INFORMATION AND COMMUNICATION TECHNOLOGY EDUCATION IN PRIMARY SCHOOLS: STUDENTS' COMPETENCIES, ATTITUDES AND NEEDS

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ABSTRACT

INFORMATION AND COMMUNICATION TECHNOLOGY EDUCATION
IN PRIMARY SCHOOLS: STUDENTS' COMPETENCIES, ATTITUDES AND NEEDS

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This study aimed to provide a general picture of ICT education in primary schools. Through this aim, students' perceived ICT competencies, their attitudes towards the ICT course, the characteristics of the teaching-learning process in the ICT course, the deficiencies of the IT classrooms and the effectiveness of the ICT Student Workbook were analyzed. This study was designed as a cross-sectional survey study. In order to collect the data, a self-reported questionnaire consisted of 63 items was developed by the researcher. The sample consisted of 442 Grade 8 students in 11 primary schools located in the metropolitan area of Izmit. Both descriptive and inferential statistics were utilized to analyze the data. Multivariate Analysis of Variances with Pillai's Trace test was employed to investigate whether the significant differences among dependent variables across independent variables existed.

Results of the study indicated that primary school students generally perceived themselves competent in ICT tasks and they had favorable attitudes towards the ICT course. Significant differences were found in students' perceived ICT competencies and attitudes with respect to gender, educational background of parents, computer ownership and availability of home assistance related to the ICT course. This study also revealed

several obstacles which prevent taking full benefits of IT classrooms, and problems with the implementation of the new ICT program.

Keywords: information and communication technologies (ICT), ICT competencies, attitudes, ICT program, IT classrooms.

ÖZ

İLKÖĞRETİM OKULLARINDA BİLİŞİM TEKNOLOJİLERİ EĞİTİMİ:
ÖĞRENCİLERİN YETERLİKLERİ, TUTUMLARI VE İHTİYAÇLARI

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Bu çalışmanın amacı ilköğretim okullarındaki bilişim teknolojileri eğitimini genel bir çerçevede ele almaktır. Bu doğrultuda, öğrencilerin bilişim teknolojileri yeterlik algıları, bilişim teknolojileri dersine karşı tutumları, bilişim teknoloji sınıflarının eksiklikleri, bilişim teknolojileri dersindeki öğretme-öğrenme sürecinin özellikleri ve Bilişim Teknolojileri Öğrenci Çalışma Kitabının etkinliği incelenmiştir. Araştırmanın deseni enlemesine kesitsel anket çalışmasıdır. Çalışmada 63 maddeden oluşan ve araştırmacı tarafından geliştirilen anket kullanılmıştır. İzmit'in merkez bölgesinde yer alan 11 ilköğretim okulundan seçilen 442 sekizinci sınıf öğrencisi araştırmanın örneklemini oluşturmuştur. Elde edilen veriler betimleyici ve yordayıcı istatistiksel yöntemler kullanılarak analiz edilmiştir. Gruplar arasında istatistiksel olarak önemli farklar olup olmadığını incelemek için çoklu varyans analizi kullanılmıştır.

Araştırma sonuçları öğrencilerin genellikle kendilerini yeterli gördüklerini ve derse karşı olumlu tutumlara sahip olduklarını göstermiştir. Ayrıca cinsiyet, ebeveynlerin eğitim durumu, evde bilgisayar sahipliği ve evde derse yönelik yardımın olmasının, öğrencilerin yeterlik algıları ve derse karşı tutumları üzerinde istatistiksel olarak önemli bir etkiye sahip olduğu saptanmıştır. Ayrıca, bu çalışma Bilişim Teknoloji sınıflarından tam olarak

yararlanılamamasının nedenlerini ve yeni Bilişim Teknolojileri programının uygulanması sırasında karşılaşılan aksaklıkları ortaya çıkarmıştır.

Anahtar Kelimeler: bilişim teknolojileri (BT), BT yeterlikleri, tutumlar, BT programı, BT sınıfları.

To My Father

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I am grateful to Assist. Prof. Dr. Cennet Engin Demir, my advisor, for her encouragement and insight throughout my research and for guiding me through the entire thesis process from start to finish. Has it not been for her faith in me, I would not have been able to finish the thesis.

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LIST OF ABBREVIATIONS

ADSL : Asymmetric Digital Subscriber Line
ANOVA : Analysis of variance
BEP : Basic Education Program
CAE : Computer Aided Education
CAM : Computer Attitude Measure
CAS : Computer Attitude Scale
CT : Communication Technology
CUE : Computer Use and Experience Scale
ICT : Information and Communication Technology
ISTE : International Society for Technology in Education
IT : Information Technology
MANOVA : Multivariate Analysis of Variances
MoNE : Ministry of National Education
NRI : The Networked Readiness Index
OECD : Organization for Economic Co-operation and Development
OECS : Organization of Eastern Caribbean States
PISA : Program for International Student Assessment
SPSS : Statistical Package for the Social Sciences
SSI : State Statistics Institute
UNDP : The United Nations Development Program
UNESCO : United Nations Educational, Scientific and Cultural Organization
UNICEF : United Nations Children's Fund

CHAPTER I

INTRODUCTION

1.1 Background of the study

It is almost more than twenty years ago; Deaton (1990) stated that

> W*hether or not we touch a computer, it is almost impossible to escape their daily influence on us; from speedy information transmittal, printouts, and receipts, to control of lights and temperature of our workplaces* (cited in Al-Mujaini, 2006, p.26).

About 25 years later, today, computer technologies with impressive changes are integrated to modern culture and appear to be a key tool of the world's economic and social change.

Today, we have a term, “Information and Communication Technology” [ICT] which has gained popularity recent years. It encompasses the effective use of equipment and programs to access information, and store, organize, manipulate and present it (Gay & Blades, 2005). It is reported by Organization of Eastern Caribbean States [OECS] (2002) that

> *In recent years ICT has had, and is continuing to have, an increasingly significant impact on all aspects of society. There are few areas of life, at home, at school and in work, where this new technology has not made an impact. ICT expands our access to, and understanding of the world at large* (p.10).

Information and communication technology can be used as a personal tool, but also people can benefit from ICT in order to engage in collaborative activities, and to get local and worldwide communication (OECS, 2002). It is also a vital means for social change and economic development that is seen as an essential tool for developing countries. It is explained in the book published by World Bank (2006a) that the world’s policy makers

have recognized the significance of ICT which offers primary inputs for economic development, contributes to global integration and also improves the effectiveness and efficiency of public sector. As a result, for governments, it became a priority to improve ICT access and quality.

According to the report of Organization for Economic Co-operation and Development [OECD] (2001a), there are three main rationales for the inclusion of ICT into education: economic, social and pedagogical. For the economic rationale, the center of attention is on the perceived needs of the economy and the requirement in many areas of employment to have personnel with ICT skills because being knowledgeable on and familiar with ICT have become important factors of employability. Therefore, the ones who do not have ICT skills will have a great economic disadvantage in the information era. That's why education has the responsibility of meeting the demands of a changing economy and preparing future workers.

The second rationale is sociological which highlights the importance of ICT as a requirement for participation in society. ICT competency has become an essential life skill, in such a way that the range of skills and processes supported by ICT is brought together in the nation of digital literacy, which is both a requirement and a right for all learners. It is apparent that societies will suffer if some of their members have little or no ICT facility, especially since public and many other services are increasingly becoming available on-line.

The last rationale is pedagogical. It underlines the role of ICT in teaching and learning. As a result of the dramatic changes in ICT, its potential for this has developed rapidly and considerably. It can increase the extent and richness of learning and can support the development of higher-order thinking skills, including analysis and synthesis. There is an increasing convergence between the economic, social, and pedagogical rationales, as modern society gradually more looks to schools to foster independent and creative thinkers who can confidently solve problems and manage their own learning throughout their lives.

The educational use of ICT is described in the report by OECS (2002) that ICT can be used to help students play their full part in society. Students should be well enlightened about the current and potential applications of ICT and should be possessed with skills to

make use of those applications. Furthermore, they must be able to evaluate the effectiveness of the resources offered by ICT and determine when it is most appropriate to use them. ICT can provide one of the most potentially powerful learning tools in a way that computers can support learning across the whole curriculum, but also communication networks can provide the student with access to huge amounts of information. Additionally, ICT can be used to support broader educational objectives including learning independently, collaborating in groups and communication skills.

As a result, it is not difficult to understand why education systems around the world are now under increasing pressure to use information and communication technologies as part of the educational process. The reason behind this pressure is explained briefly by Stephenson (2004) that there is an increasing expectation that students must attain a level of technological fluency to function effectively in society, and Costello (1997) adds that it is in the responsibility of schools to provide students with required facilities.

United Nations Educational, Scientific and Cultural Organization [UNESCO] (2002) reported four broad approaches through which educational systems and individual schools proceed in their adoption and use of ICT. These approaches are termed “emerging”, “applying”, “infusing”, and “transforming”, and they represent a continuum. Schools at the beginning stages of ICT development demonstrate the emerging approach. They begin to purchase some computing equipment and software. In this phase, administrators and teachers are just starting to investigate the possible ways and consequences of using ICT for school management and adding ICT to the curriculum. Although schools at this emerging phase are still making use of traditional and teacher-centered techniques, there is an alertness of ICT use. In the second phase that is the applying approach, administrators and teachers benefit from ICT for tasks already carried out in school management and the curriculum. At the applying approach phase, schools where teachers largely have control over the learning environment adapt the curriculum in order to enlarge ICT use in various subject areas. The next phase which is the infusing approach involves integrating or embedding ICT across the curriculum, so schools employ a range of computer-based technologies in laboratories and classrooms. Teachers explore new ways in which ICT changes their personal efficiency and professional practice. The curriculum begins to reflect real-life applications. And finally, schools that use ICT to rethink and renew school organization in creative ways are at the transforming approach. The focus of the curriculum becomes learner-centered and it

integrates subject areas in real-life applications. In this phase, schools become learning centers for their communities.

In Turkey, computers started to be used in education more than twenty years ago. It is possible to see the usages of ICT as a tool and subject in educational context of the country. ICT has been taught as a discrete subject and offered as an elective course to students in primary education at public schools since 1998. Students are taught ICT separately from its use in other courses. However, as a result of the improvements on ICT since its initiation in primary education, it became necessary to redesign the ICT curriculum which had been used for almost ten years.

Finally, the new ICT program started to be implemented for the grades 1-3 in the academic year 2006-2007 and the other graders were introduced to the program during the academic year 2007-2008. In this context, the name of this course has been also changed and become “Information Technologies”. The program offers a broad standpoint on the nature of technology, how to use and apply a variety of technologies, and the impact of ICT on self and society. It includes the use of ICT as encountered in the daily life of many communities; specific units covers basic concepts of ICT, using computers and managing files, word processing, spreadsheets, databases, producing presentations, searching for information and communicating with computers and also social and ethical issues on ICT (Ministry of National Education [MoNE], 2007).

1.2 Purpose of the Study

The purpose of the study was to describe the current status of ICT education in public primary schools through investigating Grade 8 students’ perceived ICT competencies and their attitudes towards the ICT course, the characteristics of the teaching-learning process of the course, the deficiencies of the IT classrooms in terms of their appropriateness to successful implementation of the ICT program, and students’ perceptions on the ICT Student Workbook about its effectiveness.

1.3 Rationale for the Study

Today, ICT keeps on evolving at an amazing pace. New technologies are introduced continually, and existing ones become outdated almost as soon as they appear. As a result of those changes, new ICT competencies which are considered as “life skills” in the new information age appear. Familiarity with new ICT competencies has become very

important since it plays a central role for the development of modern economies and societies and is explicitly required in the work and leisure of contemporary life. While most of the areas of employment require having personnel with ICT skills, public and many other services are increasingly becoming accessible online. ICT has changed almost every area of our lives; at home, at school and in work (OECD, 2001a; OECS, 2002; Pelgrum & Law, 2003).

Although learning about technology is no longer the primary goal for developed countries, it is still a significant challenge that developing countries cannot overlook. It is essential to ensure that the younger generation will not grow up as technological illiterates (Pelgrum & Law, 2003). As a developing country, Turkey needs to ensure that the Turkish youth are equipped with ICT skills to have a successful future and cope with changing world.

As a consequence of the importance of ICT competency, education systems are now under rising pressure to integrate ICT in the educational process. According to Eraut (1989), during the integration process of ICT into education, priority should be given to developing an ICT infrastructure within the educational system, which can respond flexibly and with increasing capability and capacity to new opportunities and policy changes. It has been also mentioned in the report “Policy Note: ICT in Schools in Turkey” by World Bank (2004) that the national ICT infrastructure support has a serious impact on the long-term implementation and sustainability of ICT in schools.

It is strongly believed that ICT enables change to take place, and contributes a great deal to socio-economic growth (The United Nations Development Program [UNDP], 2001). However, it is important to achieve a better understanding of the conditions within which such enabling potential will be realized. In that sense, Pelgrum (2001) highlighted the obstacles which affect the realization of ICT goals and reported that insufficient number of computers, inadequate peripherals, and insufficient copies of software, a shortage of computers and lack of technical support are the main ICT-infrastructure-related obstacles affecting the attainment of ICT goals. Similarly, the report “Learning to change ICT in Schools” by OECD (2001a) underlines the significance of appropriate levels of equipment for effective use of the technology and discusses that although Internet access has increased considerably, more work stations and higher bandwidth are considered necessary to promote extended and sophisticated use. Exceptional grants for the initial installation of ICT have to be followed by regular funding for maintenance, technical

support, and the cost of being on-line that can be a severe deterrent to Internet use. An on-going re-equipment plan will be necessary over time to sustain quality use.

Although ICT infrastructure seems to be a necessary condition for the successful implementation of the ICT program, as Selwyn (1997) stated, without the learners' inclination to use ICT, just providing access to hardware and software is not enough to ensure effective integration of ICT into an educational setting.

Shneiderman (1980) asserted that positive attitudes improve the learning process so much so that a positive attitude generally increases the motivation to learn and to retain information, and a negative attitude, on the other hand, may obstruct learning and retention of information (cited in Burger, 2003, p.17). As Houle (1996) stated, attitudes are also important for computer courses and one of the factors that should receive attention to facilitate effective learning for those courses.

The report "Learning to Bridge the Digital Divide" by OECD (2000) expressed that many students lack experience in information handling and in effective independent learning. Schools should develop the learning environment and give students a more active role, and therefore support their ability to find information and transform it into knowledge and their skills to find interesting, relevant and reliable information, and how to work with it. As another report "Learning to change ICT in Schools" by OECD (2001a) states, modern society is thus increasingly looking to schools to foster independent and creative thinkers who can confidently solve problems and manage their own learning throughout their lives. Within this context, it has been also given part in this study to examine the teaching-learning process in the course and comprehend its characteristics to serve those aims, and to understand the extent to what the learning strategies required by the new program designed in the light of constructivism are being used by teachers.

With the new program, the students were provided with a workbook to be used for their in-class and out-of-class activities. Educational materials need to be a regular feature of the teaching-learning process. In turn, the educational system needs to continually assess their appropriateness for a number of factors including accuracy, the organization and sequencing of topics, the level of reading difficulty and interest to students (United Nations Children's Fund [UNICEF], 2000). Consequently, it has become important to know and to explain to what extent the ICT Student Workbook is effective to guide students through their learning.

1.4 Significance of the study

This study will inform educators and decision making of students' ICT competencies, their attitudes towards the ICT course, IT-classrooms-related obstacles, characteristics of the teaching-learning environment of the course, and students' perceptions on the course workbook considering its effectiveness as a good guiding material.

It seems to be important to explore ICT competencies of the eighth grade level students who are now ready to get further education through high schools and will become the future employees and adults soon. They will be required to use ICT extensively in their future lives, so educators need to ensure that they will have required competencies to use ICT effectively. Teachers are responsible for not only graduating students but also to ensure students' possessed essential skills that allow them to succeed in an ever-changing technological environment. Furthermore, effects of several demographic variables on students' perceived ICT competencies revealed by this study will be helpful for teachers, stake holders and curriculum planners to make wise decisions to improve students' competencies.

