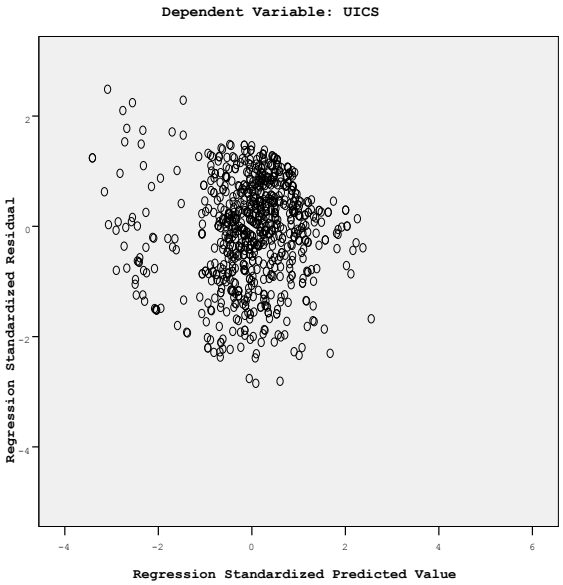

Figure 4. 3 Scatter plot of predicted value and residual of UICS

Multicollinearity assumption is necessary to detect if there is any high correlation between any two of the independent variables. As discussed before, experience variable were removed from the analysis because of the possibility of high correlation with the variable age. Except for this situation there was not any high correlation between any two of the predictor variables. There is not any VIF value which is higher than the critical value 4. In addition, all the tolerance values were higher than .20. As a result, there was not any correlation among predictors which was violating the multiple regression analysis. Mahalonobis distance, Cook's distance, and Leverage statistics were checked to investigate the outliers and residuals. The critical Chi square value for nine is 27.88 and there is not any record which has higher Mahalonobis distance value than this critical value at α=.001. Leverage values lied between 0-1. There were few cases having higher df values than calculated Cook's distance value. Since no difference was observed between the results of multiple regression analysis with and without these cases, the result with inclusion of these cases was reported.

After checking all the assumptions, multiple regression analysis was run with two groups of predictors. As discussed before, first group variables were teaching experience, gender, and dummy variables coming from field of profession variable. The second group variables were home computer use, number of trainings and total hours of training. The results of hierarchical regression analysis yielded significant models. Table 4.26 presents information about this regression analysis on the dependent variable UICS.

Significant results were gained from first model (F (6, 900) =22.62, p<.05). Gender, teaching experience, and field variables explained 13% of the variance of UICS (R^2= .13). Second model is significant, too (F (9, 900) =37.82, p<.05). Home computer, number of trainings and total hours of training explained 15% percent of the variance (ΔR^2= .15). All predictor variables were explained %28 of UICS (R^2= .28). Gender and teaching experience were found significant in terms of contribution to two of the models. Home computer use, number of training, and total hours of training

contributed the second model significantly. Having one of the fields of profession was not significantly contributed to either of models. But being Math teacher was slightly coming forward among all fields. Its unique contribution to model is much higher than others ($sr^2_{(Math\ T.)}$= .004, $sr^2_{(Social\ Studies\ T)}$ = .0005, $sr^2_{(Science\ \&\ Technology\ T.)}$= .00002, $sr^2_{(Other.)}$= .000001). This means that being Math teacher have a slight negative contribution to prediction of UICS. Except for field of profession variables, other basic demographic variables teaching experience and gender have significant unique contributions to model ($sr^2_{(Gender)}$ = .01, $sr^2_{(Teaching\ Exp.)}$ = .09). All of the computer use history related variables were found significant, but among all predictors, use of home computers made the biggest contribution to the second model ($sr^2_{(Home\ Computer\ Use.)}$= .11, $sr^2_{(Number\ of\ Trainings)}$ = .01, $sr^2_{(Total\ Hours\ of\ Training)}$ = .008)

Table 4. 26

Hierarchical Regression Analysis Predicting UICS with Gender, Teaching Experience, Field, HCU, NUMT and NUMH

Model	Predictors	R	R^2	ΔR^2	ΔF	sr^2	*B*	β
Model 1		.36	.13	.13	22.62			
	Gender					.03	4.23	.15**
	Teaching Exp.					.11	-.48	-.33**
	Math T					.003	-2.68	-.05
	Social Studies T.					.00008	-.55	-.01
	Science & Tech. T					.0005	.89	.02
	Others					.001	.88	.03
Model 2		.53	.28	.15	59.35			
	Gender					.01	2.50	.09*
	Teaching Exp					.09	-.40	-.27**
	Math T					.004	-2.93	-.05
	Social Studies T.					.0005	-1.3	-.02
	Science & Tech. T					.00002	-.13	.03
	Others					.000001	.02	.01
	Home computer use					.11	-15.16	-.31**
	Number of trainings					.01	1.14	.13*
	Total hours of training					.008	0.01	.11*

*p< .05, **p< .001)

4.3.3. Perceived Computer Self- Efficacy in terms of Technical Knowledge (TK) (Research Question 3.2)

Necessary assumptions were checked before conducting multiple regression analysis for the variable TK. Number of observations for each of eight independent variables was enough. Normal distribution of residuals for the dependent variable TK was controlled by the histogram (Figure 4.4) and P-P plot (Figure 4.5). Histogram and P-P plot for residuals did not indicate any skewness.

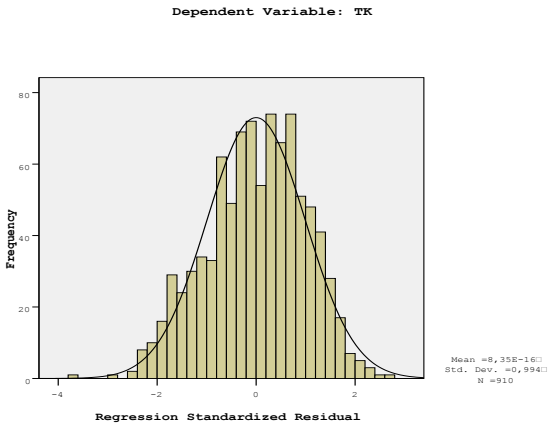

Figure 4. 4 Histogram of TK's residuals with normal curve.

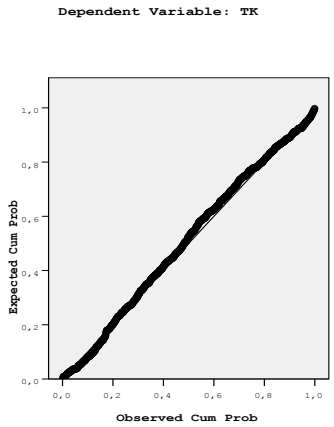

Figure 4. 5 P-P plot of TK

Durbin Watson test results were checked to confirm independence of observation. The test yielded appropriate value (d=1.86) which is between 1.50 and 2.50. Scatter plot for TK were also controlled to indicate whether there exist a pattern or not. There was not any pattern that is observed from the Figure 4.6. Homoscedasticity assumption was gained.

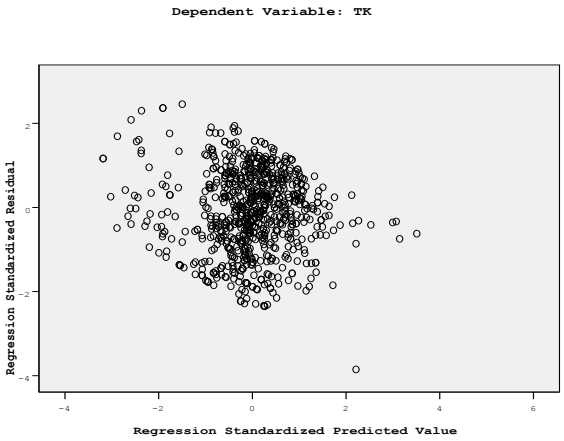

Figure 4. 6 Scatter plot of predicted value and residual of TK

VIF values are lower than four, and tolerance values are higher than .20. Therefore, there is not any correlation among predictors violating multicollinearity assumption. The critical Chi square value for nine independent variables is 27.88. There is not any record which has higher Mahalonobis distance value. Leverage values lied between 0-1. There is not any value higher than the calculated Cook's distance value. Table 4.27 is about regression analysis on the dependent variable TK. First model was found significant (F (6, 909) =24.53, p<.05). 14% of TK were explained by the predictors gender, teaching experience, and field variables (R^2= .14). Second model was also significant (F (9, 909) = 42.36, p<.05). The variables from the second model (home computer, number of trainings and total hours of training) explained 16% percent of the variance (ΔR^2= .16). Total 30 percent of the dependent variable were explained by the predictors (R^2= .30). Gender and teaching experience were found significant into two of the models. In addition, being a Math teacher was also a

significant contributor to the second model (sr^2= .01). Home computer use, number of training, and total hours of training were also found significant in the second model. Except for being Math teacher, having one of the fields of profession was not significantly contributed to either of models (sr^2 (Social Studies T) = .002, sr^2 (Science & Technology T.)= .002, sr^2 (Others)= .007). In other words, being Math teacher has a negative contribution to having high TK scores. Basic demographic variables age and gender have significant unique contributions to the model (sr^2 (Gender) = .04, sr^2 (Teaching Exp.) = .08). Computer history variables were found significant, but among all predictors, use of home computers again made the biggest contribution to the second model (sr^2 (Home Computer Use.)= .11, sr^2 (Number of Trainings) = .02, sr^2 (Total Hours of Training) = .01).

Table 4. 27

Hierarchical Regression Analysis Predicting TK with Gender, Age, Field, HCU, NUMT and NUMH

Model	Predictors	R	R^2	ΔR^2	ΔF	sr^2	*B*	β
Model 1		.39	.14	.14	24.53			
	Gender					.08	8.08	.23**
	Teaching Exp.					.10	-.58	-.34**
	Math T					.006	-4.98	-.07*
	Social Studies T.					.001	-2.79	-.04
	Science & Tech. T					.0001	-.56	.00
	Others					.002	-1.59	-.04
Model 2		.55	.30	.16	67.23			
	Gender					.04	5.84	.17**
	Teaching Exp.					.08	-.48	-.28**
	Math T					.01	-5.57	-.08*
	Social Studies T.					.002	-3.10	-.04
	Science & Tech. T					.002	-1.95	-.02
	Others					.007	-2.72	-.07*
	Home computer use					.11	-17.91	-.28**
	Number of trainings					.02	1.94	.17**
	Total hours of training					.01	.01	.12*

*p< .05, **p< .001)

4.3.4. Perceived Computer Self- Efficacy in terms of Micro Soft Office Programs and Their Applications (OPA) (Research Question 3.3)

In this section, results of hierarchical multiple regression analysis on the dependent variable OPA were presented. From the Figure 4.7 and Figure 4.8, normal distribution of residuals was seen.

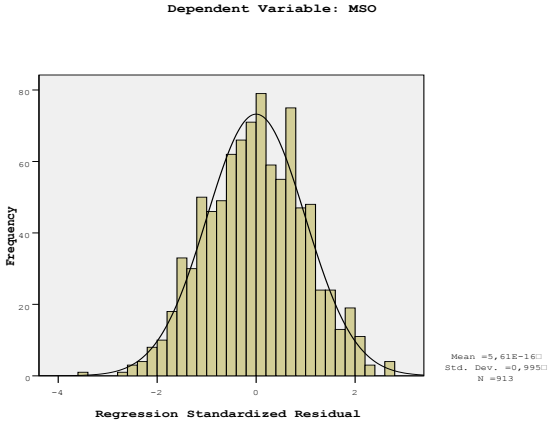

Figure 4. 7 Histogram of OPA's residuals with normal curve

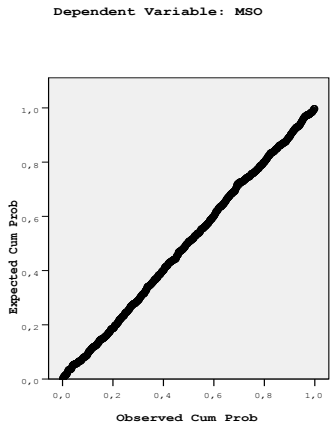

Figure 4. 8 P-P plot of OPA

Independence of observation assumption for multiple regression analysis on OPA was confirmed by the Durbin Watson test. The test produces appropriate value

(d=1.83) which was between 1.50 and 2.50. Scatter plot for OPA didn't show any pattern (Figure 4.9) Homoscedasticity assumption was gained.

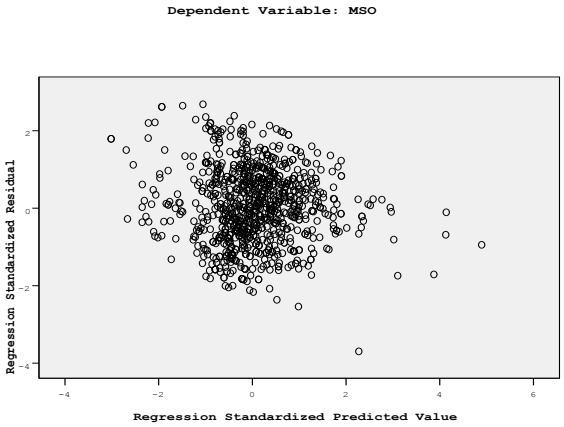

Figure 4. 9 Scatter plot of predicted value and residual of OPA

There was not any case violating multicollinearity. VIF values are not higher than the critical value four and tolerance values are higher than .20. As a result, there is not any correlation among predictors which was violating the multiple regression analysis. The critical Chi square value for nine was 27.88 and there was not any record which has higher Mahalonobis distance value than this critical value at α=.001. Leverage values lied between 0-1. There were not any values higher than the calculated Cook's distance value.