More specifically, this study will contribute to the scant body of literature on ICT in Turkey since most of the studies on students' ICT competencies and attitudes were carried out in technologically advanced countries where individuals are more likely to have been intensively exposed to ICT as compared to the ones in Turkey. The results of these studies may not be suitable for the conditions experienced in Turkish context; as a developing country, its experience with ICT is quite newer. Therefore, more studies should be conducted in order to get a clearer picture of ICT's position in Turkey.

There is also a need to explore students' attitudes towards the ICT course in order to ensure the successful implementation of the new program, and have an understanding of students' state of readiness for the future courses. The results will be also helpful for teachers in order to develop positive attitude towards the course since factors affecting students' attitudes were presented.

Another significant aspect of this study is that it will provide information regarding IT classrooms' adequateness and appropriateness to successful implementation of the ICT program, will offer a deeper understanding of the circumstances under which the new program is being implemented. The results will provide information about the adequacy of physical facilities in IT classrooms in order to conduct effective implementation of the new

ICT program, and will offer suggestions to improve the learning environment in IT classrooms.

The new ICT program started to be implemented for the grades 1-3 in the academic year 2006-2007 and the other graders were introduced to the program during the academic year 2007-2008. Fortunately, this study will be one of the studies which present the first critics derived from the implementation of the new program and the use of the workbook.

1.5 Limitations of the study

The major limitation of this study was that it relied on only students' self-reported data. For instance, the results are a measure of how students perceived their own competencies. It may be more preferable to support students' self-reported data with a variety of measurement tools, such as direct observation and interviews.

Another limitation of this study is that the results cannot be generalized directly to all eight grade level students in Turkey. The population of this study is limited to the Grade 8 students in the primary schools located on the metropolitan area of Izmit.

1.6 Definition of Terms

Attitude: "*Mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related"* (Allport, 1935, cited in Openshaw, 1967, p.91).

Information and Communication Technology (ICT): Any technology involved in communicating such as software, CD-ROMs, the Internet, television and radio, image capture devices including still and video cameras, sending, data logging and control apparatus, and other equipment, for example even using a video recorder (Alsop & Hicks, 2001).

ICT Competency: The ability "*to use ICT to retrieve, store, create, present, sort and exchange information*" (European Commission, 2003, p.13).

Information Technology: The term used to describe computer hardware and software which are used "*to access and retrieve information, and store, organize, manipulate and present*" it by electronic means (UNESCO, 2003, p.7).

Information literacy: the composition of knowledge, understanding, skills, and attitudes that individuals need to have in order to completely contribute as members of society in the information age (UNESCO, 2003).

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter is to present the related literature on the issues covered in this research. The chapter includes the following headings:

- What is ICT?
- Information and Communication Technology competencies,
- Attitudes towards Information and Communication Technologies,
- Factors affecting students' ICT competencies and attitudes,
- Information and Communication Technologies in Turkey,
- The new Information and Communication Technology Program,
- The Information and Communication Technology Student Workbook.

2.1 What is ICT?

ICT is an acronym which stands for Information and Communication Technology. In order to attain a clear definition of what ICT is, the following definitions provided by UNESCO (2003) can be used as a guide:

- Information technology [IT] is the term used to describe computer hardware and software which are used "*to access and retrieve information, and store, organize, manipulate and present*" it by electronic means. While the items of equipment such as personal computers, scanners and digital cameras are included in the hardware category, database storage and multimedia programs take place in the software category (p.7).

- Communication technology [CT] is the term used to describe telecommunications tools which are used to seek and access information, such as phones, faxes, modems and computers.

- Information literacy represents the composition of knowledge, understanding, skills, and attitudes that individuals need to have in order to completely contribute as members of society in the information age.

Through the light of these terms explained above, ICT can be considered as an umbrella term that includes all technologies for the manipulation and communication of information; it is the overlap of computer information and telecommunication technologies, and their applications. Therefore, ICT offers more than just computers, but any technology involved in communicating such as software, CD-ROMs, the Internet, television and radio, image capture devices including still and video cameras, sending, data logging and control apparatus, and other equipment, for example even using a video recorder (Alsop & Hicks, 2001).

Information and communication technologies are information handling tools that are used to create, store, and process, distribute and exchange information. These different tools are now able to work together, and come together to form networked world which reaches into every corner of the world (UNDP Evaluation Office, 2001). Thus, ICT can be used to access global knowledge and communicate with other people since it is an electronic based system of information transmission, reception, processing and retrieval, which has drastically changed the way people think, the way people live and the environment in which people live (Ogunsola, 2005).

Pelgrum and Law (2003) reported that at the end of 80s, the term computers was replaced by IT signifying a shift of focus from computing technology to the capacity to store and retrieve information. Then, around 1992 when e-mail started to become accessible to the general public, this was followed by the introduction of the term ICT; IT was then replaced by ICT. However, it is also very common to find definitions of ICT that are synonymous with those of IT. For instance, Killick (2000) describes IT as the group of technologies which is revolutionizing the handling of information and embodies a convergence of interest between electronics, computing and communication. In this study, the terms IT and ICTs will be used nearly synonymously and in a somewhat broad sense as well.

2.2 Information and Communication Technology Competencies

The New Oxford Dictionary of English (2001) defines competency as "*the ability to do something successfully or efficiently; as the scope of a person's or group's knowledge or ability; as a skill or ability*". In many of other definitions, competency is defined as a combination of knowledge, skills and attitudes. For instance, Parry (1998) considers competency as a cluster of related knowledge, attitudes and skills, and points out that it affects a major part of one's roles or responsibilities and correlates with performance, and it can be measured against well-accepted standards.

A person gains competency through education, training, experience, or natural abilities. While there are different definitions of competency, as Clark (1999) explains, most of them have two common components: first, they are observable or measurable skills, knowledge and abilities, and second they must distinguish between superior and other performers.

Therefore, competency is an individual characteristic that can be measured reliably and that can be used to make differentiation between superior and average performers, or between effective and ineffective performers (Bartram, Robertson, & Callinan, 2002). As far as ICT competency is concerned, it can be regarded as the ability "*to use ICT to retrieve, store, create, present, sort and exchange information"* (European Commission, 2003, p.13). As shown in the aforementioned literature, since ICT has become increasingly significant in every aspect of life, it seems necessary to become ICT competent for everyone. It plays a major role in dealing with information and its transformation into knowledge. Students who possess ICT skills will be able to apply the basics in authentic, integrated ways to solve problems, complete projects and creatively enhance their abilities.

Considerable resources have been invested to justify the place of ICT in education since it provides many benefits and gains that can be achieved by students (Jhurree, 2005). For example, Papert (1996) identified the several positive effects of ICT on students and stated that it improves students' motivation and creativity when they are faced with the new learning environments, and provides a greater disposition to research and problem-solving concentrating on real-life applications, results in more comprehensive acquisition of knowledge and encourages collaborative work. Furthermore, students become able to produce knowledge, increase their capability to deal with rapidly changing world and gain new skills fostered through technological literacy (cited in OECD, 2000, p.26).

Moreover, in the report “Information and Communication Technology (ICT) Learning Outcomes in Mathematics and Language Arts for Lower Secondary School Students in the Eastern Caribbean” by OECS (2002), characteristics of the students who have ICT competencies are described. Those students can:

- *develop knowledge, ability, and responsibility in the use of information technology;*
- *acquire, organize, analyze, evaluate, and present information using appropriate information technology;*
- *use ICT to expand their range and effectiveness of communication;*
- *solve problems, accomplish tasks, and express creativity, both individually and collaboratively, using information technology;*
- *understand the role and impact of information technology and apply ethical, responsible, and legal standards in its use* (p.14).

In its several reports, OECD has highlighted the importance of these competencies. For instance, in the report “The Knowledge-based Economy”, discussing the increasing demand for more highly skilled workers, OECD (1996) was pointed out that the need to learn competencies in using information shapes the knowledge-base economy. Since reaching information is getting less difficult and expensive, this makes competencies of selecting information and using it effectively more essential. In the knowledge-based economy, it is highly required to develop competencies to select relevant information, interpret and decode it through learning new skills and forgetting old ones.

Another report, “Educational Policy Analysis 2001” states that the knowledge-based economy is based on the production and use of information and knowledge, and the capability of producing and using information effectively is thus a vital source of skills for many individuals (OECD, 2001b). And again, the report “Learning to Change: ICT in Schools” states that in a world with easy access to huge stores of information, the skills of accessing, handling and using data and materials is more significant than the ability to recall in detail ever greater amounts across many fields of knowledge (OECD, 2001a).

As a result of the new technologies which are introduced continually, new ICT competencies appear. In order to have a successful future and cope with changing world, students need to acquire these competencies. There are different interpretations on

adequate ICT competencies. For example, MoNE (2007) portrayed three main learning areas with a number of goals and objectives through the acquisition of which primary school students will become ICT competent. Similarly and very recently, International Society for Technology in Education [ISTE] (2007) formed standards, under the name of National Education Technology Standards for Students 2007, in relation to ICT competencies. These standards present what students should know and be able to do in order to learn effectively and live productively in an increasingly digital world. The followings are the main headings of these standards:

- *Creativity and Innovation: Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.*
- *Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.*
- *Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.*
- *Critical Thinking, Problem Solving, and Decision Making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.*
- *Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*
- *Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems, and operations* (p.1).

2.3 Attitudes towards Information and Communication Technologies

Attitudes have been a favorite topic since the beginning of the twentieth century. Attitude has been defined in a variety of ways by then, even in social psychology, where the study of attitudes has its disciplinary home (Brief, 1998). One of its early and well-known definitions was given by Allport (1935, cited in Openshaw, 1967, p.91) that attitude is "*mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with*

which it is related". It can be derived from Allport's definition of attitude that attitudes are formed and organized through experience, that is, people are not born with attitudes and attitudes are not passive, but rather they exert a dynamic or directive influence on behavior. As far as the construct of attitude is concerned, it consists of affective, cognitive and behavioral components. The cognitive component is the belief, perception, and idea component, the affective component is the feeling or emotion component and the behavioral component is related to taking action (Ajzen & Fishbein, 1980).

Attitudes have long been documented as significant predictors of individual differences in many educational endeavors. For example, Fishbein and Ajzen (1980) described attitude as a predisposition to act towards objects in a consistently favorable or unfavorable way and it plays a significant role in influencing subsequent behaviors. They stated that attitudes lead to behavioral intentions towards the object. Accordingly, it can be then said that how people think and feel about ICT has a great impact on how they behave, that is, attitudes towards ICT are an antecedent to and a predictor of ICT usage (Al-Gahtani & King, 1999).

Attitudes towards ICT are also most frequently studied issue in the literature and in most of the studies conducted; it is referred to as computer attitude (Meelissen & Drent, 2008). In these studies, attitudes towards ICT have been conceptualized in a variety of ways; some researchers developed scales that focus on self-efficacy beliefs, while the others used computer attitude scales which include components that tap computer competence and value beliefs (Vekiri & Chronaki, 2008).

Bandura (1986) described self-efficacy as "*people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances*" (p.391). He explained that it is not concerned with the skills people have, but with judgments of what they can do with whatever skills they possess. Concordantly, Compeau and Higgins (1995) stated that computer self-efficacy is "*a judgment of one's capability to use a computer"* (p.192). They explained that computer self-efficacy has a major impact on an individual's expectations towards using computers and it is related more to computer management ability for a specific task than to partial computer skills in information technology. Therefore, in the scale they developed to measure self-efficacy beliefs, they took into consider the magnitude, strength, and generality of self-efficacy and focused on abilities to make use of a computer in the accomplishment of a task such

as using software for data analysis, rather than reflecting simple component skills such as formatting diskettes.

There are also plenty of scales constructed for use in assessing computer-related attitudes. The Computer Attitude Scale [CAS] is one of the most extensively used scales in the studies. It claims to account for the affective, the cognitive and the behavioral dimensions of the attitude construct (Francis, Katz, & Jones, 2000). CAS was developed by Loyd and Gressard (1984) with three dimensions: computer anxiety, computer confidence, and computer liking. Then, Loyd and Loyd (1985) added one more dimension to the scale: computer usefulness. Computer anxiety refers to fear of computers or the tendency of a person to be uneasy, apprehensive, and phobic towards current or future use of computers in general. Computer confidence refers to the ability to use or learn about computers. It has been shown to be closely related to computer anxiety, with an inverse relationship. Computer liking refers to liking or enjoying working with computers.

In the relevant literature, different from CAS, there are many other scales constructed to study ICT attitudes (Kay, 1993; Levine & Donitsa-Schmidt, 1998; Potosky & Bobko, 1998; Selwyn, 1997).

Kay (1993) suggests that attitudes towards computers as a multifaceted rather than a uniform construct and argues that it may be inappropriate to use a general attitude measure to examine its direct relationship with a specific behavior. The Computer Attitude Measure [CAM] developed by Kay (1993) assesses attitudes towards computers by means of four sub-scales; cognitive, affective, behavioral and perceived control. The cognitive component focuses on belief, the affective component is the emotion or feeling, and the behavioral component of the attitude is related to what an individual actually does or intends to do with the technology. The final dimension considers the perceived control components of computer attitudes.

Selwyn (1997) also designed a multidimensional computer attitude scale including a total of 21 items with similar components of CAM. He named its subscales as affective attitudes towards computer, perceived usefulness of computers, perceived control of computers, and behavioral attitudes towards computers.

In order to test the hypothesis that positive computer attitudes and confidence lead to a commitment to learning to use computers, Levine and Donitsa-Schmidt (1998) developed

the computer attitudes and self-confidence questionnaire. The questionnaire was designed in order to measure seventh through twelfth grade students' attitudes and self-confidence towards computer use. It comprised 42 statements encompassing seven dimensions called educational tool, tool of enjoyment, important tool, and stereotypes, computer self-confidence, perceived computer knowledge, and three measures of computer use which are home computer, the extent of school computer use and frequency of overall use.

The Computer Use and Experience Scale [CUE] is another scale to measure students' attitudes towards computers. It was developed by Potosky and Bobko (1998) as a 12-item instrument. The scale includes statements on various uses for computers, to what extent computers are used for particular reasons, and how these factors affect how good people perceive themselves to be at using computers.

2.4 Factors Affecting Students' ICT Competencies and Attitudes

For more than 20 years, students' ICT competencies and their attitudes towards computers and computer technologies, and various factors affecting them have been studied with different samples and instruments. In this study, gender, educational background of students' parents and computer ownership are deeply examined.

2.4.1 Gender

Research generally supports that females tend to be less interested in computers, to have less positive views about the value of computing, and to report more computer anxiety and less confidence in their computer abilities (Volman & van Eck, 2001). There are a large number of studies in the literature, which have focused on this issue. Some of the studies have found no or slight differences, on the other hand some others have tremendously revealed significant gender differences in ICT attitudes and competencies (Akkoyunlu, 1996; Göktaş, 2006; Hakkarainen et al., 2000; Jorge, Gutiérrez, García, Jorge & Díaz, 2003; Meelissen & Drent, 2008; Papastergiou & Solomonidou, 2005; Sam, Othman, & Nordin, 2005; Shaw & Marlow, 1999; Top, 2003; Volman, van Eck, Heemskerk, & Kuiper, 2005; Whitley, 1997; Young, 2000).

In her study, Akkoyunlu (1996) investigated the effect of integration of computer literacy skills into curriculum on 4th and 5th grades primary pupils' achievements, computer skills

and attitudes towards computers. The researcher also focused on the gender differences regarding these issues and reported that as students are exposed to more computer courses and they become more knowledgeable on computers, their computer anxiety decreases, and they become more confident. However, no significant difference between girls and boys in relation to their attitudes towards computers was reported.

However, Göktaş (2006) detected some gender differences in his study examining K-12 teachers' perceived ICT competencies and reported that there was a significant effect of gender on perceived ICT competencies scores. 1429 K-12 teachers participated in the study; 875 of them were males and 554 were females. Mean score of males were found higher than that of females which means that males perceived themselves more competent technology users than females did. This was a consistent result with the correlation analysis conducted in the study. During the correlation analysis, males were coded as 1 and females as 2. Göktaş (2006) found that while gender was increasing, perceived ICT competencies scores was decreasing. In other words, negative correlation between gender and perceived ICT competencies scores was found, which showed that males felt more competent than females.

Hakkarainen et al. (2000) designed a study to explore Finnish elementary and high school students' skills and practices of using ICT. 515 students from 25 schools responded to a self-report questionnaire in the study. Students' skills in using ICT were examined by asking them to assess how well they had mastered certain applications of ICT. Even though small gender difference was found regarding students' enthusiasm about ICT, the difference between male and female students' perceived ICT skills was found very significant; male students' self-assessed skills of ICT were found higher than those of female students.

Jorge et al. (2003) designed a study on the usage of the ICT with the participation of 730 university students from different subject areas including social sciences, law and human sciences. They aimed to detect whether there are differences related to the ICT usage between males and females. The results expressed no significant differences between males and females in the use of technologies such as mobile telephones or computers, however there were significant differences in the knowledge of various types of software in accordance with gender: operating systems, word processors, spreadsheets, presentations, Internet and educational software. In all cases, males were found to have greater knowledge on software than females.

Meelissen and Drent (2008) commented on gender differences and attitudes towards ICT on which a lot of research has been carried out during the last 25 years. They argue that although the results of these studies are far from unambiguous, most research shows that gender differences in computer attitudes are in association with non-school related factors such as computer experience, accessibility of computers at home, computer skills, the “masculine” image of computers, and parents’ computer use and attitudes. Meelissen and Drent (2008) also conducted an exploratory study on the effect of non-school related factors in conjunction with school related factors, on students’ computer attitudes. They conducted explorations on data from the ICT-monitor, a Dutch large-scale survey on the implementation of ICT in primary, secondary, and vocational education. In the study, it was found that the factor “perceived encouragement by parents” showed the strongest significant effect on the computer attitude of girls as well as that of boys. The more encouragement from parents to use computers, the more positive the students’ attitudes were towards computers. Although boys experienced more encouragement from their parents than girls did, the effect of encouragement by parents was found even a little stronger for girls’ computer attitude than boys’ computer attitude. In other words, gender differences in computer attitude were found to be related to gender differences in students’ perceived encouragement by parents in computing. In the study, as of the school related factors, the effect of teacher characteristics on students’ computer attitude was also explored, under three components; gender, teaching experience, and computer experience. The researchers reported that none of those characteristics seemed to be related to students’ computer attitudes, but the computer experience of the female teachers had a small effect on girls’ computer attitude.

Papastergiou and Solomonidou (2005) conducted a study in order to investigate gender differences in Internet use by Greek high school pupils within school and out of school environments. A sample of 170 boys and 170 girls, in total 340 pupils aged 12–16 years, completed a written questionnaire on their attainability, location, frequency and purposes of Internet access. The study showed that the proportions of boys and girls who used the Internet inside school did not differ significantly, however boys were more likely to use the Internet outside school than girls were. Additionally, although both inside and outside school boys used the Internet for recreational activities and for Web page creation more than girls did, they detected no other significant gender differences regarding Internet use for communication, Web surfing and information search activities.

Sam, Othman and Nordin (2005) designed a research to study in which they investigated the differences in attitudes towards the Internet based on gender. 81 female and 67 male students of a Malaysian university took part in the study. In the study, Internet Attitude Scale (IAS) which was a 20-item self-report inventory was used. In term of usage pattern for the Internet, there were no statistically meaningful differences among the students based on gender. Similarly, they detected no significant gender difference in Internet attitudes.

Shaw and Marlow (1999) conducted a study to evaluate students' initial attitudes towards the use of ICT. 99 undergraduate science students participated in the study. The researchers identified six dimensions for student attitudes towards ICT; “comfort”, “interactivity”, “self-satisfaction”, “value new technology”, “experience” and “context”. Students exhibited low scores in the attitude dimensions of “value new technology”, “interactivity” and “context” indicating that they were uncomfortable with computers, were unhappy about the lack of personal contact and would prefer to learn in a more traditional mode. In addition, further analysis revealed significant differences between genders, especially in the “comfort” dimension; males reported feeling more at ease with the new technology.

In his study, Top (2003) also found differences between males and females. He analyzed the gender differences among university students with respect to the perceived ICT competencies. 383 Foreign Language Education Department students at Middle East Technical University participated in the study; 96 of them were males and 287 of them were females. Among its most striking findings was that in “the technology operations and concepts category” of the instrument, while 54.7% of the male students placed their level as good or excellent, this was only 16.1% for the female students. Overall mean score for male students in this category was 3.30 and 2.57 for female students, that is, the mean score for male students stands for the descriptor average, and below average for female students. For all the items in this category, males’ means were higher than females’ means. Additionally, except for “using imaging devices” item, all males’ means were higher than 3.00, however, except for “having basic knowledge of technology” item; all females’ means were less than 3.00.

In their study, Volman et al. (2005) investigated the accessibility and attractiveness of different types of ICT applications in education for girls and boys in the Netherlands. The study was conducted in seven primary and secondary schools and data were collected

on participation, ICT skills and learning results, ICT attitudes and the learning approach of pupils. A total of 213 pupils completed the questionnaire of the study. Gender differences, especially in primary education, were found small. The only remarkable differences were that girls at primary school consider themselves to be less good at surfing and downloading files from the Internet and less girls than boys at secondary school said that they could burn a CD and download files from the Internet.

The data coming from a meta-analysis by Whitley (1997) who examined the studies on gender differences in computer-related attitudes and behavior using US and Canadian participants concluded that females participated in the examined studies had less positive computer attitudes than males; however their attitudes towards computers were hardly ever negative. It was also reported that males compared with females saw computers as more appropriate to themselves and considered themselves more competent on computer-related tasks.

With the participation of middle and high school students, Young (2000) conducted a study in which a survey of student attitudes to computers was developed and used to explore differences in attitudes towards computers. The study indicated that gender differences in attitudes towards computers resulted from a greater confidence among males about ICT and the perception amongst females of computers as a male domain and hence a rejection of computers by them.

2.4.2 Educational background of parents

As Shashaani (1994) stated, an individual's first exposure to the world occurs within the family, where he or she internalizes norms and beliefs, and also learns basic attitudes, acquires a self-image. Thus the family as an agent of socialization affects an individual's educational and occupational decisions to some extent.

Several studies have documented the effect of parents' education level on students' educational expectations and achievement. For example, using U.S. Department of Education data collected between 1972 and 1988 by the National Longitudinal Studies Program, Drazen (1992) aimed to measure student achievement in the areas of reading and math and its relationship with family socioeconomic standing. Data was collected in 1972 with 19,000 students and again in 1988 with 25,000 students. In 1972, factors that affected student achievement in reading were described in order of their significance as

education level of parents, time spent on homework, non-minority racial status, and parental income, and in math the factors were non-minority status, being male, education level of parents, and time spent on homework respectively. In 1988 while the factors were education level of parent, non-minority status, family income, and time spent on homework for reading, they were education level of parent, non-minority status, family income, and time spent on homework for math. This longitudinal study showed that 75% of the time, education level of parent was the number one factor related to the performance of the students in the areas of reading and math achievement.

The study by Benjamin (1993) revealed that the level of the mother's education is one of the most important factors influencing a child's achievement in school. Data obtained from a sample group of fourth grade students found that the average level of proficiency on reading was lower for students with mothers not graduating from high school. It was also found that more highly educated mothers succeeded greater in providing their children with the cognitive skills that promote achievement in school. Likewise, Benjamin (1993) reported that as mothers enhance their own literacy skills, they are more likely to positively influence their own children in academic achievement. In the study, it was reported that as mothers became more confident in their own abilities, they made greater efforts to contribute to their children's academic growth and achievement.

In the study "Barriers to Participation: Financial, Educational and Technological" by The Smith Family (2003), obstacles to educational participation and achievement experienced by students from financially disadvantaged families in Australia were investigated. In the study, students' family background was found more important than the school environment itself, parental attitudes appeared to have a huge influence on a child's education and there was a strong association between the parent's education level and student's positive attitudes towards school and learning.

The effect of parents' education level on students' experiences with ICT has also been investigated in several studies. For example, Zappalà and McLaren (2002) presented data on the access and usage of ICT. The data came from a survey of computer and Internet access and usage among students and their families on The Smith Family's Learning for Life (LFL) program, Australia. The survey was sent to parents in 5,850 households, they were asked to pass on the survey to their children to complete. 7,226 students completed the survey and provided data for the study. A striking finding was the significant relationship between the level of parental education and computer and Internet

access. When comparing students whose parents had less than ten years of education with students whose parents were university educated, the rate of home computer access was 43% for the former and 88% for the latter. Similarly, the rates for Internet access were disparate. While only 18% of the students whose parents had less than ten years of education had Internet access at home, this increased to 57% of households with a university-educated parent(s).

Piyancı (2007) examined the relationship between sixth grade students' academic self-concept related to the Computer Course and their achievement in computer. 137 girls and 134 boys participated in the research. In the study, academic self-concept was described as how a student sees himself/herself at school and how he/she compares himself/herself to other students. The research has discerned that there were significant differences on the academic self-concept scores of students with respect to their parents' educational background. Particularly, scores of students whose parents had graduate degrees were found significantly higher than those of others. For instance, the mean score for students whose mother was university graduated was 4.26 while it was 3.99 for students whose mother got only 8-year primary education. Piyancı (2007) reported that students who have more educated parents are more likely to have higher self-concept scores in comparison to students with less educated parents.

Shashaani and Khalili (2001) examined computer attitudes based on computer interest, computer confidence, computer stereotype, and perceived computer usefulness among 375 Iranian undergraduate students (155 males and 220 females). Data on family socioeconomic status, father's occupation and education, and mother's occupation and education were also collected through the questionnaire. After analyzing data, Shashaani and Khalili (2001) found that parental education, particularly mother's, had a stronger effect on students' attitudes than did parental occupation. They also reported that parental education was associated with sons' computer attitudes: more highly educated parents promoted their sons' computer confidence, reduced their sons' stereotypic views about computer users, and improved their attitudes about the effects of computers in daily life. The influence of parental education on females' attitudes was reported more significant: the higher parents' education level, the greater their daughters' interest in computers, the greater their confidence in working with computers and the stronger their belief that computer is useful. Parents' education level was found to be related inversely to female students' stereotypic views: daughters of more highly educated parents were more in favor of gender equality in computing.

In order to understand possible reasons for the differences, Attewell and Battle (1998) suggest that it could be parental involvement; highly educated parents appear more likely to help with home computing and more likely to be aware of the importance of engaging in learning with their children. Likewise, explanations provided by Zappalà and Considine (2001) posited that parents with higher educational attainment may be more likely to promote the value of higher levels of achievement, and also more likely to supply with both the psychological and educational support students need to excel in school. The study carried out by Giacquinta, Baucer, and Levin (1993) may be helpful to understand the importance of parental involvement. In their study, they examined home computing among 70 mainly middle-class families from 1984 to 1986 and detected the importance of parental involvement in children's computer use at home. It was found that children used their computers almost completely for playing games and they viewed educational software as boring. They further found that educational use of computers was in only a modest amount and it was highly dependent upon ''hands-on'' parental support. The few children using computers in an educational way had highly involved parents helping choose appropriate software, coaching their child on the computers, working jointly with the child at the keyboard, and offering practical assistance. On the other hand, in the vast majority of families where such parental support lacked, children focused completely on playing computer games.

2.4.3 Computer Ownership

It is evident that having a computer at home increases the computer accessibility for students and as the accessibility increases, the amount of time they spent working with computers increases. Loyd and Gressad (1984) put the importance of computer experience this way:

> *It is becoming increasingly evident that familiarity with computers and the ability to use them effectively will be of critical importance to success in many different fields. Computer experience is therefore gaining wide recognition as crucial component of educational process* (p.67).

Linn (2005) explains the importance of home computers by using their connection with time spent using computers, and argues that students can get as much access to a computer in one weekend at their home as in a whole year at their schools. Therefore, computer ownership is a crucial factor to improve students' experience with computers.

In the study conducted by Attewell and Battle (1998), the effects of home computers for students' school performance was examined with the participation of a random sample of the USA schools with random samples of eighth grade students. Students were interviewed about their grades and also on frequency of talk with parents, about educational matters and about the presence of educational objects at home. Students' test scores in mathematics and reading were also provided by schools. Through multiple regression analyses, it was found that having a home computer was related to higher test scores in mathematics and reading, even after controlling for family income and for cultural and social capital.

Numerous researchers have commented on students' having a computer at home and the subsequent relationship with their ICT skills and attitudes. For example, Kirkman (1993) in his study "Computer Experience and Attitudes of 12-year-old students: Implications for the UK National Curriculum" reports that students' domestic use of computers is distinctly different from their use in school, and home computer use has a stronger effect on attitudes towards computers than gender, socio-economic status or academic ability. Furthermore, Colley, Gale and Harris (1994) found that greater use of computers at home leads students to have lower computer anxiety, and also it increases confidence for male students and liking of computers for females. Hence the more students use computers, the more experienced, confident and comfortable they become with computers. Akkoyunlu (1996) also reported similar results and stated that increased computer experience diminishes computer anxiety and increases confidence with computers. She also added that attitudes towards computing can be improved by computer experience.

Nichols (1992) examined the effect of computer ownership at home on elementary students' achievement in BASIC and LOGO programming. 96 second and 79 fifth grade students took part in the study. The students were grouped by ability, gender and computer ownership for analysis. Although there was no statistical difference among groups, he reported that there was a tendency for students who owned computer at home to outperformed non-owners in the achievement scores in BASIC and LOGO programming with respect to better homework and posttest results.

Selwyn (1998) performed a study to examine the nature and extent of students' use of computers at home and the subsequent relationship with their use of ICT in schools and colleges. He used a sample of 16-19 aged students and gathered quantitative and

qualitative data to explore students' experiences of home computing. Findings of the study have shown that students with access to a home computer had significantly more positive attitudes towards ICT, both in case of male students and females; however female students' attitudes are less significantly improved by using a home computer compared to males. Additionally, the use of computers at home was found to be advantageous to students in terms of their classroom ICT performance, computer proficiency, and amount of computer use in the school. Computer use at home also was found to have a positive effect on the general performance of students in school.

More recently, Göktaş (2006) examined the effect of having a computer at home on K-12 teachers' perceived ICT competencies. He found a significant effect of computer ownership on perceived ICT competencies scores. According to the study, mean scores of the participants who owned computer were significantly higher than the ones who did not, that is, the participants who owned computer at home perceived themselves more competent ICT users. He reported that 3.4% of the variance in perceived ICT competencies scores was accounted for by computer ownership.

Additionally, although children get more access to home computers, social inequality may influence the frequency of home computer use, and the way computers are used, and consequently may affect the educational benefits derived from computer ownership. Within this context, one of the factors investigated in research about computer ownership is that of gender. Culley (1993) reported that boys are over twice as likely to have access to a home computer. The reason for this was described by Newton and Beck (1993) that parents are often more willing to purchase a computer for a son than they are for a daughter. Furthermore, the study conducted by Reinen and Plomp (1997) discusses that gender differences are an international trend. In their study, after the implementation of a 10-nation survey, they concluded that access to home computers is another "input indicator" for gender differences, in a way that male students have more possibilities to work with computers than female students do, with respect to availability of computers at home.

2.5 Information and Communication Technologies in Turkey

Within the increased priority that is being given to information literacy, Information and Communication Technology is being seen in many countries as a very important area of focus. Similarly, Turkey considers providing all benefits of ICT to all of citizens without any boundaries and developing ICT skills in order to ensure economic and social

development. The basic principle is to make everybody, without any discrimination on the basis of region and place of residence, enjoy the internet and communications services. In Turkey, wide usage of reasonably priced technologies and social and cultural transformation is the main issues which will be covered by the target year, 2010 (e-Inclusion Subgroup, 2007).