Information about multiple regression analysis on the dependent variable OPA is available through Table 4.28. First model was significant with F (6, 912) =18.52, p<.05. Predictors from first model explained 11% of the variance (R^2= .11). Second model was also significant (F (9, 912) = 35.95, p<.05). 15% of total variance of OPA were explained by the second group of variables (ΔR^2= .15). As for the dependent variable UICS, only gender and teaching experience were found significant in the first model. They were also significant in the second model. Additionally, home computer use, number of training, and total hours of training were also found significant in the second model as expected. The unique contributions of these

significant variables to the second model are .008 for gender, .08 for teaching experience, and .06, .03 and .01 for home computer use, number of trainings and total hours of training respectively. Being one of member of the fields did not contribute significantly to explanation of the OPA's variance.

Table 4. 28

Hierarchical Regression Analysis Predicting OPA with Gender, Age, Field, HCU, NUMT and NUMH

Model	Predictors	R	R^2	ΔR^2	ΔF	sr^2	*B*	β
Model 1		.33	.11	.11	18.53			
	Gender					.02	3.72	.15**
	Teaching Exp					.09	.41	-.31**
	Math T					.002	-1.93	-.04
	Social Studies T.					.0004	-1.19	-.02
	Science & Tech. T					.0002	.55	.02
	Others					.00001	-.09	-.001
Model 2		.50	.26	.15	58.47			
	Gender					.008	2.07	.08*
	Teaching Exp.					.08	-.34	-.27**
	Math T					.003	-2.45	-.05
	Social Studies T.					.0006	-1.26	-.02
	Science & Tech. T					.0001	.40	.01
	Others					.001	-.88	-.03
	Home computer use					.06	-9.94	-.22**
	Number of trainings					.03	1.59	.20**
	Total hours of training					.01	.01	.13*

*p< .05, **p< .001)

4.3.5. Perceived Computer Self- Efficacy in terms of Classroom Applications (CA) (Research Question 3.4)

Figure 4.10 and Figure 4.12 presents histogram and P-P plot for the residuals of CA. The information available through these figures assures that residuals are normally distributed for CA. There were not any skewed condition, therefore, normality assumption for multiple regression analysis were gained.

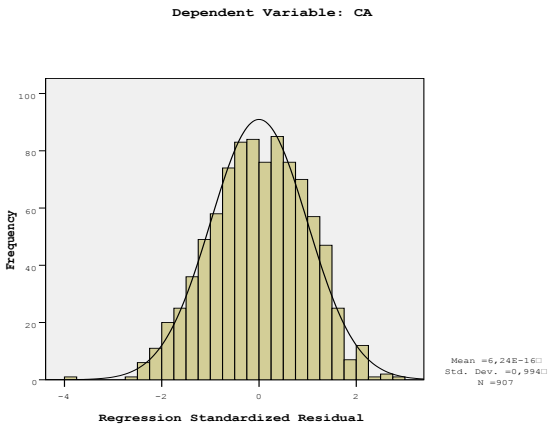

Figure 4. 10 Histogram of CA's residuals with normal curve

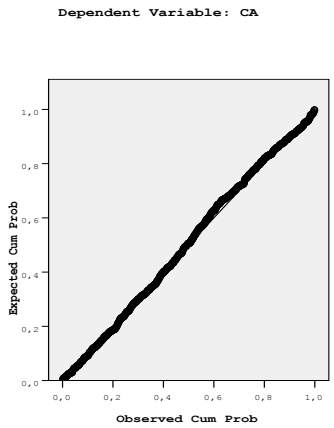

Figure 4. 11 P-P plot of CA

Homoscedasticity were controlled by the scatter plot (Figure 4.12) which belongs to the dependent variable CA. As seen from it, there was not a definite pattern between residuals and predicted values. Therefore there was not a problem in terms of homoscedasticity. Independence of observation was also not a problem for multiple regression analysis on CA because Durbin Watson test produces a value between the critical boundaries 1.50 and 2.50 (d= 1.84).

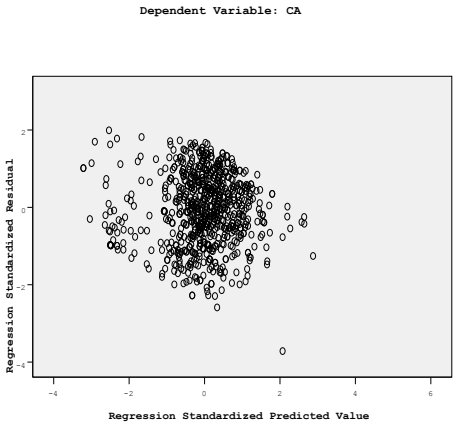

Figure 4. 12 Scatter plot of predicted value and residual of CA

Multicollinearity assumption is necessary to detect if there is any high correlation between any two of the independent variables. There was not any VIF value which is higher than the critical value 4. In addition all the tolerance values are higher than .20. As a result, there is not any correlation among predictors which is violating the multiple regression analysis. Mahalonobis distance, Cook's distance, and Leverage statistics were checked to investigate the outliers and residuals. The critical Chi square value for nine is 27.88 and there is not any record which has higher Mahalonobis distance value than this critical value at α=.001. Leverage values lied between 0-1. No cases were detected with higher value that the calculated Cook' distance value.

After checking all the assumptions, multiple regression analysis was run with two groups of predictors. Table 4.29 presents information about this regression analysis on the dependent variable CA. Significant results were gained from first model ($F(6, 906)=18.62$, $p<.05$). Gender, teaching experience, and field variables explained 11% of the variance of CA ($R^2= .11$). Among them, only gender and teaching experience significantly contributed to the first model. Second model is also significant with $F (9, 906) =34.95$ ($p<.05$). Home computer, number of trainings and total hours of training explained 15% percent of the variance ($\Delta R^2= .15$). All predictor variables

were explained %26 of CA (R^2= .26). Gender and teaching experience were found significant in terms of contribution to both models (sr^2 (Gender) = .01, sr^2 (Teaching exp.) = .07). On the other hand, Math T. variable were also significant in the second although it was not significant in the first model (sr^2 (Math T.)= .006). Home computer use, number of training, and total hours of training also contributed significantly to the second model significantly (sr^2(Home Computer Use.)= .09, sr^2 (Number of Trainings) = .02, sr^2 (Total Hours of Training) = .01).

Table 4. 29

Hierarchical Regression Analysis Predicting CA with Gender, Age, Field, HCU, NUMT and NUMH

Model	Predictors	R	R^2	ΔR^2	ΔF	sr^2	*B*	β
Model 1		.33	.11	.11	18.62			
	Gender					.03	4.80	.17**
	Teaching Exp					.09	-.45	-.30**
	Math T					.004	-3.33	-.06
	Social Studies T.					.003	-3.17	-.05
	Science & Tech. T					.0002	.52	.01
	Others					.0002	-.73	-.03
Model 2		.51	.26	.15	60.26			
	Gender					.01	2.93	.10*
	Teaching Exp.					.07	-.37	-.24**
	Math T					.006	-3.75	-.07*
	Social Studies T.					.003	-3.37	-.05
	Science & Tech. T					.0002	-.56	.01
	Others					.003	-1.61	-.06
	Home computer use					.09	-14.17	-.28**
	Number of trainings					.02	1.47	.16**
	Total hours of training					.01	.01	.12*

*p< .05, **p< .001)

4.3.6 Perceived Computer Self- Efficacy in terms of Advance Computer Use (ACU) (Research Question 3.5)

In order to check normal distribution of residuals which belongs to ACU, histogram (Figure 4.13) and P-P plot were examined. It was seen that residuals did not skewed left or right. Therefore, it can be assumed that residuals were distributed normally.

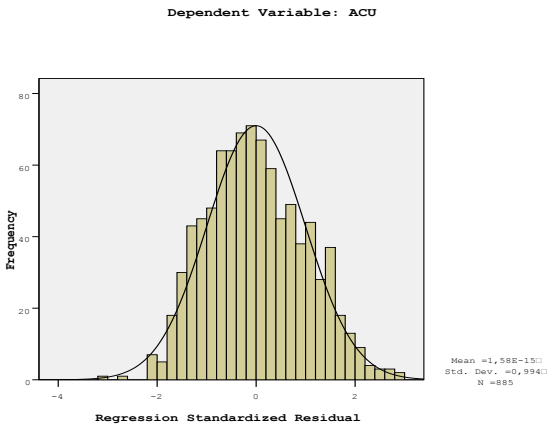

Figure 4. 13 Histogram of ACU's residuals with normal curve

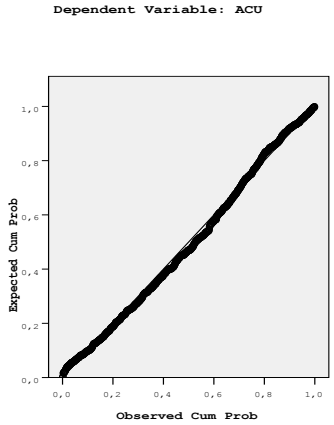

Figure 4. 14 P-P plot of ACU

Scatter plot of ACU (Figure 4.15) indicated that predicted values and residuals did not showed any pattern, so homoscedasticity assumption were not violated. Durbin Watson test generated the value 1.81 and it lies between the critical values 1.50 and 2.50 to assure the condition of independence of observation.

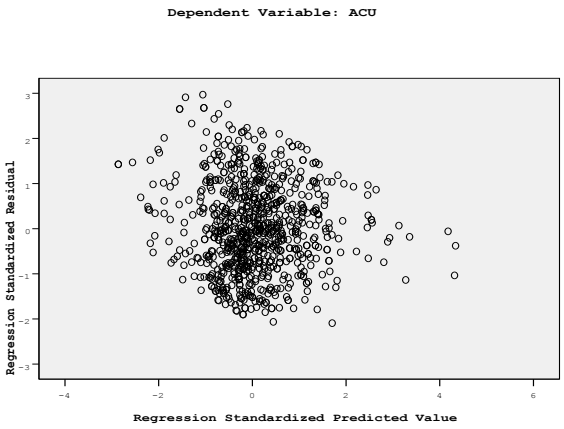

Figure 4. 15 Scatter plot of predicted value and residual of ACU

Multicollinearity was not observed. Tolerance values were found higher than 2.00. In addition, VIF values were also lower than the critical value 4.00. A for the previous multiple regression analyses, the critical Chi square value for nine is 27.88 and no record were observed with higher Mahalonobis distance value than this critical value at α=.001. Leverage values lied between 0-1. There are not any values higher than the calculated Cook's distance value.

Table 4.30 presents necessary numbers for the results of the hierarchical multiple regression analysis on the dependent variable ACU. First model was found significant (F (6, 884) =19.77, p<.05). %12 of the variance was explained by the first model. Analysis resulted with significance values for second model also (F (9, 884) = 34.00, p<.05). 14% change explained variance were calculated from the first to second model (ΔR^2=.14). In the first model, gender and teaching experience were found significant. These predictors were also significant in the second model. Home computer use, number of training, and total hours of training were the other variables significant in this model. The unique contributions of these significant variables to the second model are .03 for gender, .07 for teaching experience, and .05, .02 and .02 for home computer use, number of trainings and total hours of training respectively.

Being one of member of the fields was not contributed significantly to explanation of the ACU's variance.

Table 4. 30

Hierarchical Regression Analysis Predicting ACU with Gender, Age, Field, HCU, NUMT and NUMH

Model	Predictors	R	R^2	ΔR^2	ΔF	sr^2	*B*	β
Model 1		.35	.12	.12	19.77			
	Gender					.05	9.61	.22**
	Teaching Exp					.08	-.68	-.29**
	Math T					.002	-3.65	-.04
	Social Studies T.					.001	-3.86	-.04
	Science & Tech. T					.000004	.14	.002
	Others					.001	-1.45	-.03
Model 2		.51	.26	.14	55.15			
	Gender					.03	6.70	.15**
	Teaching Exp.					.07	-.58	-.25**
	Math T					.003	-3.96	-.05
	Social Studies T.					.002	-4.04	-.04
	Science & Tech. T					.0005	-4.28	-.02
	Others					.004	-1.37	-.06
	Home computer use					.05	-15.94	-.20**
	Number of trainings					.02	2.58	.18**
	Total hours of training					.02	.03	.16**

*p< .05, **p< .001)

4.3.7. Perceived Computer Self- Efficacy in terms of Total IT self efficacy Scores (TSE) (Research Question 3.6)

Factors affecting teachers' total IT Self Efficacy scores (TSE) were investigated in this section. Normal distribution of residuals was controlled by examining histogram (Figure 4.16) and P-P plot (4.17) of the related variable. As seen from the figures, there was not a situation violating normality assumption of multiple regression analysis on TSE.