As a consequence of its importance, public initiatives have intended to broaden the use of ICT in schools by establishing computer laboratories and embedding actual classrooms with digital technologies to assist and support current classroom learning (Kozma, 2003), and nationwide school ICT programs or projects for school teaching and learning have expanded increasingly worldwide (Rasinen, 2003). Parallel to the international trend of the increasing attention to ICT in education worldwide, MoNE aims to integrate ICT into the Turkish education system by means of certain policies and development strategies in order to keep pace with the information age. In this sense, MoNE (2005) aims to accomplish the following goals in order to integrate ICT into the Turkish education system in the 2000s:

- *IT hardware and software will be provided for every school including primary education schools;*
- *secure and fast internet connection will be provided to all school;*
- *all students, teachers, directors, parents and the school staff will be able to access IT;*
- *IT classroom with 20+1 computers per 500 students, at least 2 computers with internet and intranet connection per teachers' room and at least 1 computer will be provided with the same specs for the guidance services, libraries and administration offices;*
- *necessary software and in-service training courses will be provided in order to ensure that teachers, students, directors and the school staff are able to use IT and successfully take advantage of it during the educational processes;*
- *current curriculum will be transformed into a student-centered one and it will be provided that students access information by using IT tools by themselves during their educational processes;*

- *work will be carried on in order to avoid the digital divide and ICT at schools will be at all citizens service;*
- *technical support centers for schools will be established in order to provide the necessary technical support for the update and continuous maintenance of the IT hardware at schools* (p.70-71).

In order to provide students with technology-rich learning environments and make them acquire ICT skills, Turkey has made significant investments in ICT resources. In Turkey, ICT-related initiatives started as early as 1984. There have been some projects going on related with integration of ICT in Turkey's educational system since then (Göktaş, Yıldırım, & Yıldırım, 2006). The followings are four of the major projects carried out in Turkey:

- Computer-Aided Education Project
- The Project for Globalization in Education
- Basic Education Program (I-II)
- Internet Access Project

Computer-Aided Education Project: Computers were first introduced to Turkish schools in 1984 by the initiation of a Computer-Aided Education [CAE] Project, which took shape between 1984 and 1986. Through this project, it was aimed to spread computer literacy and the use of computers as a tool to compensate for the poor quality and persistent deficiencies of suitable teachers. In the academic year 1985-1986, 101 high schools were provided with 1,111 computers, that is, 10 computers for students and one for the teachers in each school. What's more, two teachers from each school were trained during a period of five weeks. Also, 130 computers were bought for 101 tourism and hotel-operation high schools. These schools introduced a computer-literacy course as an elective course in the academic year 1987-1988. In the following academic year, 805 computers were bought in order for training students in vocational high schools, with some emphasis on hardware maintenance (Yedekçioğlu, 1996).

The Project for Globalization in Education: The Project for Globalization in Education 2000 which was supported by the World Bank began a very important step for the Turkish Educational System. During this project, ICT classes were established in 2,451 primary and secondary schools in 80 provinces and 921 towns in Turkey. These ICT classes

were equipped with computers, printers, scanners, office program, electronic references, video, overhead projectors, TV, educational videocassettes, transparencies, and required software for the courses of computer literacy and for the other subjects were provided. The purpose to be attained in the project was to follow the developments of the information age and to be able to create a society with adapted information and technology standards (Akkoyunlu & Orhan, 2001).

Basic Education Program Phase I: In 1998, the MoNE received a loan from the World Bank to invest in a two-phase National Basic Education Program [BEP], the second phase of which is still being implemented. The objectives stated in the BEP were to expand 8-year compulsory education, to improve the quality of education, and to make basic education schools learning centers of the community. One of the objectives of this two-phase development program is to make certain that each student and teacher become at least literate in ICT (OECD, 2005a).

The first phase of the Basic Education Program was closed by the end of 2003. It was the starting point for ICT education in primary schools in Turkey. In the first phase of BEP, one of the aims of the MoNE was to establish and equip learning centers called "Information Technology Classrooms" in all primary schools. In order to realize this purpose, MoNE created 3188 IT classrooms in 2802 primary schools during the first phase (MoNE, 2005). Consequently, computer literacy course was included in the primary school education starting with grade four to eight, in 1998, as an elective course. Being a literacy course, it aimed to teach basic computer skills and to introduce students to some commonly used computer applications, such as word processors, paint, and communication tools.

In 2004 within the context of BEP I, in order to offer proposals for the future, a research called "The Effect of IT Classrooms" was conducted. It was one of the monitoring and evaluation reports prepared by universities on social, institutional effects and financial analysis of the BEP I. In this research, views of teachers, students, school administrators, parents and authorities of Educational Directorates on developing and monitoring the applications of ICT were investigated. According to the results of the study, it was seen that IT classrooms enable administrators, teachers and especially students to have access to information and communication technologies. What's more, it was determined that IT classrooms had an important role in providing opportunities to students, as two of every three students within the sample started using computers at school and 55% of

students did not have any opportunity to use computers outside school. Also, approximately one-third of schools have had their web pages prepared or they were at the stage of getting them prepared, which supports the view that administrational staff have started to use ICT widely and effectively (MoNE, 2005).

However, the research also showed that all teachers considered IT classrooms as laboratories established for computer lessons rather than an environment to be made use of in their own lessons. The followings are the other problems described in the research; inadequacies of educational software and technical support, lack of any factor encouraging teachers to use computers for educational purposes, IT classrooms kept locked, and limitedness of internet opportunities (MoNE, 2005).

Özdemir and Kılıç (2007), in their study, conducted an investigation into the 1998-2003 Phase I of the ICT component of the BEP, and stated deficiencies in the project's conceptualization, planning, management and implementation. The researchers detected that however a great deal of financial support was provided for hardware and software, there was not sufficient amount of funding for the other requisites such as curriculum review and training. Furthermore, IT classrooms were not supported technically and financially in a sufficient amount in order to maintain them to the necessary extent and standards, and the content and language of the course courseware, CDs, DVDs and videos were not matched well with the curriculum.

Basic Education Program Phase II: After the implementation of the first phase of the Basic Education Program, the World Bank started negotiations for the second phase, and the Loan Agreement for the phase 2 was signed on 26 July 2002. According to this agreement, the Phase I objectives were expanded (MoNE, 2005).

During the phase II, it is aimed to keep on improving basic education quality through continued investments for the equipment of schools, which includes establishment of IT classrooms in several thousand more primary schools. MoNE also is planning to create an educational portal, train more supervisors, principals and teachers, develop and refurnish more schools in low-income areas, develop pre-school and special needs education and provide ICT training and materials for educating children with special needs. Also supporting in-service training in ICT to teachers, assisting in utilizing ICT to improve instruction and assisting computer instructors for the full utilization of ICT

classroom potential are the other target studies in the phase II (MoNE, 2005; OECD, 2005a; World Bank, 2006a).

Internet Access Project: The aim of the project was to provide students with fast, robust and continuous internet access to computer laboratories at schools and to equip more schools with broadband internet connections, in cooperation with Turk Telekom Incorporation. It was planned to provide approximately 21,500 K12 schools with Asymmetric Digital Subscriber Line [ADSL] broadband Internet connections until the end of 2005. Furthermore, e-mail, web-hosting and similar services were provided to the MoNE within the scope of the project (Keskinkılıç, 2004; OECD, 2005a). Through this project, about 20,000 schools and Ministerial institutions by the end of October 2004 and 29,000 schools and Ministerial institutions until the end of 2007 were provided access to the Internet, that is, almost 12 millions of students were provided Internet connections at their schools (MoNE, 2008).

Despite those projects discussed and many other projects not mentioned here, it is necessary to carry out more projects in order to improve ICT facilities at the schools because Turkey still suffers from the lack of appropriate integration of ICT in its educational context and is experiencing problems about achieving the desired goals on ICT. For example, the study conducted by Akbaba-Altun (2006) determined several problems in the integration of computer technologies in education in Turkey. The participants in the study included 17 school principals, 15 computer coordinators, and 151 primary education supervisors. The findings of this study showed that there are too few computers, slow Internet connections, insufficient software in the native language, and a lack of peripheral equipment at schools. Additionally, since the ICT classrooms at schools were placed in existing older classrooms that were not designed according to the needs of IT classrooms at schools, they are neither large enough nor suitable for students.

Akbaba-Altun (2006) also reported that when ICT equipment breaks down, repair is often delayed, and school principals' lack of technical knowledge, their interpretations of regulations according to his/her own will, and their lack of support were the other problems. Additionally, when they feel anxious about the materials in IT classrooms, they keep these laboratories locked and do not open them for use because of the fear of breakdowns.

Results of different international assessment studies, which contribute to the understanding of differences between Turkey and other countries, also show that Turkey may be well on its way to achieving its targets but it still needs to do much more. For example, OECD's Program for International Student Assessment (PISA) research in 2003 among 15-year-old youths living in 41 countries, including all 30 OECD countries focused on students' familiarity with ICT to meet the challenges of today's knowledge societies. The followings are some of the interesting results in relation to availability of computers at home and school:

- Almost 15% of students have never used a computer. The percentage increases to 21% for female students who have never used a computer; it is more than double the percentage of male students (9%);
- Only just over one-third of students can access computers at home, about one-half at school and nearly three-quarters in other places;
- The number of computers per student is less than 0.05, implying 20 or more students per computer;
- More than 70% of students are in schools where school heads reported that instruction was hindered a lot or to some extent by a shortage of computers for instruction (OECD, 2005b).

On the other hand, according to world development indicators provided by World Bank, the ratio of personal computers per 1,000 people in developed countries is 574, but it is only 52 in Turkey. Similarly, the ratio of internet users per 1,000 people in developed countries is 545; however it is only 142 in Turkey. On the other hand, only 40% of primary and secondary schools in Turkey have access to the Internet while in developed countries, 98% of the schools are provided access to the Internet (World Bank, 2006b).

According to the Networked Readiness Index [NRI] 2007-2008 in the Global Information Technology Report (2007), Turkey is the world's 55th ICT compliant country among 127 countries, which means that Turkey is down 3 positions from the year before; it had maintained the position 52 among 122 countries in the NRI 2006-2007. The NRI is used to measure the propensity for countries to leverage the opportunities offered by ICT for development and increased competitiveness. This index is composed of three component indexes which assess: the environment for ICT offered by a given country, the readiness of the community's key stakeholders - individuals, business and governments, and the

usage of ICT among these stakeholders. In the report, it is stated that Turkey is broadly stable at 55thplace, with a rather even performance across the three NRI components. It showed much room for enhancement especially in the readiness sub-index, typically in the accessibility of ICT, the quality of education, and the government's vision and e-leadership in ICT diffusion. According to the study, Turkey occupies 52nd place in terms of the Internet access in schools, it maintains the position 65 considering the Internet users in the country, and Turkey is at 72nd place among 127 countries in terms of government success in ICT promotion.

2.6 The New Information and Communication Technology Program

Countries must be able to benefit from technological developments and this can be realized only by educating individuals on ICT and equipping them with ICT skills. Technological developments lead to changes in work and changes in the organization of work, and required competencies are therefore continually changing. MoNE (2007) described the competencies gaining in importance as:

- using Turkish effectively and correctly,
- ICT competencies,
- critical thinking,
- decision-making,
- handling of unexpected situations,
- working as a member of a team,
- communicating effectively,
- generalist competencies.

All these competencies gaining importance required the revision of the school curricula. Thus, MoNE developed a new curriculum which includes a number of different views and perspectives to be applied in the teaching-learning process. The name of the course which was *Computer Course* previously was also changed and became *Information Technologies Course*.

The introduction of ICT in schools leads a decrease in the teacher-oriented activities and a shift from didactic approaches to a constructivist one in education. Similarly, the new

ICT program also highlights the importance of constructivism approach and its implications for the learning environment. As Özden (2002) stated, in order to achieve the learning objectives of the program, there is a need to blend the traditional and constructivist approaches by taking individualistic differences of the students into consideration, which helps achieve the most effective learning environment for the course (cited in MoNE, 2007, p.9).

In these premises, teachers are expected to implement an in-class or out-of-class activity for each learning objective and also should elaborate on supporting each objective with alternative activities. At the end of each unit, students should also be given assessment activities which cover all learning objectives of the unit. Additionally, at the end of each step, besides implementing assessment activities including all units, teachers should have a high opinion of setting students performance works or projects in relation to the step. Moreover, in accordance with their ICT competency levels, students can be provided ICT Certificate (MoNE, 2007).

In order to ensure that learning occurs, teachers are also asked to use a variety of assessment methods, but especially performance assessment techniques which are designed to have students demonstrate their understanding by applying their knowledge or skills to an authentic task (MoNE, 2007). The keystone of performance assessment is the use of an authentic task in which students are required to address problems grounded in real-life contexts. Such tasks are typically complex, somewhat ill-defined, engaging problems that require students to apply, synthesize, and evaluate various problem solving approaches (Brualdi, 1998; Shavelson, Baxter, & Pine, 1991). They help teachers be able to have a more complete picture of students' progress in all areas of development (Ratcliff, 2001). Furthermore, such tasks often have more than one acceptable solution; they may call for students to create a response to a problem and then explain or defend it. The process involves the use of higher order thinking skills such as cause and effect analysis, deductive or inductive reasoning, experimentation, and problem solving. They may be used mainly for assessment at the end of a period of instruction, but are frequently used for learning as well as assessment (McBrien & Brandt, 1997).

Hence, besides using traditional assessment methods, teachers are strongly suggested to benefit from performance assessment techniques such as digital portfolios, projects, performance works, self and peer-assessment, control lists, interviews and concept

maps. Assessment in the course should improve students' learning, concentrate on both process and product, provide feedback about the effectiveness of the learning process, give students opportunity to demonstrate their skills and knowledge, help students take responsibility of their own learning and help them develop positive attitudes towards using technology, encourage them work with their peers collaboratively, enable students to review their performance in order to enhance their learning, incorporate students' opinions into identifying criteria for assessment and help them feel competent and successful at using technology (MoNE, 2007).

2.6.1 Goals of the ICT Program

The program was developed into three main learning areas; Basic Operations and Concepts, Usage of ICT and Advanced Applications in ICT. They are called "Basic Level", "Intermediate Level" and "Advanced Level" respectively. Each level encompasses several steps in itself; there are, in total, eight steps in the program (MoNE, 2007).

"The Basic Level" covers first three steps of the program and focuses on the basic concepts needed to effectively use of ICT in daily life. At the end of this stage, the students should be able to

1. use computer and its peripheral devices successfully;
2. use various technology sources for both directed and independent learning activities;
3. communicate about technology using developmentally appropriate and accurate terminology;
4. use developmentally appropriate multimedia resources (e.g., interactive books, educational software, elementary multimedia encyclopedias) to support learning;
5. work cooperatively and collaboratively with peers, teachers, and others when using technology;
6. demonstrate positive social and ethical behaviors when using technology;
7. practice responsible use of technology systems and software;
8. create developmentally appropriate multimedia products with support from teachers, family members, or student partners;

9. use technology resources (e.g., puzzles, logical thinking programs, writing tools, drawing tools) for problem solving, communication, and sharing of thoughts and ideas;
10. gather information and communicate with others using telecommunications, with support from teachers, family members, or student partners (MoNE, 2007).

Secondly, “the Intermediate Level” includes fourth and fifth steps of the program and aims to equip students with skills mainly on word processing, spreadsheets, databases, creating presentations, multimedia applications and desktop publishing. At the end of this stage, students should be able to

1. use keyboards and other input and output devices successfully with an appropriate level of proficiency;
2. discuss common uses of technology in daily life and the advantages and disadvantages those uses provide;
3. discuss basic issues related to responsible use of technology and information, and describe personal consequences of inappropriate use;
4. use general-purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum;
5. use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create presentations for audiences inside and outside the classroom;
6. use telecommunications efficiently to access remote information, communicate with others and improve areas personal interest in support of direct and independent learning, and pursue personal interests;
7. use online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom;

8. use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem-solving, self-directed learning, and extended learning activities;
9. determine which technology is useful and select the appropriate technology resources to address a variety of tasks and problems;
10. evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias that occur in electronic information sources (MoNE, 2007).

Finally, “the Advanced Level” consists of sixth, seventh and eight steps of the program. Besides having some similarities with other stages, it also focuses on programming languages, object-oriented programming and web design. At the end of this stage, students should be able to

1. apply strategies for identifying and solving routine hardware and software problems that occur during everyday use;
2. demonstrate knowledge of current changes in information technologies and the effects those changes have on the workplace;
3. exhibit legal and ethical behaviors when using information and technology and discuss consequences of misuse;
4. use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research;
5. apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum;
6. design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom;
7. collaborate with peers, experts, and others using telecommunications tools to investigate educational problems, issues, and information, and to develop solutions for audiences inside and outside the classroom;
8. select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems;

9. develop practical applications for learning and problem solving and demonstrate an understanding of relations of these applications with hardware, software and communication;
10. discover and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems (MoNE, 2007).