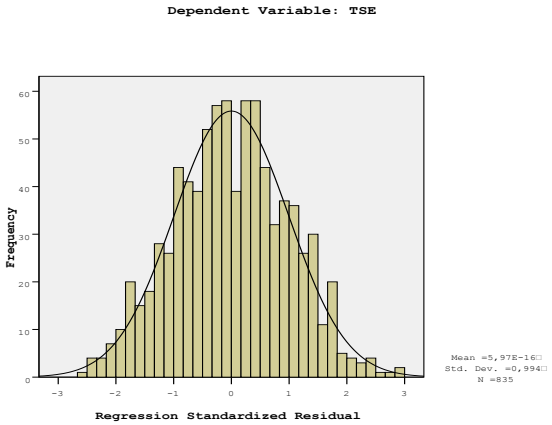

Figure 4. 16 Histogram of TSE's residuals with normal curve*16*

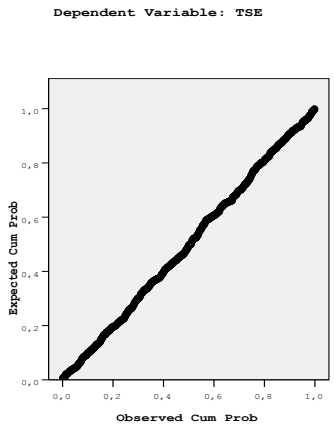

Figure 4. 17 P-P plot of TSE

Homoscedasticity and independence of observation are another two assumptions for the analysis. Scatter plot (Figure 4.18) indicated that there is not pattern between standardized residuals and predicted values. In addition, with the d value 1.80 from the Durbin Watson test, independence of observation for multiple regression analysis was also guarantied.

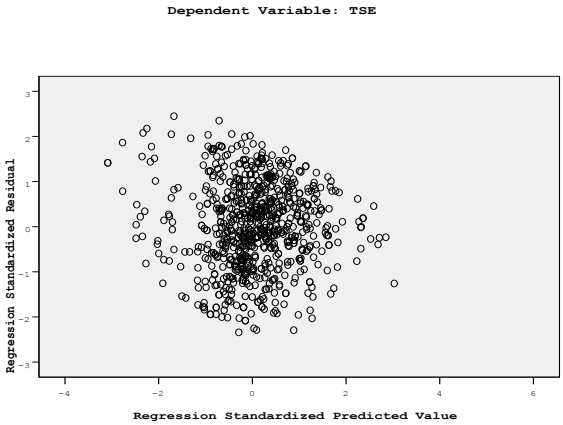

Figure 4. 18 Scatter plot of predicted value and residual of TSE

Multicollinearity was not observed. Tolerance values were found higher than 2.00. In addition, VIF values were also lower than the critical value 4.00. A for the previous multiple regression analyses, the critical Chi square value for nine is 27.88 and no record were observed with higher Mahalonobis distance value than this critical value at α=.001. Leverage values lied between 0-1. There are not any values higher than the calculated Cook's distance value.

Numbers for the results of the hierarchical multiple regression analysis on the dependent variable TSE were presented through Table 4.31. Both of the models were found significant. For the first model, *F* (6, 834) value was 23.16 and this model explained 14% of total variance. Gender and teaching experience were significant in the first model. For the second model, 15% change in explained variance were calculated ($F(9, 834)= 39.19$, $p<.05$). In addition to gender and teaching experience, Math teacher, home computer use, number of training, and total hours of training were found significant ($sr^2_{(gender)}= .03$, $sr^2_{(teaching\ exp.)}= 0.09$, $sr^2_{(Math\ T)}= .005$, $sr^2_{(Home\ Computer\ Use.)}= .09$, $sr^2_{(Number\ of\ Trainings)} = .02$, $sr^2_{(Total\ Hours\ of\ Training)} = .01$). Total 31% of the total variance in IT self efficacy perceptions of teachers were explained with the predictors form these two models. As explained before, teaching experience and home computer use were found as the most powerful predictors to estimate IT self efficacy beliefs of teachers in terms of ICT integration. On the other hand, gender,

number of training, and total hours of training were also found as important predictors. Except for these variables, field of profession was not seen as strong as the other variables to explain the variance. Significant results were just found between Math teacher and the reference category Classroom teacher variables with negative contribution. This means that being Math teacher instead of being classroom teacher negatively affects TSE of teachers participated in the study.

Table 4. 31

Hierarchical Regression Analysis Predicting TSE with Gender, Age, Field, HCU, NUMT and NUMH

Model	Predictors	R	R^2	ΔR^2	ΔF	sr^2	*B*	β
Model 1		.38	.14	.14	23.16			
	Gender					.05	31.47	.20**
	Teaching Exp.					.11	-2.7	-.33**
	Math T					.004	-17.78	-.06
	Social Studies T.					.001	-10.49	-.03
	Science & Tech. T					.00008	1.96	.01
	Others					.0001	-1.87	.01
Model 2		.55	.30	.16	61.18			
	Gender					.02	20.62	.13**
	Teaching Exp.					.09	-2.26	-.28**
	Math T					.005	-18.90	-.06*
	Social Studies T.					.002	-13.87	-.04
	Science & Tech. T					.0004	-4.03	.02
	Others					.003	-7.22	-.05
	Home computer use					.09	-70.47	-.27**
	Number of trainings					.02	8.52	.18**
	Total hours of training					.01	.08	.13*

*p< .05, **p< .001)

4.5 Summary of the Chapter

In the result chapter, data collected from three main resources were analyzed and the results were reported. Main conclusion derived from data analysis is that teachers have to operate some basic technology and computer skills to meet the needs expressed by the curricula. But teachers expressed several barriers preventing them to integrate technology into school circumstances. Some of these barriers are originated from the stakeholders who are not teachers, such as inappropriate student-ICT relationship, insufficient technological infrastructure of schools, and problem related with in-service trainings given to teachers. But their low competency, literacy, and self-efficacy in terms of ICT were spoken out loudly by teachers.

Via the examination of curricula which were in the scope of the study, use of Internet in different formats was found a crucial application of ICT in educational activities in schools of K-8. Internet search, field trips, and use of Internet based visuals are in the scope of the ICT related skills that the teachers need to have to integrate these ICTs in school setting successfully. In addition, videos and other multimedia applications, use of office tools, and basic visual design tools are other necessary subjects that need to be preserved in the ICT literacy of teachers.

Teachers were asked whether they have these skills and they can use technology as the curricula propose. Although technological infrastructure of schools, inappropriate use of computers by students and their parents according to teachers, main issue about unsuccessful ICT integration is teachers' inefficacies in terms of technology use and technology integration. Current status and politics about organizing computer training for in-service teachers were seen as an area that needs the initial action plan to recover the problem of technology integration.

As understood from the statistical information available though Turkish Ministry of National Education, almost all of the teachers has attended at least a computer related in-service training and they have a certificate which provides evidence for their level

of literacy. For this reason, instead of assessing their computer literacy, teachers were asked to evaluate their computer self-efficacy on different computer self-efficacy constructs. For construct and total IT Self Efficacy beliefs of teachers, teaching experience and home/personal use of computers were found the strongest variables affecting positively these constructs. Although their gender and training history were also found as other significant predictors of IT Self Efficacy, they were not as powerful as age and home/personal use of computers. Their field were also found significant predictor in some cases, and also it was seen that field of profession variable cannot explain considerable amount of IT Self Efficacy variance Table 4.32 summarizes the statistical analysis results with the unique contributions of each significant variables.

Table 4. 32

Unique contribution of significant independent variables

Model	Predictors	UICS	TK	OPA	CA	ACU	TSE
Model 1	R^2	.13	.14	.11	.11	.12	.14
	Gender	.03	.08	.02	.03	.05	.05
	Teaching Experience	.11	.10	.09	.09	.08	.11
	Math T		.006				
	Social Studies T.						
	Science & Tech. T						
	Others						
Model 2	R^2	.28	.30	26	.26	.26	.30
	Gender	.01	.04	.008	.01	.03	.02
	Teaching Experience	.09	.08	.08	.07	.07	.09
	Math T		.01		.006		.005
	Social Studies T.						
	Science & Tech. T						
	Others		.007				
	Home computer use	.11	.11	.06	.09	.05	.09
	Number of trainings	.01	.02	.03	.02	.02	.02
	Total hours of training	.008	.01	.01	.01	.02	.01

CHAPTER 5

DISCUSSION, CONCLUSION, AND IMPLICATIONS

Throughout this chapter, a conclusion of the research, general discussion of the findings as the answers of the research questions of this study, and possible implications and possible future research suggestions were presented.

The main purpose of the study was to investigate the possible factors which affect the success of ICT integration in K-8 schools. Integration of ICT into education might be defined as attempts of increasing the use of Internet and other computer based tools for educational activities to develop learning (Van Melle, Cimellaro & Shulha, 2003). Integration of ICT has a multi-dimensional structure including technological infrastructure and adaptation human side to technology enhanced environment (Unluer, 2011).

For this reason, a deep focus was given to the curricula of Math, Social Studies and Science and Technology courses to define the pattern of ICT use that teachers and students were expected to follow during scholar activities. With the guiding information gained through examination of curricula, teachers were basically asked whether they can follow this pattern and which the basic concerns constituting possible threats against integration of ICT.

After analyzing data collected from teacher interviews qualitatively, level of computer-self efficacy perceptions of teachers were also investigated. Quantitative data were analyzed after collecting data via IT Self Efficacy questionnaire which was developed by the researcher.

5.1. ICT in Curricula (Research Question 1)

Math, Social Studies and Science and Technology courses' curricula were investigated in order to draw the pattern of ICT use in schools of K-8. Grades from 4 to 8 were included in the study. At the end of the examination of these curricula, basic ICT application groups and necessary skills that teachers and students should have to fulfill successfully these applications were identified.

Major use of ICT was found as the use of Internet in different formats. Internet based search, virtual field trips, and obtaining multimedia and visual course materials are different formats of Internet use in curricula. It is a quite expected result because Internet constitutes one of the most used tools to reach information in different parts of life as in education. As elaborated by McEneaney (2000), web-based instructional resources can provide powerful instruments which enable us to do the things that we can never do by printed media, therefore, probably Internet is the most transformative technology in the history. It is inevitable to equip curricula without the integration of Internet in today's educational system (Kilimci, 2010). Although such uses of ICT as video demonstrations, office tools, and poster design are not dense as much as Internet, they are also highly visible in the curricula.

5.2. Teachers' feeling about the use of ICT in educational activities (Research Question 2)

In this section, teachers' feelings about ICT in their daily and personal life were discussed. The data leading this section were collected through semi-structured interviews. The results were extracted by the help of the qualitative analysis of which

results were discussed together with the previous section which includes ICT usage in curricula.

5.2.1. The way of ICT use and the source of ICT literacy

In terms of frequencies of ICT applications in different courses and grade levels, there are some differences with the quantities. For example, the number of ICT use in Science and Technology course almost equals to the total number of ICT applications in Math and Social Studies both in direct and indirect manner. It is an expected finding because, as indicated by Linn (2003), computer technologies are promising in terms of different learning opportunities in such courses. Since Science and Technology course preserves visualization in its nature, this result is also as expected. These variations are not visible among grade levels as among different courses.

There are considerable amount of ICT applications defined by the curriculum. Successful transition of the ICT applications from curricula to educational environment has great importance. According to Sugar et al. (2004), students who have been taught in a well designed technology rich environment presented their expectations for future use of technology from their teachers. Even if the existence of these applications can be easily observed, the success is not so clear. According to the study of Chandra and Llyod (2008), ICT can improve students' performance in some cases and these results could not be globally accepted because of the complexity of the environment. There are many variables increasing this complexity in educational environments. Therefore, teachers were asked to define this complexity in their classroom to understand and explain the status of ICT integration. From the analysis of the qualitative data gathered via interviews, it was found that there is a relationship between daily use of computers and academic use of computers by teacher. In detail, teachers using computers for their daily purposes, such as communication, entertaining, searching for information and etc. also use

them for educational purposes more often. Therefore, it can be concluded that use of computers in and out of school setting might be interdependent.

This situation is also observable from the sources of ICT literacy of teachers. Five basic ICT literacy sources were detected; in-service training programs, personal efforts, help form colleagues, undergraduate education, and help from family members. On the contrary to expect normally in-service trainings were not found as the major source of ICT literacy, instead teachers' personal efforts to increase their knowledge about use of computers were found as the major source of ICT literacy.

Perceptions of teachers actually move the focus from the type of source to interrelationship between the sources and their life. In other words, if the way that teachers try to increase their ICT literacy is easy to apply to their daily life and can bring easiness to accomplish some tasks that are important for them, then this way becomes much more preferable by teachers. This might be the main reason for which teachers define the ICT training as secondary source of ICT literacy. Considerable part of the teachers indicated that they cannot learn anything from in-service training programs because of some reasons. These reasons mostly were based on inability to transfer the content of these training to their daily practices, or their fundamental needs were mostly underestimated before designing in-service training programs. On the other hand, when they were able to clarify their technology based needs, they could find solution for the needs, and these solutions mostly come from their personal efforts or personal contacts that are more knowledgeable in the ICT subject.

5.2.2. Curricular Activities

As discusses in the previous sections, Internet use made an enormous transformation in terms of integration of educational technologies. Parallel to the amount of Internet based ICT activities in curricula, teachers mostly chose Internet as a frequently used ICT tool. There are several fundamental reasons to explain why Internet is the most preferable tool for teachers. First of all, Internet somehow has the potential to cope

with the technological infrastructure related problems of schools. Even if there is not any available classroom computer, computer laboratory, or internet connection in the school boundaries, it is still possible to conduct internet based activities. For example, most of the teachers give research homework or projects to students to conduct at their home with the assumption that all students have access to internet and computers out of the school.