In addition to these main areas, in order to help students' academic development on ICT and to inform them of ethics and social values regarding ICT, two more learning areas were expanded into the whole curriculum. They were named "Academic Process in ICT" and "ICT Ethics and Social Values". The former aims to make students be able to successfully use their ICT skills in other fields and the latter aims to help students understand the ethical and societal issues on and the responsible use of technology systems, information, and software (MoNE, 2007).

2.7 The Information and Communication Technology Student Workbook

In Turkey, it was not very common to benefit from workbooks before the Curriculum Reform through which students started to be given workbooks. For the first time, workbooks prepared for different subject areas were distributed free to all primary students in the academic year 2005-2006. In this context, during the academic year 2007-2008 with the introduction of the new ICT program, students were provided "ICT Student Workbooks". In the previous years, computer teachers needed to choose the course book(s) among the ones which were approved by MoNE and ask students to purchase it. However, now students are given free workbooks called "ICT Student Workbook" to support their learning.

Among the ancillary materials which are a part of comprehensive programs, it is apparent that the most preferred ones are workbooks. They are classically bound in soft covers and contain from 100 to 200 pages. Each of these pages includes a separate task or activity. They are most often consumable; students write their answers on pages. They are also named "*skill builders*, *skill books*, *bonus books and independent practice books"* (Britton, Woodward, & Binkley, 1993, p.162). Workbooks are usually written to complement and support the basic text material. They contain exercises, tests, projects and other activities that correlate with the textbook chapters. As Osborn (1984) stated, they can be used as a means of regularly evaluating individual learning and assignments

in a workbook can provide students with opportunities for practice, review, and synthesis of instructional material. They can also teach students to work independently and can give students a sense of accomplishment. Additionally, they can serve to bridge the gap between home and school in a way that when parents regularly see completed worksheets, they are able to better understand what is going on at school and may be able to reinforce learning (cited in Levary, 1990, p.294-295).

It is undeniable that teachers have a big role in students' successful engagement in workbooks. None of the workbooks is published with the assumption that its use will not require intelligent preparation and presentation by the teacher. In many cases in which dissatisfaction with the use of workbooks appears, the difficulty has lain either in the failure of the teacher to make adequate preparation for the use of the workbook or in his malfunction to present the material properly (Kerr, 1947).

In order to use workbooks effectively, teachers must make important decisions regarding the purpose of workbook assignments. For each assignment, they need to decide whether it will be used for testing or teaching. If the pages are to be used for testing, the teacher needs to determine whether the completed pages will provide a clear indication of student knowledge and/or difficulty. If the pages are to be used for teaching, then they must choose whether the intent is to actually teach new subject or to review introduced ones. If the page is to be used for teaching something new, the educator must consider such elements as how to provide immediate feedback to students and whether the page really addresses the subject to be learned. If the page is to be used for review, the educator must consider such elements as the difficulty of the page and the efficacy of the page. Furthermore, teachers must present extra explanation when instructions in the workbook are ambiguous, change the sequence of pages when necessary, and supplement weak coverage of a topic (Levary, 1990).

Some teachers refuse to consider the use of workbooks in classrooms which are under their supervision. They feel that the use of workbooks is not professionally reasonable and workbooks are often regarded as a kind of busy work (Kerr, 1947). Not only from teachers, but also workbooks have been the focus of attack from many other quarters; curriculum planners who want teachers to be more creative; parents who accuse schools of giving their children busy work and some college professors who encourage teachers to develop their own activities (Britton et al., 1993).

Nevertheless, in spite of negative attitudes from many quarters, workbooks continue to be published and continue to be used since there are many benefits derived from usage of workbooks in educational context. For instance, workbooks supplement the curriculum by providing additional drill material because they contain enough practice material to satisfy the needs of the average pupil. Workbooks also present new and different exercises to check comprehension, aid the child in making generalizations, and direct his attention to related fields of interest which he/she may wish to explore further. Thus, they also offer opportunity for adjustment of the program to individual differences (Kerr, 1947).

To sum up, research generally supports the idea that workbooks can be used as powerful ancillary materials to promote learning and to facilitate in maximizing opportunities for students to practice, understand and further investigate the concepts taught (Kerr, 1947, Britton et al., 1993, Erden, 1997). However, it is also important to know how effective and helpful workbooks themselves are to facilitate students' learning; they may sometimes stress unimportant information and even provide wrong information (Durkin, 1974). Therefore, it is still questionable that the ICT Student Workbook is a valuable educational material to enhance students' ICT skills and to entail them to go further.

The ICT Student Workbook for the eighth graders includes a number of activity sheets under three units which are separated as Information Technologies, Designing a Website and Programming Languages. The workbook starts with pages which introduce students to the overall structure of the workbook and how to follow the directions in it. On those pages, students are given explanations what the symbols used in the workbook imply and what specific parts of the assignments ask students to do. Furthermore, in the inner parts, students are given activity sheets related to specific topics of the units. Although it is designed as a workbook to be used in the IT course, students are also provided brief information in order to help them implement the assignments. There are lots of pictures and photos in the workbook and it has a colorful design. At the end of the workbook, there are dictionary part which includes the definitions of the terms used in the workbook, references part which consists of the resources benefited from in order gathering information included in the workbook and appendixes part which is composed of self-evaluation forms for the students.

CHAPTER III

METHODOLOGY

The methodology of this study is presented in this chapter, which includes design of the study, research questions, description of the variables, participants, data collection instrument, data collection procedure, and data analysis..

3.1 Design of the study

The purpose of this study was to explore the 8th grade primary school students' perceived ICT competencies and their attitudes towards the ICT course. Furthermore, developing an understanding for the characteristics of the teaching-learning process of the course, determining the deficiencies of the IT classrooms in terms of their appropriateness to successful implementation of the ICT program, and examining the students' perceptions on the ICT Student Workbook about its effectiveness are the other aims of this study.

The approach to this study was chosen as quantitative. Quantitative research is one of the research methodologies relying heavily on numbers in reporting results, sampling and provision of estimated instrument, reliability and validity (McMillan & James, 2001). The research method used in this quantitative research was descriptive.

According to Best and Kahn (1998), descriptive research requires "*the analysis of the relationships between non-manipulated variables and the development of generalizations, extending its conclusion beyond the sample observed*" (p. 139). This method basically collects data to define and portray the characteristics of the object of research and to discover answers to the questions of who, what, when, where and sometimes how. By asking these questions, descriptive research provides descriptions of

phenomena or characteristics associated with a subject population and estimates of the proportion of a population that have these characteristics, and helps discover associations among different variables (Cooper & Schindler, 2001).

Since the purpose of this study was to measure what currently was, the cross-sectional survey method was chosen among many types of descriptive research methods as the most appropriate one. In cross-sectional studies, the purpose of the research is descriptive, often in the form of a survey. There is usually no hypothesis, but the aim is to describe a subgroup within the population with respect to a set of factors. What's more, a cross-sectional study lets the researchers find the prevalence of the outcome of interest, for subgroups within the population at a given time-point (Levin, 2006). More specifically, in this study, a self-reported questionnaire composed of 63 items in seven sections was used to gather quantitative data. Descriptive and inferential statistics were employed to analyze the data collected through the questionnaire.

3.2 Research Questions

This study was guided by six major research questions and related sub-questions which are listed below:

1. What are the students' perceived ICT competencies?
    - 1.1. Is there a significant difference in the perceived ICT competencies of the students with respect to gender?
    - 1.2. Is there a significant difference in the perceived ICT competencies of the students with respect to education level of parents?
    - 1.3. Is there a significant difference in the perceived ICT competencies of the students with respect to computer ownership?
    - 1.4. Is there a significant difference in the perceived ICT competencies of the students with respect to availability of assistance at home for the course?
2. What are the students' perceived competencies on specific computer software?
3. What are the characteristics of the teaching-learning process of the ICT course from the perspectives of students?
4. What are the students' attitudes towards the ICT course?
    - 4.1. Is there a significant difference in the ICT course attitudes of the students with respect to gender?

4.2. Is there a significant difference in the ICT course attitudes of the students with respect to education level of parents?

4.3. Is there a significant difference in the ICT course attitudes of the students with respect to computer ownership?

4.4. Is there a significant difference in the ICT course attitudes of the students with respect to availability of assistance at home for the course?

5. What are the obstacles to successful implementation of the ICT program regarding IT classrooms from the perspectives of students?

6. What are the students' perceptions of the ICT Student Workbook to facilitate learning?

3.3 Description of the variables

The variables in this study were classified into two categories; independent variables, and dependent variables.

3.3.1 Independent variables

There are five independent variables in this study:

a. Gender: It is a categorical variable with two levels (1=Female, 2=Male).

b. Education level of mother: It is a categorical variable with seven levels (1=not literate, 2=literate but no diploma, 3=elementary school graduate, 4=middle school graduate, 5=high school graduate, 6=university graduate, 7=postgraduate (master's and/or Ph.D. degree)).

c. Education level of father: It is a categorical variable with seven levels (1=not literate, 2=literate but no diploma, 3=elementary school graduate, 4=middle school graduate, 5=high school graduate, 6=university graduate, 7=postgraduate (master's and/or Ph.D. degree)).

d. Computer ownership: It is a categorical variable with three levels (1=Yes and connected to the Internet, 2=Yes but not connected to the Internet, 3= No).

e. Availability of assistance at home for the course: It is a categorical variable with two levels (1=Yes, 2=No).

3.3.2 Dependent variables

There are five dependent variables in this study:

a. Students' perceived competencies on basic ICT tasks: It is a continuous variable with four levels (4=always competent, 3=usually competent, 2=sometimes competent, 1=never competent).

b. Students' perceived competencies on advanced ICT tasks: It is a continuous variable with four levels (4=always competent, 3=usually competent, 2=sometimes competent, 1=never competent).

c. Course confidence: It is a continuous variable with four levels (4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree).

d. Course usefulness: It is a continuous variable with four levels (4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree).

e. Course liking: It is a continuous variable with four levels (4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree).

3.4 Participants

The target population about which the researcher was interested in obtaining data and drawing conclusions included the entire 8^{th} grade students in all the public primary schools located on the metropolitan area of İzmit, Turkey. The sample consisted of 448 students from 11 primary schools (see Appendix A). The researcher employed the cluster random sampling method in which subjects who belong to the same group are chosen all together to form part or the whole of a sample (Fraenkel & Wallen, 1990).

Through the sampling process, out of 49 public primary schools in İzmit's metropolitan area, 11 schools were randomly selected to include in the selection process. After having a subset of all the schools, two classes within the determined subset were selected randomly to take part in the study. The number of students chosen in each school ranged from 38 to 43. Eventually, a total of 448 Grade 8 students; 220 girls and 228 boys, from 11 public primary schools constituted the sample of this study.

3.5 Data collection instrument

The instrument to gather data was developed by the researcher himself after a comprehensive review of the literature. The books written about investigated issues in this study, the related articles and studies published on different journals, reports of the international organizations and unpublished theses conducted in both Turkey and other countries were all examined broadly. Subsequently, in accordance with the related literature, the researcher designed a self-reported questionnaire which included seven sections.

Besides gathering students' demographic information, by using the questionnaire it was aimed to collect data on students' perceived ICT and computer software competencies, characteristics of the teaching-learning process in the ICT course, students' attitudes towards the ICT course, deficiencies of IT classrooms, and students' perceptions on the effectiveness of the ICT Student Workbook. The final version of the questionnaire (see Appendix B) included seven sections:

Section 1 (Demographic information): This section was designed to obtain data on school, age, gender, the educational background of parents, computer ownership, and availability of assistance at home for the course.

Section 2 (Students' perceived ICT competencies): This section was designed based on the objectives of the new ICT program (MoNE, 2007) but the related literature was also reviewed (Göktaş, 2006; Hakkarainen et al. 2000; ISTE, 2007; Piyancı, 2007; Top, 2003). In this section, the researcher aimed to investigate to what extent the students perceived themselves competent on specific ICT tasks. Section 2 included 17 items in total, with four alternative responses presented for each item with a value ranging from 1 to 4: 4=always competent, 3=usually competent, 2=sometimes competent, 1=never competent.

Section 3 (Students' perceived computer software competencies): This section aimed to investigate students' perceived competencies on computer software. It comprised 5 items: Word Processor (MS Word), Presentation Application (MS PowerPoint), Spreadsheet Software (MS Excel), Database Application (MS Access) and Operation System (Windows XP). This section consisted of five point scale items: 5=completely competent, 4=competent, 3=slightly competent, 2=incompetent, 1= completely incompetent.

Section 4 (Characteristics of the teaching-learning process in the ICT course): This section was developed mainly in accordance with the descriptions provided by MoNE (2007), about the effective teaching-learning environment for the ICT course. The related literature (Akkoyunlu, 1996; McBrien & Brandt, 1997; OECD, 2001a; Ratcliff, 2001) also guided the researcher through the development of this section. The researcher's aim in this section was to investigate characteristics of the teaching-learning process in the ICT lesson. The students were given 9 statements with four point scale items in this section: 4=All the time, 3=Usually, 2=Sometimes, 1=Never.

Section 5 (Students' attitudes towards the ICT course): This section consisted of items to determine to what extent the students had positive attitudes towards the ICT course. It was developed by the researcher after reviewing the related literature (Akkoyunlu, 1996; Compeau & Higgins, 1995; Francis-Pelton & Pelton, 1996; Loyd & Loyd, 1985; Shaw & Marlow, 1999). Students' attitudes were investigated through 10 items with four alternative responses: 4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree.

Section 6 (IT classroom deficiencies): This section aimed to determine the obstacles to the effective implementation of the ICT program, regarding IT classrooms. For each of 7 items in this section, the students were required to choose one of two options; Yes or No. In order to develop this section of the questionnaire, whole-class discussion with a Grade 8 class consisting of 33 students was conducted. Research suggests that whole class discussion can be effective to share and explain the variety of solutions by which individual students have solved problems. It also allows students to see the different ways of examining a situation and the variety of suitable and acceptable solutions (Grouws & Cebulla, 2000). The discussion which lasted about 35 minutes was recorded by the researcher. The topic of the discussion was the IT-classroom-related problems that the students experienced during their lessons, and the solutions to overcome those problems. Besides the whole-class discussion, in order to develop this section, the researcher examined the related literature (Akbaba-Altun, 2006; OECD, 2001a; OECD, 2005; Özdemir & Kılıç, 2007; Pelgrum, 2001).

Section 7 (Students' perceptions on the effectiveness of the ICT Student Workbook): This section was developed by the researcher based on the related literature (Çepni, Ayvacı, & Keles, 2001; Demirel, 1998; Kerr, 1947; UNICEF, 2000) and comprised items to identify the effectiveness of the ICT Student Workbook. Students' perceptions on the clarity of language of the workbook, relevance of the activities and visual elements, and

usefulness of the knowledge in the workbook were obtained. In this section, the students were given 7 statements with four alternative responses: 4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree.

After the development of the questionnaire, in order to ensure its content and face validity, it was examined by two IT teachers, one expert from the department of Educational Sciences at Middle East Technical University and one expert from the department of Computer Education and Instructional Technologies at Middle East Technical University. In response to their feedback, the questionnaire was then revised. It was also checked by two Turkish teachers for the clarity of its language.

Having made all necessary revisions on the questionnaire, a pilot testing was conducted with a total of 27 grade 8 students in a primary school which would not be included in the sampling. The aim of the pilot study was to check internal consistency of the survey items and to see whether the instrument was in appropriate length, the items were understandable and the wordings were appropriate. After the pilot study implementation, no reason was found to make modifications on the questionnaire items.

After pilot testing, reliability coefficient was calculated for each section separately. The reliability coefficient was found to be .94 for the Section 2, .89 for the Section 3, .78 for the Section 4, .79 for the Section 5, and .84 for the Section 7.

3.6 Data collection procedure

After selection of the schools, they were visited by the researcher during the first two weeks in May, 2008. During these visits, the ICT teachers working in those schools were informed of the study and classes which would take part in the sample were determined.