Similar situation can also be present for teachers. To prepare for forthcoming class, Internet provides them with easy access information source. They can search for subject of the next lesson, for available materials and visual which can be used in classroom, and etc. Actually using Internet for both of teachers and students might not load teacher with the requirements to have high ICT literacy skills. As understood from the interview results, teachers do not hesitate to give Internet based homework and projects to students even they define themselves as low level technology users. Unless students presents these homework and projects which can be evaluated without using technology (i.e. as print outs), Internet use does not turn into a problem in terms of ICT skills needed and technological infrastructure.

Among the teachers, lack of classroom computers and projectors were seen as the biggest barrier for in-class ICT applications. Using different visuals, animations, videos, office tools or other digital educational materials to make lectures richer and easy to understand for students were seen as possible by teachers only in fully equipped classrooms. It is not a common belief that schools' computer laboratories can serve for this purpose. On the other hand, some of the teachers give some examples about how they use these computer laboratories even if their number is very low, but this situation enlighten us to reach the result that if teachers spend necessary effort to integrate technology for in-school activities, there might be ways to achieve this in spite of a number of difficulties.

5.2.3. Resources and Support

Except for the technological infrastructure of schools, their resource repertoires are also weak and this condition was indicated many times by the teachers interviewed. In general, schools do not have digital materials or teachers are not aware of existence of these materials available in their schools. In fact, these materials mostly limited to several VCDs related to some of the content in the curricula. Therefore, the tendency among teachers is to use Internet instead of the resources available in their schools. In the near future, it is expected that FATIH project will heal the technology based problems of schools by integrating computers, smart-boards and tablet PCs into classrooms. But still lack of enough materials and digital contents is a crucial problem against effective use of this high density technology.

At this point, teachers' enthusiasm plays crucial role to increase the number and quality of digital materials and resources in schools. Today, Turkish Ministry of Education supports school financially. But still teachers are expected to present their demands and needs for digital materials to spend this financial support in this way. Several teachers highlighted this situation throughout the interviews and changes in teachers' enthusiasm might be an important factor to shape the future of FATIH project.

One of the striking thought which is very common among teachers interview was that students are much more literate at using computers than teachers. That is; they do not have any technology knowledge that students do not know. Instead of providing technology support for students, they direct them to other people who are capable of giving technological advices to students. Inclusion of third party into the relationship of students and teachers for ICT based curricular activities has potential side effects. It could reduces' teachers enthusiasm to increase their ICT literacy, because someone is always present to do "these things" for them. In other words, they do not feel the need to improve themselves. Some of the teachers interviewed complained about the parents' effects on students' works. In other words, they cannot

be able to distinguish students' efforts from parents' help to their children. They said that sometimes parents complete the whole homework and they have to treat it as the students' performances. At this point, this might not only students' fault because students most of the time do not have necessary directions for their ICT based homework. For instance, there are many examples of Internet search activities in the curricula. In general, teachers do not explain how to use "key words" for these searches, or they do not tell the ways how to eliminate unnecessary or inappropriate sources from their Internet search. Then, the unwelcome parent inclusion into ICT based homework or projects become inevitable.

The concept of computer teacher is not common in the world, therefore courses related with information and communication technologies are not also in elementary schools. In Turkey, however, there is such a course given as elective by computer teachers. In addition to teaching these courses, these teachers also serve their schools as a kind of technology coordinator and consultant. This mission put them at the top of the list which includes the technology literate people who can support others in emergency. Actually, teachers do not only consult computer teachers, but also direct their students if they cannot solve students' technology based problems by themselves. This situation, in fact, loads crucial responsibilities on computer teachers to maintain the integration of ICT. Educating students to be computer literate is their primary workspace, but it might not be incorrect to claim that providing technology consulting to other stakeholders of the schools would be the most important mission of them in the future with the dispersion of FATIH project on our life.

During the undergraduate education, computer teachers are trained also about how to design, evaluate and use the instructional technology materials. But, today, teachers who have a kind of certificate indicating their ability to use computers are treated as computer teachers in schools but it is easy to say that they are compatible to help teachers how to use educational technology. Again, other sources that teachers ask for technology consultation like family members and friends cannot be as effective

as computer teachers for integration educational technology into schools. Therefore, condition of computer teachers has to be put into reconsideration by policy makers.

5.2.4. Barriers to ICT Integration and Possible Solutions

Teachers who participated in the interviews signified five basic barriers preventing ICT integration. These were;

1. Inappropriate use of ICT by students, parents, and teachers
2. Unhealthy computer-student relationships
3. Not enough technological infrastructures
4. Teachers fear of using technology / Low self-efficacy levels
5. Insufficiency and low quality in-service trainings.

As discussed in the previous section, inappropriate use of ICT by students, parents, and teachers and unhealthy computer-student relationships seemed the results of other basic problems. Low technology support for students, not well technologically educated students and parents might be inevitably causing some other barriers for ICT integration for schools.

On the other hand, insufficiency of technological infrastructure in schools is defined as a big barrier as many studies indicated in the literature (Wachira & Keengwe, 2011, Malcolm-Bell, 2010; Almekhlafi & Almeqdadi, 2010; Brown, 2010). According to research conducted by Wells and Lewis (2006), lack of access to technology was the most frequent barrier for integration of ICT into education in United States. On the other hand, U.S. National Center of Education Statistics' reports, nearly 100% of the schools have access to Internet. At this point, to conclude teachers' disclosures about the low technology access as the most frequent barrier could not be accepted as it defined by them. Therefore, access to technology in schools should be structured and re-defined to distinguish full access from seldom or no access to technology. Then to make more accurate inferences from teachers'

expressions about whether access to technology is a real barrier for them or some other problems forces teachers to blame technology access could be possible.

Fear of computer issue or low self-efficacy as the barriers indicated by teachers were mostly described in a relation with the teachers' perceptions about the technology in-service trainings. That is; teachers avoid using computers because they have not been trained enough and they cannot be sure whether their technology skills are enough to handle the ICT based application in classroom. As a result, they hold back and do not attempt to use ICT.

Two main proposals were put forth by teachers to overcome with these barriers. First one was the improvement of teacher training programs since they thought that fear and low self-efficacy to use ICTs in classroom were because of insufficient and low quality in-service trainings. Increase in amount of trainings, quality of trainers, variety of subjects could be helpful to cope with the integration of educational technology. If the technology training programs are not scheduled according to schedules of teachers, they see the trainings as extra load on themselves, and this perception naturally reduces the efficiency. In addition, they are also not paid for their attendance. Teachers, for this reason, expect that their spare times should be devoted to any kind of training not to obstruct their school works, and to give full attention.

Practice opportunities are also important for teachers. If methods used to deliver the instructions do not let the teachers practice what they learn, the training loses its meaning for teachers and they mostly cannot put into practice this knowledge in their life. Then, as expected, ICT trainings do not make intended contribution neither for increasing IT Self Efficacy beliefs nor reduce their fear of technology. According to Teo (2009), opportunities to interact with computers and related technologies should be provided to teachers to increase their use of these technologies in schools. Similarly, Yuen et al. (1999) this interaction has to be given in the trainings, so they can learn how to use technology for educational purposes. Without necessary

opportunities for teacher practice in trainings, time and money spent by the government, trainers, and teachers cannot turn the necessary value for system of education in Turkey. For FATIH project, thousands of teachers have to be trained for the transformation which was estimated by the government. For the success of the project, training the teachers in system needs a special interest. With the existing methods used, it may not be possible to elaborate teachers for the adaptation of the new technologies which are smart-boards and tablet PCs.

5.3 Teacher's IT Self Efficacy (Research Question 3)

After exploring the pattern of ICT defined by curricula and explaining the success of ICT integration into school setting from the perspectives of teachers, their IT Self Efficacy perceptions were also investigated and discussed in this section. According to Zimmerman (2000), self-efficacy beliefs of people could supply more powerful information than their knowledge, or skills to make predictions. Self-efficacy does not only affect the ICT integrations, but also affect other elements such as intention to use ICT and ICT usage behavior (Smarkola, 2008). In other words, if we can explain the factors effecting IT Self Efficacy, it could be easier to make actions to increase future success and reduce possible failures on any subject. By this way, designing better training programs, providing useful materials and integrating educational technology efficiently could be possible. Through this section, factors effecting teachers' IT Self Efficacy were discussed in detail with the information gained by analyzing the data of IT Self Efficacy questionnaire.

5.3.1. Discussion of Descriptive Information about IT Self Efficacy, Gender, Age, Field, and Experience

Gender was found as a significant factor on IT Self Efficacy of teachers. In terms of total self-efficacy scores (TSE), males scored higher than females. Actually it is the same for all the sub-scales including UICS, TK, OPA, CA, and ACU. The result is consistent with the majority of available literature (Awoleye & Siyanbola, 2005,

Bimer, 2000, Cassidy & Eachus, 2002; Durndell & Haag, 2002) although other studies indicating insignificant effect of gender also exist (Pamuk & Paker, 2009, Sendurur et al., 2011). The biggest gap between males and females were found on the subscale "Technical Knowledge (TK)". It was also expected because the roles that society defined on males and females could be a factor to explain the result. In our daily life, technical things are mostly in the responsibilities of males. Therefore, females feel deficiency in the technical part of the using computers, such as establishing the connections of a projector, or fixing a printer with paper misleading.

In terms of fields, Classroom teachers and Science and Technology teachers scored a little bit higher than other fields, but these differences were very limited. Therefore, it could be inferred from the descriptive results that field of IT Self Efficacy beliefs of teachers did not change over the field of professions.

Unlike the field of profession, teachers' age and experience seems in very strong relationship with IT Self Efficacy. Descriptive results indicated that when the amount of experience and age is increasing, IT self efficacy of teachers in all of the subscales is decreasing. According to Bandura (1994), there is a positive correlation between experience, age and self-efficacy belief. Social cognitive theory describes experience as the fundamental vehicle to change self-efficacy. In other words, if someone's experience on something is increasing, he/she tends to be having high self-efficacy on the same thing. At that point, experience does not indicate the experience with computers, but the experience in teaching. Teachers who are more experienced in teaching are mostly older teacher and thus age and time spent on computers are negatively correlated. As a result, older teachers or highly experienced teachers showed low IT Self Efficacy, naturally. This result might make age and experience as important variables that should be taken into account for any kind of long term plans for ICT integration in schools.

5.3.2. Discussion of Descriptive Information about IT Self Efficacy, and Computer Training History of Teachers

Interesting results were found from the descriptive analysis of IT Self Efficacy in terms of the amount of training that teachers attended. Among the teachers who attended less than 120 hour computer training, there was no parallelism between the lines of IT Self Efficacy and amount of computer training. In other words, higher computer self-efficacy could not be connected with high amount of computer training in some cases. For example, the teachers who attended 30 hours or less computer training scored higher than the teachers who attended 60-89 hours computer training in terms of Total Self-Efficacy (TSE) scores. This situation is valid for all the subscales. On the other hand, teachers who attended 120 hours or more computer training had considerably higher self-efficacy scores than others. The results open the discussion about the obligation of in-service trainings. Teachers who took computer trainings less than 60 hours mostly attended these trainings because they have to. In other words, they just attended one training to have the certificate that the Turkish Ministry of Education set as a requirement for teachers and it is mostly out of their personal intention.

It is expected that if a teacher continues to attend computer trainings after completing one, he/she probably have extra motivation to learn more about computers and their possible use in educational setting. For this reason, numbers of training that teachers took were also included in the inferential analyses in this research to explain the factors behind the successful integration of ICT in schools.

5.4. Discussion about Investigation of Factors Affecting IT Self Efficacy of Teachers.

In this section, factors which have potential to affect IT Self Efficacy of teachers directly were discussed with the information gained through series Hierarchical Multiple Regression Analyses. Teachers' scores for each subscale and total scores

were taken as dependent variables for each analysis. Teachers' gender, age, experience, field of profession, home/personal computer use, number of computer training, and total hours of computer training were taken as the potential predictors of IT Self Efficacy. For all Hierarchical Multiple Regression Analyses, two models of independent variables were used. In the first model, basic demographic variables (gender, age, experience, and field of profession), in the second model computer history variables (home/personal computer use, number of computer training, and total hours of computer training) were included. Detailed information gained throughout the quantitative part of the research were presented and discussed in the following sections.

5.4.1. Discussion about Investigation of Factors Affecting IT Self Efficacy of Teachers in terms of "*Use of Internet and Computer to Support* (UICS)"

For the variable UICS, two of the models were found significant. When all the variables in the second model contributed significantly, only gender and age were found as significant predictors for UICS in the first model. Therefore, gender, age, home/personal computer use, number of computer training, and total hours of computer training are the important predictors to make a prediction of teachers' general use of internet and computers to support classroom activities. As discussed in the previous sections, teachers' fields were not significant predictors.

On the other hand, there are some unexpected results, too. As indicated in the literature, literacy level and self-efficacy on the same object are highly related to each other, but computer related variables were the least powerful predictors among the significant variables. The reason of low contribution of computer training to UICS could be related the features of the training programs that teachers attended. According to Benson et al. (2004), teachers feel comfortable the things that they learned from trainings, but they do not feel the same comfort to use them in classroom. In other words, training programs might not be designed appropriately to increase teachers' internet and computer use to support classroom activities.