During the last week in May, 2008, the questionnaire was administered to a total of 448 students who constituted the sample of the study. Direct administration technique was used to conduct the questionnaire; hence it was conducted by the researcher himself. Students were given extra explanation about the study and the instructions in the instrument. There appeared no problem in the administration of the study. Although the students were told that there was no time limitation for filling out the questionnaire, it usually took about 20 minutes for the students to complete it.

3.7 Data analysis

The data obtained were entered into the Statistical Package for the Social Sciences [SPSS] 15.0 program and were analyzed through descriptive and inferential statistics. The responses were checked for irregularities and missing data. Out of 448 students that participated in the study, the data obtained from 6 students were not included in the analysis because of anomalies in the data and incomplete information.

Based on the nature of this study, the researcher used descriptive statistics to describe the identified characteristics. The frequencies, means, percentages, and standard deviations for the items were presented. In order to calculate descriptive statistics, questionnaire items were grouped in accordance with independent variables, and also descriptive categories were developed from the data itself for the sections 4, 6 and 7.

The researcher also made use of inferential statistics to determine if the significant differences among dependent variables across independent variables existed. The analysis involved the use of Multivariate Analysis of Variances [MANOVA] with Pillai's Trace test. Pillai's Trace test was preferred since it is, as Olson (1976) stated, more robust than the other three multivariate tests: Wilks's lambda, Hotelling's trace, and Roy's largest root (cited in Liu, 2003, p.54). It was also highlighted by Bray and Maxwell (1985) that as compared to the other tests, its robustness is the most when the assumptions are violated (cited in Field, 2005, p. 594).

When any effect were found to be statistically significant at the .05 alpha level, univariate analysis of variance [ANOVA] was conducted to find the factor(s) contributing to the multivariate significance. If more than two categories (as in the case of education level of parents) regarding an independent variable occurred, the Bonferroni test was performed to determine which of the subgroups' mean scores on the dependent variables differed significantly.

CHAPTER IV

RESULTS

This chapter reports the findings of the study and the data analysis regarding research questions listed previously. The purpose of the study was to describe the current status of ICT education in public primary schools through investigating Grade 8 students' perceived ICT competencies and their attitudes towards the ICT course, the characteristics of the teaching-learning process of the course, the deficiencies of the IT classrooms in terms of their appropriateness to successful implementation of the ICT program, and students' perceptions on the ICT Student Workbook about its effectiveness. A cross-sectional survey was conducted with a self-reported questionnaire to examine the research questions of the study.

This chapter was divided into eight parts as the followings:

- Verification of the instrument
- Demographic information;
- Students' perceived competencies on specific ICT tasks;
- Students' perceived competencies on specific computer software;
- The characteristics of the teaching-learning process in the ICT course;
- Students' attitudes towards the ICT course;
- IT classroom deficiencies;
- Students' perceptions on the effectiveness of the ICT Student Workbook.

4.1 Verification of the instrument

After the main study, reliability coefficient was calculated for each section separately in order to check the internal consistency of the instrument. The reliability coefficient was found to be .90 for the Section 2, .87 for the Section 3, .81 for the Section 4, .80 for the Section 5, and .84 for the Section 7.

A factor analysis was applied to the Section 2 in order to determine whether the items were grouped in two theoretical factors. Initial principal component analysis with varimax rotation of the 17 items inventory revealed two factors eingenvalues above 1 (see Table 1). Factor 1 pertained 9 items: items 1, 6, 7, 8, 12, 13, 15, 16, and 17 while Factor 2 pertained 8 items: items 2, 3, 4, 5, 9, 10, 11, 14. These two dimensions explained 59.364% of variance. Factor 1 was named “Basic ICT tasks” and Factor 2 was named “Advanced ICT tasks” in accordance with the related literature. The analysis showed that the Cronbach alpha of Factor 1 (Basic ICT tasks) was .91, and the Cronbach alpha of Factor 2 (Advanced ICT tasks) was found to be .93.

Table 1. Factor Loading Obtained via Principal Component Analysis with Varimax Rotation for Section 2

Items	Factor 1	Factor 2
Item 1. Identify keys on a keyboard	**.691**	.291
Item 6. Send/receive e-mail	**.602**	.150
Item 7. Use the Internet to make search	**.700**	.063
Item 8. Identify the accuracy of information found	**.636**	.168
Item 12. Use a printer to take printout	**.682**	.194
Item 13.Use technology devices when needed	**.740**	.192
Item 15. Identify ethical issues related to use of ICT	**.566**	.321
Item 16. Identify the safety rules while using computers	**.621**	.295
Item 17. Save a file to external memories	**.652**	.139
Item 2. Solve hardware problems	.102	**.629**
Item 3. Solve software problems	.119	**.695**
Item 4. Install a program	.182	**.600**
Item 5. Uninstall a program	.062	**.626**
Item 9. Design a website	.222	**.640**
Item 10. Define variables in a programming language	.232	**.715**
Item 11. Write a simple program using a prog. language	.071	**.747**
Item 14. Use HTML codes to design a website	.084	**.778**

Similar analysis was conducted for Section 5 in order to understand if the items were grouped in three theoretical factors eingenvalues above 1 (see Table 2). Factor 1 pertained two items: items 2 and 8, Factor 2 pertained five items: items 1, 4, 6, 7 and 9, and Factor 3 pertained three items: items 3, 5 and 10. These three dimensions explained 68.726% of variance. Factors were named “Course confidence”, “Course usefulness” and “Course liking” respectively in accordance with the related literature. The analysis showed that the Cronbach alpha of Factor 1 (course confidence) was .88, and the Cronbach

alpha of Factor 2 (course usefulness) was .91, and it was found to be .85 for Factor 3 (course liking).

Table 2. Factor Loading Obtained via Principal Component Analysis with Varimax Rotation for Section 5

Items	Factor 1	Factor 2	Factor 3
Item 2. I think I am successful in implementing the course activities.	**.731**	.434	.099
Item 8. I have fairs that I might not succeed in the course.	**.916**	.013	-.062
Item 1. I think the things that I have learned during the course are of great help to me in daily life	.212	**.663**	-.092
Item 4. The course enhances my interest towards computers.	.099	**.740**	.213
Item 6. By taking the course, I have increased my chances of finding a job in the future.	.075	**.717**	.222
Item 7. The course helps me do homework and projects for the other courses.	.169	**.603**	.171
Item 9. I do not have to study since my performance is not graded.	-.012	**.953**	.053
Item 3. I find the course enjoyable.	.162	-.031	**.724**
Item 5. I enjoy attending the classes.	.162	.039	**.745**
Item 10. I find the things that we learn during the course interesting.	-.041	-.177	**.752**

4.2 Demographic information

442 Grade 8 students were given part in the analysis; 218 (49.3%) were girls and 224 (50.7%) were boys. As it is illustrated in Table 3, the majority of students were at the age of 14 (69.9%). The second largest proportion was 15-aged students; it was 24.4% of the sample. There were only two students at the age of 17 years, 11 students at the age of 16 years, and the number of students who were 13 years old was 12.

Table 3. Distribution of students by age

Age	*f*	*%*
13	12	2.7
14	309	69.9
15	108	24.4
16	11	2.5
17	2	.5
TOTAL	442	100.0

The students were also asked to provide data in relation to their parents' educational background. Table 4 reports the frequencies and percentages of students for education level of parents. 5.9% of students stated that their mothers were illiterate, and similarly 6.1% of them had a mother who was literate but had no diploma. More than half of students (56.1%) reported that their mothers were elementary-school graduate. The percentage decreased to 15.6%, 12.0% and 4.3% for middle-school, high-school and university level education of mothers respectively. Additionally, there was no student with a mother having a postgraduate degree. Data shows that there was no student with a father who was neither illiterate nor had a postgraduate degree. 2.9% of students stated that their fathers were literate but had no diploma, and the percentage increased to 37.3% for students with a father graduating from elementary school. 27.9% of students' fathers graduated only from middle school, while 22.9% of students' fathers graduated only from high school. Additionally, only 9% of students had a father graduating from university.

Table 4. Distribution of students by education level of parents

Education level	Mothers		Fathers	
	f	**%**	*f*	**%**
Not literate	26	5.9	0	.0
Literate but no diploma	27	6.1	13	2.9
Elementary school	248	56.1	165	37.3
Middle school	69	15.6	123	27.9
High school	53	12.0	101	22.9
University	19	4.3	40	9.0
Postgraduate	0	.0	0	.0
TOTAL	442	100.0	442	100.0

As shown in Table 5, the percentage of students who had computers at home was higher (61.3%) than that of those who indicated that they did not have (38.7%). 65.7% of boys had computer at home and the percentage for girls was 56.9%. While 45.5% of students had access to the Internet at home, 15.8% of students reported that they had home computer not connected to the Internet.

Preliminary results failed to show statistically significant association between gender and computer ownership (X^2= 3.86, p>.05, Cramer's V = .093), however showed significant

associations between computer ownership and education level of mothers (X^2= 63.28, p<.001, Cramer's V = .268) and fathers (X^2= 46.28, p<.001, Cramer's V = .229).

Table 5. Distribution of students by computer ownership

Computer ownership		Girls		Boys		**TOTAL**	
		f	**%**	*f*	**%**	*f*	**%**
Yes	with Internet connection	90	41.3	111	49.6	201	45.5
	without Internet connection	34	15.6	36	16.1	70	15.8
No		94	43.1	77	34.3	171	38.7
TOTAL		218	100.0	224	100.0	442	100.0

33.7% of students reported that they had assistance for the course at home, while 66.3 percent did not have assistance related to ICT at their homes as illustrated in Table 6. Preliminary results showed statistically significant relationship between assistance at home for the course and education level of mothers (X^2= 31.64, p<.001, Cramer's V = .268) and fathers (X^2= 33.77, p<.001, Cramer's V = .276).

Table 6. Distribution of students by availability of ICT assistance at home

Availability of ICT assistance	*f*	**%**
Yes	149	33.7
No	293	66.3
TOTAL	442	100.0

4.3 Students' perceived competencies on specific ICT tasks

Section 2 in the instrument was designed in order to examine students' perceived competencies on specific ICT tasks (research question 1). It contains two factors; which are named "Basic ICT Tasks" and "Advanced ICT Tasks". Items 1, 6, 7, 8, 12, 13, 15, 16, and 17 constituted "Basic ICT Tasks" factor, while items 2, 3, 4, 5, 9, 10, 11, 14 were included in "Advanced ICT Tasks" factor.

Table 7 shows the percentages, mean scores and standard deviations for students' perceived competencies on specified ICT tasks. As seen in the table, students perceived the five highest competence for the item 7 (use the Internet to make search), item 6

(send/receive e-mail), item 16 (identify the safety rules while using computers), item 12 (use a printer to take printouts), and item 13 (use technology devices when needed); the mean scores were reported for those items as 3.62 (*SD*=.68), 3.39 (*SD*=.93), 3.39 (*SD*=.88), 3.36 (*SD*=.93) and 3.35 (*SD*=.92) respectively. However, they perceived the five lowest competence in how to use HTML codes to design a website (item 14), write a simple program using a programming language (item 11), design a website (item 9), solve software problems (item 3), and install a program (item 4); the mean scores were reported for those items as 2.38 (*SD*=1.07), 2.40 (*SD*=1.01), 2.55 (*SD*=.95), 2.62 (*SD*=.97) and 2.81 (*SD*=1.06) respectively. When the researcher focused only on "basic ICT tasks", the mean score was calculated 3.36 (*SD*=.60). On the other hand, it was calculated 2.70 (*SD*=.70) for "advanced ICT tasks".

Table 7. Students' perceived ICT competencies

Item	%				Mean	SD
	N	S	U	A		
Item 1. Identify keys on a keyboard	1.1	17.0	30.3	51.6	3.32	.79
Item 6. Send/receive e-mail	7.5	9.7	18.8	64.0	3.39	.93
Item 7. Use the Internet to make search	1.4	7.7	18.3	72.6	3.62	.68
Item 8. Identify the accuracy of information found	4.3	13.8	31.4	50.5	3.28	.85
Item 12. Use a printer to take printout	7.0	10.6	21.5	60.9	3.36	.93
Item 13.Use technology devices when needed	5.9	13.1	20.4	60.6	3.35	.92
Item 15. Identify ethical issues related to use of ICT	6.3	17.2	24.7	51.8	3.21	.94
Item 16. Identify the safety rules while using computers	5.2	11.6	21.9	61.3	3.39	.88
Item 17. Save a file to external memories	8.1	12.4	16.5	62.9	3.24	.96
Basic ICT tasks					3.36	.60
Item 2. Solve hardware problems	4.8	32.6	29.9	32.8	2.90	.91
Item 3. Solve software problems	12.4	36.0	27.8	23.8	2.62	.97
Item 4. Install a program	13.3	27.8	22.6	36.2	2.81	1.06
Item 5. Uninstall a program	9.3	18.3	24.2	48.2	3.11	.89
Item 9. Design a website	17.4	35.1	21.7	25.8	2.55	.95
Item 10. Define variables in a programming language	8.6	34.6	24.4	32.4	2.80	.86
Item 11. Write a simple program using a prog. language	19.5	40.5	19.9	20.1	2.40	1.01
Item 14. Use HTML codes to design a website	25.8	30.8	23.1	20.4	2.38	1.07
Advanced ICT tasks					2.70	.70

N= Never competent, S= Sometimes competent, U= Usually competent, A= Always competent

4.3.1 Differences among students regarding their perceived competencies on specific ICT tasks according to gender

As shown in Table 8, while girls achieved a slightly higher mean score for "basic ICT tasks" (*M*=3.38, *SD*=.61) than boys (*M*=3.35, *SD*=.60), boys obtained a higher mean score for "advanced ICT tasks" (*M*=2.79, *SD*=.74) than girls did (*M*=2.61, *SD*=.67).

Table 8. Students' perceived ICT competencies by gender

Factor	Girls		Boys	
	M	SD	M	SD
Basic ICT tasks	3.38	.61	3.35	.60
Advanced ICT tasks	2.61	.67	2.79	.74

In order to determine the effect of gender, a one-way MANOVA was conducted. Based on the data shown in Table 9, the MANOVA results indicated a significant main effect for gender [Pillai's trace = .038, F(2,439) = 8.76, p<.001, η^2 =.038].

Table 9. The results of MANOVA for the effect of gender on students' perceived ICT competencies

Effect		Value	F	Hypothesis df	Error df	*p*	η^2
Gender	Pillai's Trace	.038	8.760	2.0	439.0	.000	.038

Analyses of variances on "basic ICT tasks" and "advanced ICT tasks" were conducted as follow-up tests to the MANOVA (see Table 10). The ANOVA results showed that there was no statistically significant difference for "basic ICT tasks" between boys and girls [F(1,440) = .161, p>.05, η^2 =.000]. However, there existed a significant difference between genders for "advanced ICT tasks" [F(1,440) = 7.783, p<.05, η^2 =.017], that is, boys perceived themselves significantly more competent in "advanced ICT tasks".

Table 10. Follow-up test results for the effect of gender on students' perceived ICT competencies

Dependent variable		df	F	*p*	η^2
Gender	Basic ICT tasks	1	.161	.689	.000
	Advanced ICT tasks	1	7.783	.006*	.017

As supplementary information, Table 11 shows the means and standard deviations for the perceptions of groups regarding all the items in this section. As seen in the table, both groups perceived the highest competence for the item 7 (use the Internet to make search). On the other hand, girls perceived the lowest competence in how to use HTML codes to design a website (Item 14, *M*=2.26, *SD*=1.05), and boys reported the lowest competence in how to "write a simple program using a programming language" (Item 11, *M*=2.49, *SD*=1.07).

For the item 6 (send/receive e-mail), item 7 (use the Internet to make search), item 8 (identify the accuracy of information found), item 13 (use technology devices when needed), item 15 (identify ethical issues related to use of ICT) and item 16 (identify the safety rules while using computers), girls obtained higher mean scores than boys did. However, for the other eleven items, higher mean scores than those of girls were calculated for boys.