As opposed to computer training variables, use of home/personal computers were found the strongest predictors of computer self-efficacy. According to Bandura (1994) experience increases the self-efficacy, hence, using home or personal computers increases the amount of "the experience" with computers and inevitably teachers' with high experience with computers feel more efficient to use computers and internet in classroom. The results were in line with the study of Teo (2007). In his study, Teo reported that having a home computer could have positive effect on reducing the computer use anxiety. On the other hand, Sam et al. (2005) indicated that it may not always mean that more use of internet and computer leads higher computer and internet related self-efficacy, but the applications used, purpose of computer use, and the satisfaction has to be taken into consideration to understand computer self-efficacy.

5.4.2. Discussion about Investigation of Factors Affecting IT Self Efficacy of Teachers in terms of "*Technical Knowledge* (TK)"

As for the variable UICS, two of the models were found significant for self-efficacy beliefs of computer related technical knowledge (TK). To assess this type of self-efficacy, teachers were asked question about setting up and maintain the technological devices in classroom setting. In addition to gender and age, the dummy field variables *Math teacher* and *Others* were found significant with very low unique contributions. Among all the curricula examined in this research, Math curricula include the least number of *direct computer and technology use.* Math teachers' experiences with computer use for curricular activities are less than others and their self-efficacy beliefs in terms ICT integration were found as lower than others for each subscale whether the results were statistically significant or not. The results are in line with the study of Cassidy and Eachus (2002). In their study, researchers found that computer experience and computer self-efficacy have high positive correlation.

Another interesting result specific to this subscale is that contribution of gender to explanation of TK is higher than the other subscales. As mentioned before, technical things are seen as men's job by the society. Effect of the gender on technical knowledge related computer self-efficacy could be explained by this phenomenon.

Low contribution of computer training to UICS was also observed for TK. It means that, training programs have not been designed appropriately to increase teachers' technical knowledge to set up ICT for their educational activities. Again as opposed to computer training variables, use of home/personal computers were found stronger than other computer history variables with the power to increase experience with computers. On the other hand, age was found the strongest predictor for TK for this time. The reason could be the increase of fear to use technology with respect to the age. The feeling of "doing something wrong may cause irreversible problems" is more common fear among older people and it could get higher when the issue is technical.

5.4.3. Discussion about Investigation of Factors Affecting IT Self Efficacy of Teachers in terms of "*Office applications* (OPA)

Two of the models were found significant for OPA. Gender and age are the variables explaining OPA significantly. In the second model, like UICS and TK, all computer history predictors (home computer use, number of trainings and total hours of training) were found significant. Although significant variables were the same for OPA also, unique contributions of these variables to the model were different. Teaching experience is the most powerful factor to predict self efficacy beliefs of teachers to use Office programs for educational activities because of the same reasons explained for the previous dependent variable.

On the other hand, there are considerable changes among the amounts of unique contributions of computer history variables. Unique contribution of home computer use is very low when compared with others. The reason might be that using office

tools might be not easy to learn with personal efforts. An education mostly is needed to use these programs in an advance manner. When unique contribution of home computers was decreasing, contribution of training variables increased relatively. Training for using Office programs are mostly given in the initial in-service trainings. Therefore, training on such a specific area produces the highest unique contribution for the OPA among all other subscales.

5.4.4. Discussion about Investigation of Factors Affecting IT Self Efficacy of Teachers in terms of general "*Classroom Applications* (CA)"

To assess teachers' self-efficacy beliefs about classroom applications of ICT, they were asked generally about whether they can define the situations that technology can benefit most, and whether they can find appropriate applications to elaborate students' academic performances. As for other variables, both of the models resulted in significant conclusions. The significant predictors of the models were gender, age, Math teachers, home/personal computer use, number of computer training, and total hours of computer training and these variables explained together about 27% of teachers' self-efficacy perceptions about classroom applications of ICT.

In fact, age and gender's contribution to the models can be explained in similar ways as discussed in the previous sections. On the other hand, Math teacher, one of the field variables, was also found as a significant predictor. Classroom teachers (the reference variable for dummy coding of field variable) have to use computers in different ways because their field of profession includes combination of all other fields of Math, Socials Sciences, and Science and Technology. On the other hand, variability of using computers for educational activities is very limited for Math teachers when we compare them with classroom teachers. Therefore, being Math teacher instead of Classroom teacher might have affected self-efficacy perceptions of teachers about classroom applications of ICT in a negative direction. According to the results of study conducted on a group of Math teachers to investigate their opinions about computer aided instruction in Math lessons (Guven, Cakiroglu &

Akkan, 2009), Math teachers developed negative attitudes towards computer assisted Math instruction. At this point, opinions of Math teachers might be investigated whether their opinions affect self-efficacy perceptions on use of computers for classroom applications.

Computer history variables yielded similar results with the previous variables. Home computer use was again the strongest variable making the biggest unique contribution to the model. Being familiar with the computers could increase a person's awareness about the opportunities that computers present to increase productivity. This is valid for teachers, too. If they spend more time on computers, they can discover potential of computer intentionally or unintentionally. This is actually much related with the experience with computer and so experience is a strong enabler of self-efficacy.

5.4.5. Discussion about Investigation of Factors Affecting IT Self Efficacy of Teachers in terms of "Advance Computer Use (ACU)"

Questions assessing advance computer use of teachers ask whether teachers feel efficient to develop their own resources instead of finding them from other sources. Both of the modes are significant to predict the variable ACU. Total 27% of the variance was explained by the predictors. Variables (gender, teaching experience, home/personal computer use, number of training, and total hours of training) which had been found significant for all other dependent variables were also found significant for this variable.

Teaching experience/age and gender again are strong predictors of self-efficacy beliefs of teachers in terms of advance computer use for similar reasons. In some studies, gender was mentioned as in indirect relationship with computer experience, so its effect might be not directly observable by examining direct interaction between computer self-efficacy and gender. According to Maurer (1994) and Durndell and

Haag (2002), gender might influence computer experience by affecting computer anxiety and other computer based attitudes and beliefs.

On the other hand, unique contributions of in-service training variables to the models were observed as increased. It is an expected result because; doing complex things with computers, for example, designing a course website, or developing educational software needs extra trainings for teachers. As a result, the effect of training history of teachers might be higher on advance computer use self-efficacy belief of teachers than other types of computer self-efficacy.

5.4.6. Discussion about Investigation of Factors Affecting IT Self Efficacy of Teachers in terms of "*Total Scores* (TSE)"

In the light of the sub-scales of IT Self Efficacy questionnaire, total scores IT Self Efficacy were discussed in this section. Similar results were gained for total scores of teachers from the questionnaire. The first model including basic demographic variables and the second model including computer history variables were found significant on overall IT Self Efficacy beliefs of teachers. Gender, age, Math teacher, home computer use, number of trainings and total hours of training were the significant predictors by explaining 31% of total variance.

Age and home computer use made the biggest contributions to the models. Since these variables give valuable information indicating the amount of teachers' experience with computers, these variables might be found as the strongest predictors of computer self-efficacy. Lee and Tsai (2010) indicated the same result with their study. Age and experience with computers and web-based tools were found significant on the computer self-efficacy of teachers.

Results yielded by training variables were actually unexpected. As experience, literacy is also an important factor effecting self-efficacy. To increase computer literacy, in-service trainings programs have been provided to almost all teachers in

the schools of K-8. But it is obvious that, in-service trainings cannot make intended contribution to IT Self Efficacy beliefs of teachers. Pamuk and Paker (2009) found that more training leads higher computer self-efficacy. Although this study showed similar results, computer training have fallen down in the list of factors affecting computer self-efficacy of teachers positively. From this point of view, teachers have to be given also more practice opportunities in these trainings to increase their amount of experience with computers.

5.5. Conclusion

In the literature, there are a number of studies indicating effects of different factors or barriers on integration of ICT in educational setting. Several of these factors were investigated throughout this research. This study showed that in order to successfully integrate ICTs into education, teachers should have the skills which are predefined by the curricula. These skills basically are (i) being able to use internet for different purposes, (ii) benefiting from the capabilities of Office or similar programs, (iii) finding or creating multimedia materials for classroom activities, (iv) transferring these skills to the classroom setting, and (v) giving necessary technology based scaffolding to students to complete ICT based activities in and out of the classroom.

Interview with teachers showed that ICT based activities defined by the curricula mostly cannot be conducted by teachers because of some barriers. Technological instrument deficiencies were addressed as one of the biggest barriers in front of ICT integration in schools of K-8. Despite having better technological infrastructure in their classrooms, some teachers also complained about the lack of technology. Therefore for the researchers investigating barriers for use of educational technology integration, there is a need to standardize what basic technological tools to evaluate the relationship between infrastructure and successfulness of ICT integration.

Another important factor for ICT integration is the ICT literacy and self efficacy beliefs of teachers. Analyses of interviews and self-efficacy questionnaire revealed

that teachers cannot gain enough knowledge to use ICTs for educational activities from in-service training or these in-service trainings cannot provide themselves enough practice experiences to increase their computer self-efficacy. While teachers indicating that their personal effort is the most useful source of literacy; IT self-efficacy questionnaire also yielded very similar results. For three of the five subscales of the questionnaire, use of personal or home computers were found the best predictor among the others. Cleary, interaction with computers directly might be the best way to increase computer literacy and self-efficacy.

Another significant result of this dissertation is related with the power of ICT based in-service trainings or professional development provided to teachers. Aim of any professional development or training on a subject is to improve the performances of a group of people on this defined subject. Results identified that teachers participated in the interview and questionnaire parts of this study cannot improve their performances on using ICT in their fields. When teachers who had been interviewed were complaining about inefficacy of in-service training programs to train teachers, other teachers who had filled the IT Self Efficacy questionnaire highlighted that training programs cannot increase their self efficacy to use ICT for academic purposes as intended. In fact, the variable "number of training programs" most of the time contributed to the explanation of the variance of IT Self Efficacy scores more than "total hours of trainings". This means that regardless of the total hours, if a teacher attended more than one training program this might show his/her willingness to improve ICT skills and practice them in the classroom. Therefore before designing ICT training for teachers, how the training will improve professional life of teachers should be addressed in detail.

5.6. Implications for Practice

Results of the study indicated that there are several factors and barriers affecting successful ICT integration in schools of K-8. While some intentions to increase ICT integration into school settings, such as ICT training, were expected to yield

considerable amount of improvement, some other variables which are not in control of policy makers or school principles, such as age and home/personal computer use, were found as much more effective factors than trainings. By using such results, stakeholders who are responsible for education of the children in schools K-8 can manage these factors to get better improvements.

Several main areas which are suitable to make interventions for better ICT integration in schools were emerged at the end of the study. One of them is *technological infrastructure* of schools. Lack of or inadequate technology does not only cause reduces in opportunities to integrate ICT into instruction, but also reduces motivation of teachers to cultivate their ICT skills. For this reason, every school should equip with technological devices and teachers should reach these devices when necessary. With the emergence of FATIH project, it is planned that schools will have rich technology in the following couple of years. The transition from lack of technology to high technology in classroom seems like an important issue and if it cannot be managed, we might face with a number of unexpected failures. If teachers will be exposed to huge amount of technology at a time by the FATIH project, it could cause opposite and unintended results for ICT integration. Therefore, the way of transition from lack of technology to highly intense technology is a crucial element needed to be carefully examined by the policy makers and technology adapters to get the best results. In this transition period, teachers might need some special support both to deal with the new coming technologies and to improve their ICT self-efficacies as well as literacy.

The policymakers from Turkish MoNE and other ministries which are in the FATIH project have made many disclosures to enlighten the public about how big the project is. It was said that 42,000 schools will be equipped with interactive (smart) boards and thousands of students in the system will be using tablet computers for educational activities. In addition, teachers will be trained with the help of 110 distance education centers located different places in Turkey. One missing thing in these explanations is the *adaptation of pre-service teacher education*. Teo et al.

(2009) focuses on the importance of pre-service teacher education in successful ICT integration as;

> "Teacher training program should consider providing pre-service teachers with tools and experiences that will be used regularly in their future job as a teacher as teaching has become a highly complex activity in this knowledge economy. In the case of attitude formation, when teachers are supported by effective support structures that provide them with successful experiences in technology, they would be more likely to develop positive attitudes toward computer use which in turn reinforces their intention to use technology over time." (p.1008)

This opinion is very meaningful for Turkish case. Since positive attitudes and beliefs of teachers are very influential on the successful integration or adaptation of ICT in schools, we have to develop these positive attitudes and beliefs by starting from early stages of teacher education. To do this, I recommend that similar environments established in schools, should be established in teacher education institutions and faculties of education. Prospective and pre-service teachers would have practice opportunities to improve their teaching skills with technology with the guidance of faculty members. They can develop their own digital materials and prepare themselves for their future job.

On the other hand, practice with real audience would be still an issue for candidate teachers. At this point university-school relationship has to be restructured. Student-teachers should be provided with authentic practice opportunities. A pre-service teacher might be assigned to as in-service teacher with student-mentor relationship. They can share their experiences in a regular and structural base and they can arrange their schedules to create real time teaching experiences so student teachers could have chance to test what they have learned.

Standardized technology counseling for teachers is another area which should be taken into consideration. According to the results, teachers get technological advices from different sources such as computer teachers, family members and friends, and colleagues who are better at using technology. It is obvious that knowing how to use

technology does not mean knowing how to use same technology in classroom setting for educational purposes. So, getting help from who is not qualified enough to use technology for educational purposes can result with adverse side effects. According to Teo (2011), when teachers are provided with enough technology support which is timely, they might have stronger intention to use technology for educational purposes. Therefore, schools of K-8 in Turkey need full time technology counselors to provide formal advices to teachers. As understood from the declarations of policy makers, Information Technologies courses will be removed gradually from the programs of schools of K-8. In fact, these courses were given as elective, therefore functionality of computer teachers in school is being discusses in these days. At this point, role of computer teachers can be turned from teaching technology to students to providing ICT counseling to teachers and students which they actually doing in schools informally. By this way, World standards can be caught and definition of computer teachers' roles in schools can be done in an efficient way.

According to Cagiltay et al. (2001), teachers are the one of the most crucial factors affecting successful integration of educational technologies. From this point of view, *training teachers* appears as an important enabler of educational technology integration. For example, deep analysis of 4th and 5th grade Science and Technology curricula by Erdogan (2007), integration of technology into the instruction is not easy with the in-service training they took, therefore more in-service trainings arranged regularly are necessary to have continuous development. Examination of the current effect of teacher trainings or professional development programs on the integration of ICT into education from the teachers" point of view, this study resulted with several advices.

First of all, training programs have to increase computer self-efficacy beliefs of teachers with a considerable amount. According to result of the study conducted by Park (2004), computer self-efficacy, professional development, and condition of technology in the school has a direct effect on the intention of teachers to use technology. Therefore, teacher trainings should not be only designed to increase

literacy, but also computer self-efficacy and intention of teachers to use technology can also be affected positively. To do this, first of all, potential benefits of trainings should be explained to teachers in proper way with concrete examples to increase their motivation. It does not mean that teachers are completely against the use of ICT for different reasons. For example, Kaygisiz et al. (2011) indicated by the results of their descriptive study on Science and Technology teachers, positive correlation were found between amount of computer use and attitudes. This means that more practice opportunities should be given in order to increase both the amount of experience with computers and to realize the possible benefits to their instruction in the classroom (Igbaria, 2000). Positive experiences lead teachers to develop positive technology use attitudes (Teo, 2011).

Realization of providing more practice opportunities and computer use experiences to teachers needs to be connected with the FATIH project. As discussed before, more than hundred teacher training center will be in use to educate in-service teachers for the diffusion of novelties brought by the project. These centers will serve from distance with teleconferencing technologies and lots of teachers can benefit from it simultaneously. But how can this system provide practice opportunities which are necessary to increase teachers' both self-efficacy to use ICT in classroom and attitudes toward technology? Although they are not easy to imply, there are some recommendations proposed by the researcher;

1. Teachers should be able to share their own experience during trainings sessions so others can develop ideas for their situation. In addition, asynchronous platforms could be used for experience sharing and discussion. EBA (Eğitim-Bilişim Ağı / Web of Education-Information) which is online information, knowledge, and experience sharing platform is an initiative conducted by Turkish MoNE. Through this platform, digital multimedia materials have been provided to the teachers who are from the 52 schools included in the pilot study of FATIH project. These teachers can communicate with their colleagues to be in mutual sharing. To some extent, such a platform could be helpful for teachers' technology acceptance, but it is necessary to extent such initiatives to general teacher population.

2. Examples are very important in any kind of learning. Example lessons with students may constitute a part of these trainings so teachers can realize the use of these technologies in real life. With a defined timetable, real classroom demonstrations could be available through these trainings.

3. In a long term, students might be included in the process of teacher training. As indicated by different technology acceptance models, technology integration is very complex and systemic phenomenon. More inclusion of different variables in these models may help us to understand ICT integration better. It is obvious that students are most important of the process; teacher training with inclusion oo students has to be thought by the policy makers.

In addition, *scheduling in-service trainings* is another issue expressed by teachers. Most of the time, teachers think that in-service trainings brings extra weight to their work load. Training or professional development for teachers to increase use of ICT may not produce intended results if teachers settle down entire teaching activities and if they are busy with these activities (Chen, 2011). For this reason, conducting an analysis before scheduling any kind of training is necessary. Teachers interviewed generally recommended that training programs could be at the beginning or at the end of the semesters. It is possible but teachers should also apply what they have learned and get feedbacks from other teachers. To overcome with this issue, ICT trainings have to be turned into a continuous and never ending process. Instead spending a week, or a month to training, teachers may attend a program every week with reasonable amount of time. In this way, they keep themselves up to date and have opportunities to gain immediate feedback for their classroom practices.

5.7. Implications for Future Research

This study was conducted on the schools of K-8 and on the curricula and teachers from these schools. Although teachers included in the quantitative part of the

dissertation were tried to be different locations of Turkey based on the statistical information provided by the statistical institution of European Union (EUROSTAT), teachers who were interviewed may not picture the contextual differences. Therefore Qualitative parts of the study can be conducted with teachers from different places of Turkey.

There are many different factors affecting integration of educational technology in schools, but this study has not covered all these factors. When teachers' basic demographic information, professional developments and in-service trainings, personal and home computer use, technological infrastructures of schools, technological support for teachers, and different sources of ICT literacy of teachers were in the scope of the study, some other variables, such as perceptions of school principles and policy makers, needs to be added in the future studies.

In many studies, effect of professional development on the integration of educational technology and on the computer self-efficacy beliefs was discussed and the effect was found with high amount of explanation. On the contrary, this study indicated that training and professional development could not make intended contribution relative to some other variables. In the light of this, reasons of relative unsuccessfulness of in-service training needs to be examined with more detail although they were discussed in this dissertation, more studies are needed to confirm results of this study.

Main aim of this research was to highlight the agents which are dominant on current situation of ICT integration in schools and to propose some solutions for improvement. Several proposals were provided with the information gained through the research. The literature, and the results of this dissertation shows parallelism in terms of possible contributions of these proposals to the existing system of education, and to the FATIH project which is the biggest breakthrough in the integration of ICT in our schools.

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APPENDIX A

EUROSTAT STATISTICAL REGIONS FOR TURKEY

Table A. 1

Eurostat Statistical Regions for Turkey

Code	Level 1	Level 2	Level 3
TR1	Istanbul		
TR10		Istanbul	
TR100			Istanbul
TR2	Bati Marmara		
TR21		Tekirdag	
TR211			Tekirdag
TR212			Edirne
TR213			Kirklareli
TR22		Balikesir	
TR221			Balikesir
TR222			Canakkale
TR3	Ege		
TR31		Izmir	
TR310			Izmir
TR32		Aydin	
TR321			Aydin
TR322			Denizli
TR323			Mugla
TR33		Manisa	
TR331			Manisa
TR332			Afyon
TR333			Kütahya
TR334			Usak
TR4	Dogu Marmara		
TR41		Bursa	
TR411			Bursa
TR412			Eskisehir
TR413			Bilecik
TR42		Kocaeli	
TR421			Kocaeli
TR422			Sakarya
TR423			Düzce

Table A.1 (Continued)

Eurostat Statistical Regions for Turkey

TR424			Bolu
TR425			Yalova
TR5	Bati Anadolu		
TR51		Ankara	
TR510			Ankara
TR52		Konya	
TR521			Konya
TR522			Karaman
TR6	Akdeniz		
TR61		Antalya	
TR611			Antalya
TR612			Isparta
TR613			Burdur
TR62		Adana	
TR621			Adana
TR622			Icel
TR63		Hatay	
TR631			Hatay
TR632			Kahramanmaras
TR633			Osmaniye
TR7	Orta Anadolu		
TR71		Kirikkale	
TR711			Kirikkale
TR712			Aksaray
TR713			Nigde
TR714			Nevsehir
TR715			Kirsehir
TR72		Kayseri	
TR721			Kayseri
TR722			Sivas
TR723			Yozgat
TR8	Bati Karadeniz		
TR81		Zonguldak	
TR811			Zonguldak
TR812			Karabuk
TR813			Bartin
TR82		Kastamonu	
TR821			Kastamonu
TR822			Cankiri
TR823			Sinop
TR83		Samsun	
TR831			Samsun
TR832			Tokat

Table A.1 (Continued)

Eurostat Statistical Regions for Turkey

TR833			Corum
TR834			Amasya
TR9	Dogu Karadeniz		
TR91		Trabzon	
TR911			Trabzon
TR912			Ordu
TR913			Giresun
TR914			Rize
TR915			Artvin
TR916			Gumushane
TRA	Kuzey Anadolu		
TRA1		Erzurum	
TRA11			Erzurum
TRA12			Erzincan
TRA13			Bayburt
TRA2		Agri	
TRA21			Agri
TRA22			Kars
TRA23			Igdir
TRA24			Ardahan
TRB	Orta Anadolu		
TRB1		Malatya	
TRB11			Malatya
TRB12			Elazig
TRB13			Bingol
TRB14			Tunceli
TRB2		Van	
TRB21			Van
TRB22			Mus
TRB23			Bitlis
TRB24			Hakkari
TRC	Guneydogu Anadolu		
TRC1		Gaziantep	
TRC11			Gaziantep
TRC12			Adiyaman
TRC13			Kilis
TRC2		Sanliurfa	
TRC21			Sanliurfa
TRC22			Diyarbakir
TRC3		Mardin	
TRC31			Mardin
TRC32			Batman
TRC33			Sirnak
TRC34			Siirt

APPENDIX B

CURRICULUM EVALUATION CHECKLIST

Explanation	Other	Office Tools				Poster Design	Videos and Animations	Intemet				Unit/ Subject
		Pres. tools	Spread sheet	Word Proces.				Visuals	Virtual Trips	Search		

APPENDIX C

INTERVIEW QUESTIONS (TURKISH)

İlköğretim Öğretmenleri Görüşme Soruları

1. Okulunuz, branşınız ve mesleki deneyiminiz hakkında bilgi verebilir misiniz?
2. Hayatınızda hangi amaçlarla bilgisayar ve benzeri teknolojiler kullanıyorsunuz?
3. Sahip olduğunuz bilgisayar bilgisini hangi yollarla kazandınız?
    a.Ne kadarını kişisel gayretinizle kazandınız?
    b.Ne kadarını hizmet öncesi eğitiminiz sırasında edindiniz?
    c.Ne kadarını hizmet içi eğitimler kapsamında edindiniz?
    d.Diğer?
4. Dersinizde takip etmekte olduğunuz müfredatta ne gibi "bilgisayar ve teknoloji" destekli proje, ödev ve uygulamalar var?
5. Okulunuzdaki teknolojik alt yapı bu proje, ödev ve uygulamaları yerine getirmede yeterli mi?
6. Bilgisayar destekli uygulamaları yerine getirebilmek için gerekli kaynaklara sahip misiniz (Eğitim CD'leri, çeşitli yazılımlar, v.b.)?
7. Bu proje, ödev ve uygulamaları yerine getirirken dışarıdan bir desteğe ihtiyaç duyuyor musunuz?
8. Bu alanda kendinizi ne kadar yeterli görüyorsunuz?
9. Öğrencileriniz bilgisayar ve teknoloji anlamında desteğe ihtiyaç duyduğunda gerekli yardımı sağlayabiliyor musunuz?
10. Sizce bilgisayar destekli olan ve olmayan proje, ödev ve uygulamalarda öğrenci ve ürün (teslim edilen proje ve ödevler gibi) başarısı arasında bir fark var mı? Var ise ne gibi farklar var ve bunun sebepleri sizce ne olabilir?

11. Bilgisayar ve bilişim teknolojilerinin dersler ile bütünleştirilmesi hususunda ne gibi sorunlar görüyorsunuz?

12. Bu sorunların aşımında hizmet içi eğitimin önemi sizce nedir?

13. Sizce tüm öğretmenlere aynı hizmet içi eğitimler mi verilmeli, yada ön bilgi düzeyi, branş veya yaşa göre farklı eğitimler mi hazırlanmalı?

14. Bilgisayar ve bilişim teknolojilerinin eğitim-öğretim sürecinde daha başarılı ve etkin bir hal alması için neler yapılabilir?

a.Hizmet içi eğitimler alanında?

b.Okulların fiziki altyapılarında?

c.Ders içerikleri ve müfredat anlamında?

d.Diğer

APPENDIX D

INITIAL ITEM POOL

Eğitim yazılımı ve materyal geliştirme

1. Hesap çizelgesi programlarını (örneğim MS Excel) derslerimde etkili kullanabiliyorum.
2. Kelime işlemci programlarını (örneğim MS Word) derslerimde etkili kullanabiliyorum.
3. Sunum programlarını (örneğim MS PowerPoint) derslerimde etkili kullanabiliyorum.
4. Veri tabanı programlarını (örneğim MS Access) derslerime faydalı olabilecek şekilde kullanabiliyorum.
5. Derste kullanacağım materyalleri bilgisayar ortamında hazırlayabiliyorum.
6. Bilgisayar ortamında materyal hazırlarken kullanılan görsel tasarım tekniklerinden haberdarım.
7. Bilgisayar ortamında materyal hazırlarken kullanılan görsel tasarım tekniklerinden yararlandığımı düşünüyorum.
8. Daha önce görmediğim bir eğitim yazılımını kimsenin yardımına ihtiyaç duymadan kullanabiliyorum (?öğrenebiliyorum?).
9. Teknoloji tabanlı projelerde öğrencilere hangi yazılımları ve programları kullanabilecekleri konusunda gerekli desteği sağlayabileceğimi düşünüyorum.
10. Basit eğitim yazılımları geliştirebiliyorum.

İnternet ve İnternet Uygulamaları

11. İnternet ortamındaki tartışma gruplarından haberdarım.

12. İnternet ortamındaki tartışma gruplarını eğitim amaçlı kullanabileceğime inanıyorum.