Table 11. Descriptive statistics for the perceptions of students regarding Basic and Advanced ICT tasks

Factor	Item	Gender			
		Female		Male	
		M	SD	M	SD
Basic ICT Tasks	Item 1. Identify keys on a keyboard	3.27	.78	3.38	.80
	Item 6. Send/receive e-mail	3.43	.91	3.36	.96
	Item 7. Use the Internet to make search	3.70	.60	3.54	.76
	Item 8. Identify the accuracy of information found	3.33	.84	3.23	.87
	Item 12. Use a printer to take printout	3.29	.99	3.43	.87
	Item 13.Use technology devices when needed	3.40	.93	3.32	.91
	Item 15. Identify ethical issues related to use of ICT	3.26	.95	3.18	.94
	Item 16. Identify the safety rules while using computers	3.41	.84	3.38	.92
	Item 17. Save a file to external memories	3.30	1.00	3.38	.97
Advanced ICT Tasks	Item 2. Solve hardware problems	2.79	.89	3.02	.93
	Item 3. Solve software problems	2.54	.93	2.72	1.02
	Item 4. Install a program	2.70	1.04	2.93	1.09
	Item 5. Uninstall a program	3.02	1.02	3.20	1.00
	Item 9. Design a website	2.47	1.05	2.65	1.05
	Item 10. Define variables in a programming language	2.76	1.02	2.85	.96
	Item 11. Write a simple program using a prog. language	2.33	.95	2.49	1.07
	Item 14. Use HTML codes to design a website	2.26	1.05	2.50	1.09

4.3.2 Differences among students regarding their perceived competencies on specific ICT tasks according to education level of parents

In order to determine the effect of education level of mother, education level of father, and the interaction of mother and father education level, a two-way MANOVA was performed. As illustrated in Table 12, the analysis indicated a significant main effect for education level of mother [Pillai's trace = .054, F(10,844) = 2.324, p<.05, η^2 =.027], but not for education level of father [Pillai's trace = .021, F(8,844) = 1.117, p>.05, η^2 =.010] and not for the combination "father education level x mother education level" [Pillai's trace = .065, F(20,844) = 1.426, p>.05, η^2 =.033].

Table 12. The results of MANOVA for the effect of education level of parents on students' perceived ICT competencies

Effect		Value	F	Hypothesis df	Error df	p	η^2
Education level of mother	Pillai's Trace	.054	2.324	10.0	844.0	.011	.027
Education level of father	Pillai's Trace	.021	1.117	8.0	844.0	.349	.010
Education level of mother x Education level of father	Pillai's Trace	.065	1.426	20.0	844.0	.102	.033

Univariate tests on "basic ICT tasks" and "advanced ICT tasks" were conducted as follow-up tests to the MANOVA (see Table 13). The ANOVA results revealed significant effects of education level of mother for "basic ICT tasks" [F(5,436) = 3.054, p<.05, η^2 =.035], and "advanced ICT tasks" [F(5,436) = 3.029, p<.05, η^2 =.035]. However, as shown in the table, the test failed to reveal significant effects of father education level and the interaction between father and mother education levels.

Table 13. Follow-up test results for the effect of education level of parents on students' perceived ICT competencies

	Dependent variables	df	F	p	η^2
Education level of mother	Basic ICT tasks	5	3.054	.010*	.035
	Advanced ICT tasks	5	3.029	.011*	.035
Education level of father	Basic ICT tasks	4	.227	.923	.002
	Advanced ICT tasks	4	.864	.486	.008
Education level of mother x Education level of father	Basic ICT tasks	10	1.278	.240	.029
	Advanced ICT tasks	10	1.841	.052	.042

As seen in Table 14, the Bonferroni Post Hoc analysis indicated that the mean score of "basic ICT tasks" for students whose mothers were not literate differed significantly from those for the other groups. Furthermore, the analysis revealed a significance difference for "basic ICT tasks" between students whose mothers graduated from high school and students whose mothers graduated from elementary school or were literate but had no diploma. On the other hand, a significant mean difference was found for "advanced ICT tasks" between students with a high-school graduate mother and students whose mothers were literate but did not have no diploma or not literate.

Table 14. The mean differences among students' perceived ICT competencies with respect to education level of mother.

Dependent Variable	Educational level of mother (I)	Education level of mother (J)	Mean Difference I-J	p
Basic ICT tasks	Not literate	Literate but no diploma	-.22	1.000
		Elementary school	-.39*	.017
		Middle school	-.52*	.002
		High school	-.75*	.000
		University	-.70*	.001
	Literate but no diploma	Not literate	.22	1.000
		Elementary school	-.18	1.000
		Middle school	-.30	.330
		High school	-.53*	.002
		University	-.48	.084
	Elementary school	Not literate	.39*	.017
		Literate but no diploma	.18	1.000
		Middle school	-.13	1.000
		High school	-.36*	.001
		University	-.31	.396
	Middle school	Not literate	.52*	.002
		Literate but no diploma	.30	.330
		Elementary school	.13	1.000
		High school	-.23	.452
		University	-.18	1.000
	High school	Not literate	.75*	.000
		Literate but no diploma	.53*	.002
		Elementary school	.36*	.001
		Middle school	.23	.452
		University	.05	1.000
	University	Not literate	.70*	.001
		Literate but no diploma	.48	.084
		Elementary school	.31	.396
		Middle school	.18	1.000
		High school	-.05	1.000

Table 14. (continued)

Dependent Variable	Educational level of mother (I)	Education level of mother (J)	Mean Difference I-J	p
Advanced ICT Tasks	Not literate	Literate but no diploma	-.09	1.000
		Elementary school	-.37	.140
		Middle school	-.39	.230
		High school	-.68*	.001
		University	-.53	.167
	Literate but no diploma	Not literate	.09	1.000
		Elementary school	-.28	.666
		Middle school	-.30	.880
		High school	-.59*	.005
		University	-.44	.498
	Elementary school	Not literate	.37	.140
		Literate but no diploma	.28	.666
		Middle school	-.02	1.000
		High school	-.31*	.050
		University	-.16	1.000
	Middle school	Not literate	.39	.230
		Literate but no diploma	.30	.880
		Elementary school	.02	1.000
		High school	-.30	.305
		University	-.15	1.000
	High school	Not literate	.68*	.001
		Literate but no diploma	.59*	.005
		Elementary school	.32*	.050
		Middle school	.29	.305
		University	.15	1.000
	University	Not literate	.53	.167
		Literate but no diploma	.44	.498
		Elementary school	.16	1.000
		Middle school	.15	1.000
		High school	-.15	1.000

* The mean difference is significant at the .05 level.

The means and standard deviations for groups were presented in Table 15. It can be concluded that students whose mothers were not literate reported significantly lower perceptions (*M*=2.93, *SD*=.58) for “basic ICT tasks” compared to the other groups. Additionally, students whose mothers graduated from high school (*M*=3.68, *SD*=.51) reported significantly higher perceptions for “basic ICT tasks” than students whose mothers graduated from elementary school (*M*=3.32, *SD*=.60) or were literate but had no diploma (*M*=3.15, *SD*=.70). Lastly, students with a high-school graduate mother perceived significantly higher competence (*M*=3.00, *SD*=.63) for “advanced ICT tasks” than students whose mothers were literate but did not have a diploma (*M*=2.41, *SD*=.74) or not literate (*M*=2.32, *SD*=.57).

Table 15. Students' perceived ICT competencies by education level of mother

Item	Education level of mother											
	1		2		3		4		5		6	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Basic ICT tasks	2.93	.58	3.15	.70	3.32	.60	3.45	.53	3.68	.51	3.63	.44
Adv. ICT tasks	2.32	.57	2.41	.74	2.70	.71	2.71	.70	3.00	.63	2.86	.64

1= Not literate, 2= Literate but no diploma, 3= Elementary school, 4= Middle school, 5= High school, 6= University

As supplementary information, the percentages, means and standard deviations for the perceptions of groups regarding the items constituting the factors (basic and advanced ICT tasks) were provided in Appendix C.

4.3.3 Differences among students regarding their perceived competencies on specific ICT tasks according to computer ownership

In order to determine the effect of computer ownership, a one-way MANOVA was performed. The analysis showed a significant main effect for computer ownership [Pillai's trace = .140, $F(4,878) = 16.558$, $p<.001$, $\eta^2 = .070$] (see Table 16).

Table 16. The results of MANOVA for the effect of computer ownership on students' perceived ICT competencies

Effect		Value	F	Hypothesis df	Error df	p	η^2
Computer ownership	Pillai's Trace	.140	16.558	4.0	878.0	.000	.070

Univariate tests were conducted as follow-up tests to the MANOVA (see Table 17). The ANOVA test results indicated significant mean differences among groups for "basic ICT tasks" [$F(2,439) = 35.617$, $p<.001$, $\eta^2 = .140$], and "advanced ICT tasks" [$F(2,439) = 17.023$, $p<.001$, $\eta^2 = .072$].

Table 17. Follow-up test results for the effect of computer ownership on students' perceived ICT competencies

	Dependent variables	df	F	p	η^2
Computer ownership	Basic ICT tasks	2	35.617	.000*	.140
	Advanced ICT tasks	2	17.023	.000*	.072

Post Hoc analysis to the univariate ANOVA with Bonferroni test was conducted to examine the mean differences among groups in detail (see Table 18). This analysis revealed that students without a home computer obtained significantly lower means than the other groups for both “basic ICT tasks” and “advanced ICT tasks”. However, the test failed to reveal a significant mean difference between students with a home computer connected to the Internet and students with a home computer not connected to the Internet.

Table 18. The mean differences among students' perceived ICT competencies with respect to computer ownership

Dependent Variable	Computer Ownership (I)	Computer Ownership (J)	Mean Difference I-J	p
Basic ICT Tasks	Yes (CI)	Yes (NCI)	0,17	.09
		No	0,49*	.00
	Yes (NCI)	Yes (CI)	-0,17	.09
		No	0,32*	.00
	No	Yes (CI)	-0,49*	.00
		Yes (NCI)	-0,32*	.00
Advanced ICT Tasks	Yes (CI)	Yes (NCI)	0.16	.28
		No	0,41*	.00
	Yes (NCI)	Yes (CI)	-0,16	.28
		No	0,25*	.03
	No	Yes (CI)	-0,41*	.00
		Yes (NCI)	-0,25*	.03

* The mean difference is significant at the .05 level.

The means and standard deviations for groups were presented in Table 19. It can be concluded that students without a home computer perceived significantly lower competence for both “basic ICT tasks” (*M*=3.09, *SD*=.67) and “advanced ICT tasks” (*M*=2.47, *SD*=.71) than the other groups.

Table 19. Students' perceived ICT competencies by computer ownership

Factor	Computer ownership					
	Yes (CI)		Yes (NCI)		No	
	M	SD	M	SD	M	SD
Basic ICT tasks	3.58	.49	3.41	.47	3.09	.67
Advanced ICT tasks	2.89	.68	2.73	.63	2.47	.71

CI= Connected to the Internet, NCI= Not connected to the Internet

As supplementary information, the percentages, means and standard deviations for the perceptions of groups regarding the items constituting the factors (basic and advanced ICT tasks) were provided in Appendix D.

4.3.4 Differences among students regarding their perceived competencies on specific ICT tasks according to availability of ICT assistance at home

As seen in Table 20, a one-way MANOVA demonstrated a significant effect of ICT assistance at home on students' perceived ICT competencies [Pillai's trace = .068, $F(2,439) = 16.066$, $p<.001$, $\eta^2 = .068$].

Table 20. The results of MANOVA for the effect of ICT assistance at home on students' perceived ICT competencies

Effect		Value	F	Hypothesis df	Error df	p	η^2
ICT assistance at home	Pillai's Trace	.068	16.066	2.0	439.0	.000	.068

Univariate tests were conducted as follow-up tests to the MANOVA (see Table 21). The test results revealed significant mean differences between groups for both "basic ICT tasks" [$F(1,440) = 17.929$, $p<.001$, $\eta^2 = .039$], and "advanced ICT tasks" [$F(1,440) = 31.670$, $p<.001$, $\eta^2 = .067$].

Table 21. Follow-up test results for the effect of computer ownership on students' perceived ICT competencies

	Dependent variables	df	F	p	η^2
ICT assistance at home	Basic ICT tasks	1	17.929	.000*	.039
	Advanced ICT tasks	1	31.670	.000*	.067

The means and standard deviations for groups were presented in Table 22. It can be concluded that students who had ICT assistance at home perceived significantly higher competence for both "basic" (*M*=3.53, *SD*=.50) and "advanced ICT tasks" (*M*=2.96, *SD*=.64) than students who did not have ICT assistance at home.

Table 22. Students' perceived ICT competencies by availability of ICT assistance at home

Factor	ICT assistance at home			
	Yes		No	
	M	SD	M	SD
Basic ICT tasks	3.53	.50	3.28	.63
Advanced ICT tasks	2.96	.64	2.57	.71

As additional information, the percentages, means and standard deviations for the perceptions of groups regarding the items constituting the factors (basic and advanced ICT tasks) were provided in Appendix E.

4.4 Students' perceived competencies on specific computer software

Section 3 in the instrument was designed in order to examine students' perceived competencies on specific computer software (research question 2). It included five items: Word Processor (MS Word), Presentation Application (MS PowerPoint), Spreadsheet Software (MS Excel), Database Application (MS Access) and Operation System (Windows XP).

Table 23 shows the percentages, mean scores and standard deviations for students' perceived software competencies. Students reported high competencies for all the software. Overall mean score was calculated 3.75 (*SD*=.92), which falls in the descriptor "competent". More specifically, the mean score was calculated 4.06 (*SD*=.93) for the item 1 (word processor), 3.88 (*SD*=.92) for the item 2 (presentation application), 3.77 (*SD*=1.01) for the item 3 (spreadsheet software), 3.34 (*SD*=.97) for the item 4 (database application) and 3.74 (*SD*=.96) for the item 5 (operation system). All the mean scores for the items stand for the descriptor "competent" except for the mean score reported for the item 4, which stands for "slightly competent".

The highest mean score was reported for the item 1 (word processor); 74.4% of the students ranked their competency on this item as either "competent" or "completely competent". The lowest mean score was calculated for the item 4 (database application); only 45.9% of the students reported that they were either competent or completely competent on this item.

Table 23. Students' perceived competencies on specific computer software

Software	%					Mean	SD
	CI	I	SC	C	CC		
Item 1. Word Processor (MS Word)	2.9	4.1	18.6	32.6	41.8	4.06	.93
Item 2. Presentation Application (MS PowerPoint)	3.2	9.3	22.2	26.7	38.6	3.88	.92
Item 3. Spreadsheet Software (MS Excel)	4.5	9.3	24.4	29.6	32.1	3.77	1.01
Item 4. Database Application (MS Access)	8.8	14.7	30.5	25.3	20.6	3.34	.97
Item 5. Operation System (Windows XP)	8.4	7.5	20.4	29.0	34.8	3.74	.96
Overall						3.75	.92

CI= completely incompetent, I= incompetent, SC=slightly competent, C=competent, CC= completely competent

4.5 The characteristics of the teaching-learning process in the ICT course

In this section, it was aimed to investigate the characteristics of the teaching-learning process of the ICT course. Students were given 9 statements with four point scale items: 4=all the time, 3=usually, 2=sometimes, 1=never.

Table 24 shows the percentages and mean scores for students' perceptions on the teaching-learning process in the ICT course. As seen in the table, all the mean scores in this section were above 2.50 and hence stand for the descriptor "usually".

Almost three-quarters of students (74%) indicated that their teachers "usually" or "all the time" provided examples related to real life (item 1). Just 1.8% said "never" and approximately one-quarter (24.2%) chose "sometimes" for this item.

On item 2, regarding group-works activities, a great majority (88.7%) reported that they "usually" or "all the time" worked in groups during the class. Only, 0.7% stated that they never made such group activities. On the other hand, nearly half (46.6%) stated that they "never" or "sometimes" used the workbook (item 3).

The highest mean score on this section was calculated 3.43 (*SD*=.80) and it was calculated for the item 4. On this item, a clear majority (86.0%) indicated that their teachers "usually" or "all the time" showed them what they would perform by doing it herself/himself first. Only 2.9% of students said "never" and 11.1% chose "sometimes" for this item.

Students generally disagreed with the statement in item 5, “During the class, we have adequate time to make practice of what we have learned.” More than three-fifth (66.4%) indicated that they had “never” or “sometimes” adequate time during the course to make practice of what they had learned (item 5). Only 5% of students said “all the time” for this item. Similarly, nearly half (43.0%) indicated that they “never” or “sometimes” saved files that they produced during the class in order to put them into their digital portfolio (item 6).