13. Ders içi veya ders dışı etkinliklerde kullanmak amaçlı basit web sayfası tasarımları yapabiliyorum.

14. Uygun olan internet kaynaklı bilginin ayrımını yapabildiğimi düşünüyorum.

15. İnternet'te aradığım bilgiye rahatlıkla ulaşabiliyorum.

16. İnternet üzerinden örnek ders materyalleri bulabiliyorum.

17. İnternet'teki doğru ve yanlış bilgiyi ayırt edebildiğimi düşünüyorum.

18. Bilgisayar ve internetin sağladığı iletişim olanaklarını etkili bir şekilde kullanabiliyorum.

Teknik bilgi

19. Farklı işlerim sistemlerini (Windows 98, Windows 2000, Windows XP, Windows Vista, Unix, Linux gibi) kullanabileceğime inanıyorum.

20. Ders anlatımında projeksiyon aletini etkili kullanabildiğimi düşünüyorum.

21. Bilgisayar ile ilgili ortaya çıkan sorunların neden kaynaklandığını anlayabiliyorum.

22. Yazıcı (printer) ve tarayıcı (scanner) gibi araçları etkili kullanabildiğime inanıyorum.

23. Yazıcı ve tarayıcı gibi araçlarda karşılaştığım basit sorunları (kâğıt sıkışması, kablo çıkması, v.b.) sorunları çözebiliyorum.

24. Bilgisayarın monitör, klavye ve fare gibi kasa bağlantılarını yardım almadan yapabiliyorum.

25. Bilgisayarın fiziksel parçalarını tanıyorum.

26. Sınıfımda karşılaştığım bilgisayar ile ilgili basit teknik sorunları çözebileceğimi düşünüyorum.

27. Bilgisayar ile ilgili teknik kavramlara hâkim olduğuma inanıyorum.

Genel bilgi ve kişisel gelişim

28. Genel olarak bilgisayarın derslerime fayda sağlayacağına inanıyorum.

29. Gereken durumlarda bilgisayarı derslerimde etkili kullanabileceğime inanıyorum.

30. Farklı durumlarda bilgisayarın farklı özelliklerinden yararlanabiliyorum.

31. Alanımla ilgili eğitim teknolojilerindeki gelişmeleri takip edebiliyorum.

32. Bilgisayarın sağladığı olanakları öğretime destek amaçlı kullanabiliyorum.

33. Eğitim amaçlı bilgisayar kullandıkça, bu alanda gelişimimi sürdürdüğüme inanıyorum.

Sınıf içi ve sınıf dışı etkinlikler

34. Sınıfımda bilgisayar kullanırken sorun yaşayan öğrencilere yardım edebildiğime inanıyorum.

35. Bilgisayar destekli çalışmalarında öğrencilere danışmalık edebildiğime inanıyorum.

36. Öğrencilerden aldığım bilgileri (devam-devamsızlık, sınav sonuçları, ödev ve proje notları, v.b.) bilgisayar ortamında saklayabiliyorum.

37. Öğrencilerden aldığım bilgileri (devam-devamsızlık, sınav sonuçları, ödev ve proje notları, v.b.) bilgisayar ortamında analiz edebiliyorum.

38. Teknoloji tabanlı proje ve ödevlerin planlamasını etkili bir şekilde yapabiliyorum.

Müfredatta var olan bilgisayar destekli uygulamaları gerektiği gibi yerine getirebilineceğimi düşünüyorum.

APPENDIX E

COGNITIVE INTERVIEW

Note: Writings in the parenthesis belong to the interviewer.

Q1: Hesap çizelgesi programlarını (örneğin MS Excel) derslerinde ne kadar etkili kullanabilirsin?

Excel ile ilgili der aldım ama ben yeterince iyi kullanabileceğimi düşünmüyorum çünkü hala formülleri yazarken hala sorunlarım olduğunu düşünüyorum. Birde excel bana karmaşık bir programmış gibi geliyor. Buna 5 puan veriyorum.

Q2: Kelime işlemci programlarını (örneğin MS Wordl) derslerinde ne kadar etkili kullanabilirsin?

Ms word konusunda yeterince geliştiğimi düşünüyorum. Ama hala bilmediğim noktalar var. Ama işte wordart kullanma vesaire, buna ek olarak biçimlendirme vesaire bunları yapabileceğimi düşünüyorum. O yüzden bence ben bunda 7'yim.

Q3: Sunum programlarını (örneğin MS PowerPoint) derslerinde ne kadar etkili kullanabilirsin?

Ms powerpoint' i bence çok etkili kullanabilirim, kullanmayı çok seviyorum ve bütün ayrıntılarını öğrendim.

Q4: Veri tabanı programlarını (örneğin MS Access) derslerinde ne kadar etkli kullanabilirsin?

Açıkçası ben bu ismi ilk kez duyuyorum. Hiç bilmiyorum o yüzden 1. (Anlaşılmayan bir şey yok değil mi şu ana kadar okuduklarında?) Anlaşılmayan bir şey yok. Her şey çok net.

Q5: Derste kullanacağın materyalleri bilgisayar ortamında hazırlayabilir misin?

Evet hazırlarım. Ama hani Word'te, PowerPoint'te yâda paint kullanarak hazırlayabilirim ama bilmediğim programları kullanarak açıkçası nasıl hazırlayabilirim bilmiyorum. Ama bu güne kadar kullandıklarımla evet hazırlayabilirim. O zaman 6.

Q6: Bilgisayar ortamında materyal hazırlarken görsel tasarım tekniklerini uygulayabilir misin?

Görsel tasarım tekniklerini, sanırım burada şey anlıyorum ben hani visual larla ilgili birşeyler görmüştük, renk ayrımları işte bunlarla ilgili, nereye koyabilirsin, nereye koyarsan daha etkili olur, bu tür şeyler. Bu kavramla aslında ben bu sene tanıştım. Kullanabilirim ama çok çok etkili kullanamam o yüzden 5. Ama ayrıntılarını biliyorum.

Q7: Daha önce görmediğin bir eğitim yazılımını kimsenin yardımına ihtiyaç duymadan kullanabilir misin?

Açıkçası burada eğitim yazılımı derken bana verilen bir şey var program var ders anlatmam için. Onu ne kadar etkili kullanabilirim. (burada anlatmak istediğimiz, soru sana tam açık gelmemiş olabilir. Dediğin gibi senin dersin ile ilgili, herhangi bir şekilde sana yardım edebilecek, senin dersine olumlu katkı sağlayacak, geliştirilmiş bir program. Senin branşın ingilizce. İngilizce ile ilgili sana yardımcı olabilecek bir program geliştirilmiş ve sen bunu araştırıp kullanabilir, yani kimsenin yardımına ihtiyaç duymadan öğrenebilir misin, öğrenemez misin?) Yani ben açıkçası bilgisayarı çok bilmiyorum. Bilgisayar ile tanışıklığım çok arttığı için, özellikle üniversite de çok arttı, o yüzden evet kullanabilirim ama çok fazla değil. O yüzden 6.

Q8: Teknoloji kullanımını gerektirecek projelerde öğrencilere hangi yazılımları ve programları kullanmaları gerektiğini söyleyebilir misin?

(sorudan anladığını ilk önce öğreneyim) işte belli yazılım programları yada programlar var çocukların projelerini geliştirebilmeleri için. Mesela Powerpoint bunun için uygun bir programdır, mesela word. O yüzden bunları söyleyebilirim. Hangi programları kullanmaları gerektiği ile ilgili bir şeyler söyleyebilirim. Zaten yazılım programları ile ilgili başka derslerden de tanışıklığım var. Şu anda hatta devam ediyor. Ama çok çok üst düzeyde değil. O yüzden ben buna 6 diyeceğim.

Q9: Ders anlatımına yardımcı olacak eğitim yazılımları geliştirebilir misin?

Hayır. (soru açık değil mi?). evet çok açık.

Q10: İnternet ortamındaki tartışma gruplarını eğitim amaçlı kullanabilir misin?

Evet, kesinlikle kullanabilirim. Şu anda ben Audio Visual diye bir ders alıyorum. Bunun üzerine bir şey vardı, bu tartışma grupları ile ilgili. Bayağı detayına indik. O yüzden 8 diyeceğim.

Q11: Ders içi veya ders dışı etkinliklerde kullanmak için web sayfası tasarımları hazırlayabilir misin?

Web sayfası tasarımları, bilgisayar derslerinde yeni yeni görmeye başladık. Çok etkili değilim açıkçası, ama fikrim var. Terimleri fala biliyorum, yada bunların nerde fayda sağlayacağını biliyorum, fikrim var ama uygulamaya çok dökmedim o yüzden 4 diyeyim.

Q12: İnternet kaynaklı bilgilerin içinden dersine faydalı olanları ayırabilir misin?

Evet ayırabilirim. Ama tabi internet kaynaklı bilgi bilgilerimle sınırlı ise. Birçok şey biliyorum ama bilmediklerimi, gerçi içeriğini öğrenince şey yapabilirim ama şu anda kendimi ayırt edebilecek kadar etkili hissediyorum. O zaman 8 diyeceğim.

Q13: İnternetteki arama motorlarını (google, yahoo gibi) etkin kullanabilir misin?

Evet. Eskiden çok değil ama şimdi özellikle çok çok etkili kullanabiliyorum. Aradığımı bulabiliyorum.

Q14: Ders materyalleri hazırlarken internetten yeterince faydalanabilir misin?

Evet kesinlikle. Hatta en baştaki kaynağım internet.

(Şu ana kadar anlamadığın, okuyunca sana net gelmeyen soru oldu mu şu ana kadar?) Gayet açık.

Q15: İnternetteki bilgi kaynaklarının güvenilirliğini ayıt edebilir misin?

Bu konuda kendimi aslında çok fazla yeterli hissetmiyorum. Ama belli şeyler vardır, mesela wikipedia, herkes bir şeyler girebilir. Onların çok güvenilir olmadığını, az çok fikrim var aslında ama yinede çok çok etkin bir şekilde ayırt edebilir miyim bilmiyorum. O yüzden 6 diyeceğim.

Q16: Bilgisayar ve internetin sağladığı iletişim olanaklarını dersin için etkili kullanabilir misin?

Evet, çok çok etkili kullanabilir miyim bilmiyorum ama hani teknolojik olanaklar da mümkün olursa evet çok fazla kullanacağım.

Q17: Farklı işletim sistemlerini (Windows 98, Windows 2000, Windows XP, Windows Vista gibi) kullanabiliyor musun?

Windows Vista'yı geçenlerde arkadaşım yeni almış oradan biliyorum. Yeni çıkmış ve çok güzel bir şey ama windows98 biliyorum, xp biliyorum, vistayla da tanışıklığım var ama çok etkili kullanamıyorum. Ama diğerlerin evet kullanabilirim. Genel olarak bir aşinalığım var.

Q18: Projeksiyon aletini kullanarak etkili ders anlatabilir misin?

Projeksiyon aletini evet özellikle PowerPoint'te çok işe yarıyor. Bütün sunumlarımı ona dayanarak yaptığım için projeksiyon aletini çok seviyorum. 9 diyeceğim.

Q19: Bilgisayar ile ilgili ortaya çıkan sorunların kaynağın bulabilir misin?

Ama hani bunun için biraz teknik bilgi lazım ve bilgisayarla aşinalığım var ama mesela bir nokta çalışmadığı zaman bilgisayar öğretmenliğinde bir arkadaşım var

ona danışıyorum. (Burada senin sorunu çözmenden çok sorun bundan kaynaklandı diyebiliyor musun?) evet biraz fikrim var ama çok değil.

Q20: Yazıcı (printer) ve tarayıcı (scanner) gibi araçları ders materyalleri hazırlamak için etkili kullanabiliyor musun?

Yazıcıyı özellikle son iki senedir çok fazla kullanıyorum. Tarayıcıyı da öyle. Çok etkili bir şekilde kullanır mıyım? Çok çok etkili bir şekilde kullanama ama etkili kullanabilirim çünkü çok başvuruyorum bunlara. O yüzden 7 diyeceğim.

Q21: Yazıcı ve tarayıcı gibi araçlarda karşılaştığım basit sorunları (kağıt sıkışması, kablo çıkması, v.b.) çözebilir misin?.

Bunu çözemem. Çünkü yazıcıdan bir şey yaparken üçüncü bir kişi yardım ediyor. Ama en azından kağıt sıkışınca kağıdı alıp çıkarmam gerekiyor. (Mesela ilerde sınıfında okulda kullanırken buradaki gibi olmayacak. Ya da her şeyi kendin yapmak zorunda kalacaksın. Orda mesela hani baktın yazıcıda kâğıt sıkışmış veya çalışmıyor. Kablosunu çıkmış olduğunu gördün. Onu terine takabilir misin?) Evet takabilirim. Çünkü öyle bir sorunla karşılaştığımda karşıdakinin ne yaptığını biliyorum.

Q22: Bilgisayarın monitör, klavye ve fare gibi kasa bağlantılarını yardım almadan yapabilir misin?

Evet, bunları yapabilirim. 6 diyeyim ben.

Q23: Bilgisayarın fiziksel parçalarının (harddisk, klavye, RAM, disket sürücü gibi) özelliklerini açıklayabilir misin?

Evet. Bunlarla ilgili zaten bilgisayara ilk başlarken bir fikrim yoktu. Aldığımız bilgisayar dersleri de buna dayanıyordu. Sonra IS100 falan da almıştım. Bu yüzden evet açıklayabilirim.

Q24: Sınıfında karşılaştığım bilgisayar ile ilgili teknik sorunları (bilgisayarın açılmaması, projeksiyon aletinin çalışmaması gibi) çözebilir misin?

Evet, bunlarla çok karşılaşıyorum ve çözerim.

Q25: Bilgisayar ile ilgili duyduğun teknik kavramları (format atma, kopyala-yapıştır gibi) anlayabiliyor musun?

Evet anlayabiliyorum. Eskiden anlamıyordum. Şu an anlayabiliyorum. Birisi senin yanında teknik olarak bilgisayar ile ilgili konuştuğu zaman veya teknik kelimeler geçtiği zaman anlıyor musun? Sen soruyu okurken soru içerisindeki kelimeler ile mi sınırladın yoksa diğer şeyleri de düşündün mü? Sadece bunlarla sınırlı değil.) Diğerlerini de düşündüm. Mesela benim bilgisayar mühendisliğinden bir arkadaşım var. O bir şey konuşurken o kadar ileri düzeyde anlamıyorum ama genel anlamda evet. Normal bilgisayarla uğraşan bir insan konuştuğu zaman anlattıkları ile ilgili bir fikir oluşuyor.

Q26: Ders akışının gerektirdiği durumlarda bilgisayardan en üst düzeyde faydalanabilir misin?

Bilgisayardan çok üst düzeyde faydalanamam ama ders akışının gerektirdiği durumlarda evet. Bilgisayar da başvuracağım kaynaklardan bir tanesi. Bilgisayarın çok etkili olduğunu düşünüyorum zaten.

Q27: Farklı durumlarda bilgisayarın değişik özelliklerinden yararlanabilir misin?

(ne anlıyorsun sorudan, aslında benim için önemli olan sorunun tam olarak anlaşılması.) Mesela hani bilgisayarda word'te yazı yazabilirsin, powerpoint hazırlayabilirsin ama bilgisayarın çok daha farklı şeyleri olabilir. Aslında bir sürü fonksiyonu var. Bence soru bu fonksiyonları kapsamaya çalışıyor bence. Çok işlevli bilgisayar. İnsan beyni gibi bir şey. Bildiğim özelliklerinden yararlanabilirim. Değişik özelliklerini öğrendiğim sürece yararlanabilirim.

Q28: Alanınla ilgili eğitim teknolojilerindeki gelişmeleri takip edebiliyor musun?

Aslında bu güne kadar çok fazla takip edemiyordum. Ama işte aldığım dersler sonrasında, özellikle İngilizcenin teknoloji kullanılarak öğretilmesi ile alakalı. O dersi almaya başladığımdan beri takip edebiliyorum.

Q29: Bilgisayarın sağladığı olanakları öğretime destek amaçlı kullanabiliyor musun?

Evet kesinlikle kullanabilirim.

Q30: Derslerine bilgisayarın olumlu katkı sağlayacağı durumları ayırt edebilir misin?

Evet kesinlikle ayırt edebilirim. Ama hani gereksiz olduğu durumlarda olabilir.

Q31: Sınıfımda bilgisayar kullanırken sorun yaşayan öğrencilere yardım edebilir misin?.

Sanmıyorum ki benim öğrencilerim çok büyük düzeyde bilgisayar biliyor olsun. Gerçi öğrencinin ilgisine göre de değişiyor. Belli şeylerde evet yardım edebilirim. En azından kullanacağım özelliklerde bir fikrim olur. Şöyle yapman gerekli, gibi yönlendirmelerde bulunabilirim.

Q32: Bilgisayar tabanlı çalışmalarında öğrencilere yok gösterebilir misin?

Evet gösterebilirim. Ama çok üst düzeyde değil. Dediğim gibi yani seçtiğim konu ve kullanacağım materyaller konusunda zaten etkin olmak zorundayım diye düşünüyorum. O yüzden gösterebilirim diyebilirim.

Q33: Öğrencilerden aldığın bilgileri (devam-devamsızlık, sınav sonuçları, ödev ve proje notları, v.b.) bilgisayar ortamında arşivleyebilir misin?

Evet. Ama genellikle Excel kullanarak yapılacak şeyler. Evet Excel'i belli düzeyde kullanabilirim. 7 diyeceğim.

Q34: Öğrencilerden aldığın bilgileri (devam-devamsızlık, sınav sonuçları, ödev ve proje notları, v.b.) bilgisayar ortamında analiz(basit istatiksel hesaplamalar, ortalama hesabı, orta değer hesabı, frekans hesabı gibi) edebilir misin?

Evet bunları yapabilirim. Belli formüller kullanılıyor. Hesaplamalar ile ilgili fikrim var. Ama dediğim gibi yeterince yapabileceğimi düşünmüyorum. O yüzden biraz daha geliştirmem gerekiyor.

Q35: Teknoloji tabanlı proje ve ödevlerin planlamasını etkili bir şekilde yapabilir misin?

Plan aslında kişiyle alakalı bir şey. Bilgisayar anlamındaysa eğer Şöyle yapılacak, şu yöntemler kullanılacak, izlenecek şeklinde bir yol gösterebilirim. Ama çok çok etkin değil.

Q36: Müfredatta var olan bilgisayar destekli uygulamaları gerektiği gibi yerine getirebilir misin?

Bence getirebilirim. Çünkü bilgisayarla çok aşinalığım var. Kullanmak istedikleri şeylerin çok çok üst düzeyde bir şey olacağını da düşünmüyorum.

(Bu ana kadar anlamadığım bir soru oldu mu?)

Bazı yerlerde cevap verirken düşünmem gerekti. Ama bunlar soruyla değil de daha çok benden kaynaklanıyordu. Bence sorular gayet açık.

APPENDIX F

TOTAL VARIANCE EXPLAINED AFTER ROTATION

Table A. 2

Total variance explained before rotation

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	17,675	51,984	51,984	17,337	50,991	50,991
2	2,199	6,467	58,451	1,820	5,353	56,343
3	1,503	4,421	62,872	1,210	3,558	59,901
4	1,464	4,306	67,179	1,021	3,004	62,905
5	1,085	3,190	70,369	,864	2,542	65,448
6	,914	2,687	73,056			
7	,844	2,483	75,539			
8	,727	2,138	77,676			
9	,670	1,971	79,647			
10	,614	1,806	81,453			
11	,573	1,684	83,137			
12	,536	1,577	84,714			
13	,513	1,508	86,222			
14	,480	1,411	87,633			
15	,452	1,328	88,962			
16	,397	1,167	90,129			
17	,365	1,073	91,202			
18	,338	,995	92,197			
19	,294	,865	93,062			
20	,280	,824	93,886			

Table 1. A (Continued)

Total variance explained before rotation

21	,256	,753	94,639
22	,241	,709	95,348
23	,222	,654	96,002
24	,200	,587	96,590
25	,196	,577	97,167
26	,153	,451	97,617
27	,143	,420	98,037
28	,133	,392	98,429
29	,128	,378	98,806
30	,106	,311	99,117
31	9,617E-02	,283	99,400
32	7,448E-02	,219	99,619
33	6,912E-02	,203	99,822
34	6,054E-02	,178	100,000
35	,036	,100	99,919
36	,029	,081	100,000

APPENDIX H

IT SELF EFFICACY SURVEY

Bilgisayar ve Bilişim Teknolojileri Anket Formu

Bu anket, ilköğretim okullarında görev yapmakta olan öğretmenlerin bilişim teknolojilerinin dersler ile birleştirilmesi konusundaki yeterlilik inançlarını ölçmek amacı ile geliştirilmiştir. Bu anket aracılığı ile sizden alacağımız bilgiler sadece bilimsel amaçlı kullanılacaktır. Çalışma sonunda isminiz gizli tutulacak, doğrudan veya dolaylı olarak kullanılmayacaktır. Araştırma sonunda elde edilen bulguları istemeniz halinde sizinle paylaşmak için gerekli olanaklar sağlanacaktır. Katkınız için teşekkür ederiz...

Kişisel Bilgileriniz:

A) Cinsiyetiniz : ( )Bay ( )Bayan
B) Yaşınız :
C) Branşınız :
D) Evinizde bilgisayar kullanıyor musunuz? ( ) Evet ( ) Hayır
E) Bu güne kadar kaç tane bilgisayar ve teknoloji eğitimine katıldınız?.....
F) Bu güne kadar toplam kaç saat bilgisayar ve teknoloji eğitimine katıldınız?.....

Bilgisayar kullanımı ile ilgili beceri ve yeterlilik düzeyi:

Lütfen aşağıda verilen ölçeğe göre her soru için 1'den 9' a kadar yeterlilik düzeyinizi gösteren bir puan verin

1.....2.....3.....4.....5.....6.....7.....8.....9

Hiç yeterli değilim → Yeterli değilim → Yeterliyim → Çok

	PUAN (1-9)

1	Hesap çizelgesi programlarını (örneğin MS Excel) derslerinizde ne kadar etkili kullanabilirsiniz?	
2	Kelime işlemci programlarını (örneğin MS Word) derslerinizde ne kadar etkili kullanabilirsiniz?	
3	Sunum programlarını (örneğin MS PowerPoint) derslerinizde ne kadar etkili kullanabilirsiniz?	
4	Veri tabanı programlarını (örneğin MS Access) derslerinizde ne kadar etkili kullanabilirsiniz?	
5	Derste kullanacağınız materyalleri bilgisayar ortamında hazırlayabilir misiniz?	
6	Bilgisayarın sağladığı olanakları öğretime destek amaçlı kullanabiliyor musunuz?	
7	Daha önce görmediğiniz bir eğitim yazılımını kimsenin yardımına ihtiyaç duymadan kullanabilir misiniz?	
8	Öğrencilerden aldığınız bilgileri (devam-devamsızlık, sınav sonuçları, ödev ve proje notları, v.b.) bilgisayar ortamında arşivleyebilir misiniz?	
9	Ders akışının gerektirdiği durumlarda bilgisayardan en üst düzeyde faydalanabilir misiniz?	
10	İnternet ortamındaki tartışma gruplarını (forumlar, e-posta grupları, v.b.) eğitim amaçlı kullanabilir misiniz?	
11	Ders içi veya ders dışı etkinliklerde kullanmak için web sayfası tasarımları hazırlayabilir misiniz?	
12	İnternet kaynaklı bilgilerin içinden dersinize faydalı olanları ayırabilir misiniz?	
13	İnternetteki arama motorlarını (google, yahoo gibi) etkin kullanabilir misiniz?	
14	Teknoloji tabanlı proje ve ödevlerin planlamasını etkili bir şekilde yapabilir misiniz?	
15	Bilgisayarın fiziksel parçalarının (harddisk, klavye, RAM, disket sürücü gibi) özelliklerini açıklayabilir misiniz?	
16	Bilgisayar ve internetin sağladığı iletişim olanaklarını dersiniz için etkili kullanabilir misiniz?	
17	Farklı işletim sistemlerini (Windows 98, Windows 2000, Windows XP, Windows Vista gibi) kullanabilir misiniz?	
18	Projeksiyon aletini kullanarak etkili ders anlatabilir misiniz?	
19	Bilgisayar ile ilgili ortaya çıkan sorunların kaynağın bulabilir misiniz?	
20	Yazıcı (printer) ve tarayıcı (scanner) gibi araçları ders materyalleri hazırlamak için etkili kullanabilir misiniz?	
21	Yazıcı ve tarayıcı gibi araçlarda karşılaştığım basit sorunları (kağıt sıkışması, kablo çıkması, v.b.) çözebilir misiniz?	
22	Bilgisayarın monitör, klavye ve fare gibi kasa bağlantılarını yardım	

	almadan yapabilir misiniz?.	
23	Sınıfınızda karşılaştığınız bilgisayar ile ilgili teknik sorunları (bilgisayarın açılmaması, projeksiyon aletinin çalışmaması gibi) çözebilir misiniz?	
24	Bilgisayar ile ilgili duyduğun teknik kavramları (format atma, kopyala-yapıştır gibi) anlayabilir misiniz?	
25	Ders anlatımına yardımcı olacak eğitim yazılımları geliştirebilir misiniz?	
26	Farklı durumlarda bilgisayarın değişik özelliklerinden yararlanabilir misiniz?	
27	Alanınızla ilgili eğitim teknolojilerindeki gelişmeleri takip edebilir misiniz?	
28	Bilgisayar ortamında materyal hazırlarken görsel tasarım tekniklerini uygulayabilir misiniz?	
29	Bilgisayarın derslerinize olumlu katkı sağlayacağı durumları ayırt edebilir misiniz?	
30	Sınıfınızda bilgisayar kullanırken sorun yaşayan öğrencilere yardım edebilir misinz?	
31	Bilgisayar tabanlı çalışmalarında öğrencilere yol gösterebilir misiniz?	
32	Teknoloji kullanımını gerektirecek projelerde öğrencilere hangi yazılımları ve programları kullanmaları gerektiğini söyleyebilir misiniz?	
33	Öğrencilerden aldığınız bilgileri (devam-devamsızlık, sınav sonuçları, ödev ve proje notları, v.b.) bilgisayar ortamında analiz(basit istatistiksel hesaplamalar, ortalama hesabı, orta değer hesabı, frekans hesabı gibi) edebilir misiniz?	
34	Ders materyalleri hazırlarken internetten yeterince faydalanabilir misiniz?	
35	Müfredatta var olan bilgisayar destekli uygulamaları gerektiği gibi yerine getirebilir misiniz?	

İlginiz için teşekkürler...

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