49.1% of students marked either “usually” or “all the time” options for the statement “There occurs a high level of noise blocking my learning during the class” (item 7). Just 15.8% said “never” and 35.1% of students chose “sometimes” for this item.

On item 8, an overwhelming 83% marked either “usually” or “all the time” options that when there appeared a problem in a computer case, their teachers immediately tried to overcome it. Likewise, on item 9, most of students (80.5%) reported that their teacher assesses their works “usually” or “all the time”.

Table 24. Characteristics of the teaching-learning process in the ICT course

Item	%				M	SD
	N	S	U	A		
Item 1. Our teacher gives us examples related to real life.	1.8	24.2	36.0	38.0	3.10	.83
Item 2. We make group-works during the class.	.7	10.6	52.0	36.7	3.24	.66
Item 3. We use the course workbook effectively.	17.2	29.4	25.8	27.6	2.64	1.06
Item 4. Our teacher shows what we will perform by doing it herself/himself first.	2.9	11.1	26.0	60.0	3.43	.80
Item 5. During the class, we have adequate time to make practice of what we have learned.	34.8	31.6	28.4	5.0	2.78	1.03
Item 6. We save files that we produce during the class in order to put them into our digital portfolio.	17.4	25.6	20.1	36.9	2.76	1.02
Item 7. There occurs a high level of noise blocking my learning during the class.	15.8	35.1	23.8	25.3	2.59	1.03
Item 8. When there appears a problem in a computer case, our teacher immediately tries to overcome it.	5.2	11.8	21.5	61.5	3.39	.88
Item 9. Our teacher assesses our works.	7.0	12.4	21.5	59.0	3.33	.94

N= Never, S= Sometimes, U= Usually, A= All the time.

4.6 Students’ attitudes towards the ICT course

In this section, it was aimed to determine the extent to which students had positive attitudes towards the ICT course (research question 4). The section consisted of 10 items

with four alternative responses: 4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree. Students' attitudes were analyzed through three factors which were "course confidence" (factor 1), "course usefulness" (factor 2) and "course liking" (factor 3). Items 2 and 8 constituted "course confidence", items 1, 4, 6, 7 and 9 served "course usefulness" and items 3, 5 and 10 were included in "course liking". Item 8 in the factor 1 and item 9 in the factor 2 were negative statements, therefore in order to have the same level of value with the other items, the scores in those two items were reversed to 4 as strongly disagree and 1 as strongly agree while calculating the mean scores for "course confidence" and "course usefulness".

Table 25 shows the percentages, mean scores and standard deviations for students' attitudes towards the ICT course. The mean score was calculated 3.19 (*SD*=.68) for "course confidence", 3.27 (*SD*=.54) for "course usefulness" and 3.28 (*SD*=.67) for "course liking" and they all fall in the descriptor "agree".

The results indicated that students generally had positive attitudes towards the course. For instance, %93.4 of students marked the "agree" or "strongly agree" option for the statement that the course was useful for their daily lives (item 1), and 90.7% of students either agreed or strongly agreed for the item 2 (I think I am successful in implementing the course activities). Furthermore, a clear majority of students (86.7%) stated that the course was useful for them to do their homework or projects for the other courses (item 7). Similarly, for the negatively worded items, students generally placed their opinions as "disagree" or "strongly disagree"; 75.8% of students marked the "disagree" or "strongly disagree" options for the item 8 (I have fairs that I might not succeed in the course), and 64.8% of students disagreed or strongly disagreed with the item 9 (I do not have to study since my performance is not graded).

Table 25. Students' attitudes towards the ICT course

Item	%				M	SD
	SDA	D	A	SA		
Item 2. I think I am successful in implementing the course activities.	3.2	6.1	50.4	40.3	3.27	.71
Item 8. I have fairs that I might not succeed in the course.	38.0	37.8	20.1	4.1	1.90	.85
Course Confidence					3.19	.68

Table 25. (continued)

Item	%				M	SD
	SDA	D	A	SA		
Item 1. I think the things that I have learned during the course are of great help to me in daily life	1.8	4.8	32.6	60.8	3.52	.67
Item 4. The course enhances my interest towards computers.	4.1	13.1	33.3	49.5	3.28	.84
Item 6. By taking the course, I have increased my chances of finding a job in the future.	2.0	11.8	33.0	53.2	3.37	.76
Item 7. The course helps me do homework and projects for the other courses.	2.9	10.4	29.5	57.2	3.40	.79
Item 9. I do not have to study since my performance is not graded.	32.4	32.4	16.5	18.7	2.21	1.09
Course Usefulness					3.27	.54
Item 3. I find the course enjoyable.	3.2	13.8	34.1	48.9	3.28	.81
Item 5. I enjoy attending the classes.	3.4	14.5	32.6	49.5	3.28	.83
Item 10. I find the things that we learn during the course interesting.	3.2	13.8	35.9	47.1	3.26	.81
Course Liking					3.28	.67

SDA= Strongly disagree, D= Disagree, A= Agree, SA= Strongly agree

4.6.1 Students' attitudes towards the ICT course according to gender

Table 26 shows the results for the attitudes of girls and boys towards the ICT course. As shown in the table, girls obtained higher mean scores for "course usefulness" (*M*=3.22, *SD*=.52) and "course liking" (*M*=3.32, *SD*=.64) than those of boys. However, boys achieved a higher mean score (*M*=3.38, *SD*=.70) for "course confidence" than girls did (*M*=3.17, *SD*=.66).

Table 26. Students' attitudes towards the ICT course by gender

Factor	Gender			
	Girls		Boys	
	M	SD	M	SD
Course Confidence	3.17	.66	3.38	.70
Course Usefulness	3.22	.52	3.16	.55
Course Liking	3.32	.64	3.24	.70

In order to determine whether there were any statistically significant differences between genders, a one-way MANOVA was performed. As shown in Table 27, the analysis showed a significant main effect for gender [Pillai's trace = .053, F(3,438) = 8.152, p<.001, η^2 =.053].

Table 27. The results of MANOVA for the effect of gender on students' attitudes towards the ICT course

Effect		Value	F	Hypothesis df	Error df	p	η^2
Gender	Pillai's Trace	.053	8.152	3.0	438.0	.000	.053

Univariate tests were conducted as follow-up tests to the MANOVA (see Table 28). The univariate tests revealed a significant mean difference for "course confidence" [F(1,440) = 17.193, p<.001, η2 =.038], hence it could be interpreted that boys were significantly more likely to feel that the course was useful. However, gender had no significant effect on "course usefullness" [F(1,440) = .811, p>.05, η2 =.002] and "course liking" [F(1,440) = 1.748, p>.05, η2 =.004].

Table 28. Follow-up test results for the effect of gender on students' attitudes towards the ICT course

	Dependent variables	df	F	p	η^2
Gender	Course Confidence	1	17.193	.000*	.038
	Course Usefulness	1	.811	.368	.002
	Course Liking	1	1.748	.187	.004

As additional information, the percentages, means and standard deviations of genders for all the items in this section were provided in Appendix F.

4.6.2 Students' attitudes towards the ICT course according to education level of parents

In order to determine the effect of education level of mother, education level of father, and the interaction of mother and father education level, a two-way MANOVA was performed. As illustrated in Table 29, the analysis failed to reveal a significant main effect for education level of mother [Pillai's trace = .022, F(15,1266) = .633, p>.05, η^2 =.007], for

education level of father [Pillai's trace = .019, F(12,1266) = .678, p>.05, η^2 =.006] and for the combination "father education level x mother education level" [Pillai's trace = .084, F(30,1266) = 1.212, p>.05, η^2 =.028].

Table 29. The results of MANOVA for the effect of education level of parents on students' attitudes towards the ICT course

Effect		Value	F	Hypothesis df	Error df	p	η^2
Education level of mother	Pillai's Trace	.022	.633	15.0	1266.0	.849	.007
Education level of father	Pillai's Trace	.019	.678	12.0	1266.0	.774	.006
Education level of mother x Education level of father	Pillai's Trace	.084	1.212	30.0	1266.0	.200	.028

Univariate tests on "course confidence", "course usefulness" and "course liking" were conducted as follow-up tests to the MANOVA (see Table 30). The ANOVA results did not reveal significant effects of mother and father education levels. Similarly, no significant effect of the interaction between father and mother education levels was found.

Table 30. Follow-up test results for the effect of education level of parents on students' attitudes towards the ICT course

	Dependent variables	df	F	p	η^2
Education level of mother	Course Confidence	5	1.324	.253	.015
	Course Usefulness	5	.114	.989	.001
	Course Liking	5	.244	.943	.003
Education level of father	Course Confidence	4	.468	.759	.004
	Course Usefulness	4	.276	.893	.003
	Course Liking	4	.812	.518	.008
Education level of mother x Education level of father	Course Confidence	10	1.561	.116	.036
	Course Usefulness	10	1.172	.308	.027
	Course Liking	10	1.001	.077	.039

As additional information, the percentages, means and standard deviations of father education levels for all the items in this section were provided in Appendix G.

4.6.3 Students' attitudes towards the ICT course according to computer ownership

In order to determine the effect of computer ownership, a one-way MANOVA was performed. As seen in Table 31, the MANOVA results indicated a significant main effect for computer ownership [Pillai's trace = .045, $F(6,876) = 3.392$, $p<.05$, $\eta^2 = .023$].

Table 31. The results of MANOVA for the effect of computer ownership on students' attitudes towards the ICT course

Effect		Value	F	Hypothesis df	Error df	p	η^2
Computer ownership	Pillai's Trace	.045	3.392	6.0	876.0	.003	.023

Univariate tests were conducted as follow-up tests to the MANOVA (see Table 32). The univariate tests showed that computer ownership had a significant effect on "course confidence" [$F(2,439) = 5.496$, $p<.05$, $\eta^2 = .024$], "course usefulness" [$F(2,439) = 7.554$, $p<.05$, $\eta^2 = .033$], and "course liking" [$F(2,439) = 4.369$, $p<.05$, $\eta^2 = .020$].

Table 32. Follow-up test results for the effect of computer ownership on students' attitudes towards the ICT course

	Dependent variables	df	F	p	η^2
Computer ownership	Course Confidence	2	5.496	.004*	.024
	Course Usefulness	2	7.554	.001*	.033
	Course Liking	2	4.369	.013*	.020

As presented in Table 33, the Bonferroni test results revealed that there were significant mean differences for all factors between students who had a home computer with Internet connection and who did not have a home computer.

Table 33. The mean differences among students' perceived ICT competencies with respect to computer ownership

Dependent Variable	Computer Ownership (I)	Computer Ownership (J)	Mean Difference I-J	p
Course Confidence	Yes (CI)	Yes (NCI)	.10	.845
		No	.23*	.003
	Yes (NCI)	Yes (CI)	-.10	.845
		No	.13	.508
	No	Yes (CI)	-.23*	.003
		Yes (NCI)	-.13	.508
Course Usefulness	Yes (CI)	Yes (NCI)	.16	.082
		No	.21*	.001
	Yes (NCI)	Yes (CI)	-.16	.082
		No	.05	1.000
	No	Yes (CI)	-.21*	.001
		Yes (NCI)	-.05	1.000
Course Liking	Yes (CI)	Yes (NCI)	.11	.710
		No	.20*	.010
	Yes (NCI)	Yes (CI)	-.11	.710
		No	.10	.947
	No	Yes (CI)	-.20*	.010
		Yes (NCI)	-.10	.947

* The mean difference is significant at the .05 level.

The means and standard deviations for groups were illustrated in Table 34. It could be concluded that students with a home computer connected to the Internet obtained significantly higher means for "course confidence" (*M*=3.29, *SD*=.68), "course usefulness" (*M*=3.38, *SD*=.52) and "course liking" (*M*=3.38, *SD*=.63) than those of students without a home computer (*M*=3.06, *SD*=.68; *M*=3.17, *SD*=.59 and *M*=3.17, *SD*=.72).

Table 34. Students' attitudes towards the ICT course by computer ownership

Factor	Computer ownership					
	Yes (CI)		Yes (NCI)		No	
	M	SD	M	SD	M	SD
Course Confidence	3.29	.68	3.19	.64	3.06	.68
Course Usefulness	3.38	.52	3.22	.46	3.17	.59
Course Liking	3.38	.63	3.27	.64	3.17	.72

CI= Connected to the Internet, NCI= Not connected to the Internet

As supplementary information, the percentages, means and standard deviations of groups for all the items in this section were provided in Appendix H.

4.6.4 Students' attitudes towards the ICT course according to availability of ICT assistance at home

In order to determine whether there were any statistically significant mean differences between groups, a one-way MANOVA was performed. The results were presented in Table 35. The analysis revealed a significant main effect for ICT assistance at home [Pillai's trace = .028, F(3,438) = 4.235, p<.05, η^2 =.028].

Table 35. The results of MANOVA for the effect of ICT assistance at home on students' attitudes towards the ICT course

Effect		Value	F	Hypothesis df	Error df	p	η^2
ICT assistance at home	Pillai's Trace	.028	4.235	3.0	438.0	.006	.028

Univariate tests were conducted as follow-up tests to the MANOVA (see Table 36). The analysis showed that ICT assistance at home had a significant effect on "course confidence" [F(1,440) = 6.044, p<.05, η^2 =.014], "course usefulness" [F(1,440) = 10.394, p<.05, η^2 =.023], and "course liking" [F(1,440) = 3.992, p<.05, η^2 =.009].

Table 36. Follow-up test results for the effect of ICT assistance at home on students' attitudes towards the ICT course

	Dependent variables	df	F	p	η^2
ICT assistance at home	Course Confidence	1	6.044	.014*	.014
	Course Usefulness	1	10.394	.001*	.023
	Course Liking	1	3.992	.046*	.009

As shown in Table 37, significantly higher mean scores for "computer confidence" (*M*=3.30, *SD*=.64), "computer usefulness" (*M*=3.39, *SD*=.50) and "computer liking" (*M*=3.37, *SD*=.62) were obtained by students having ICT assistance at home than those of students without ICT assistance at home (*M*=3.13, *SD*=.69; *M*=3.22, *SD*=.56 and *M*=3.23, *SD*=.69).

Table 37. Students' attitudes towards the ICT course by availability of ICT assistance at home

Factor	ICT assistance at home			
	Yes		No	
	M	SD	M	SD
Course confidence	3.30	.64	3.13	.69
Course usefulness	3.39	.50	3.22	.56
Course liking	3.37	.62	3.23	.69

As additional information, the percentages, means and standard deviations of groups for all the items in this section were provided in Appendix I.

4.7 IT classroom deficiencies.

In this section, it was aimed to determine the deficiencies of IT classrooms (research question 5). The section consisted of 7 items with two alternative responses: 1=Yes and 2=No. The frequencies and percentages for students' perceptions were presented in Table 38.

As seen in the table, nearly two-fifth (38.0%) stated that the computer they used in the IT classroom did not work properly (item 1). Furthermore, approximately one-quarter (23.5%) stated that the computer was not connected to the Internet (item 2). The highest percentage for the "no" option was obtained for the statement "I use the computer myself" (item 3); more than half (57.2%) indicated that they had to use the computer with their peer(s). On the other hand, 43.9% stated that the computer did not operate fast enough to do their studies (item 4). On item 5, regarding essential software to do their studies in the IT class, a clear majority (81.9%) indicated that all the software was loaded in the computer. Similarly, an overwhelming 83% stated that CD and diskette drivers of the computer worked properly (item 6). Lastly, on item 7, regarding the physical adequacy of the IT class, only 54.1% students stated that the IT classroom was large enough.

Table 38. IT Classroom deficiencies

Item	Yes		No	
	f	*%*	*f*	*%*
Item 1. The computer works properly.	274	62.0	168	38.0
Item 2. The computer is connected to the Internet.	338	76.5	104	23.5
Item 3. I use the computer by myself.	189	42.8	253	57.2
Item 4. The processor speed is high enough to do my studies.	248	56.1	194	43.9
Item 5. All the software to do my studies is loaded in the computer.	362	81.9	80	18.1
Item 6. CD and diskette drivers of the computer work properly.	367	83.0	75	17.0
Item 7. Our IT classroom is large enough.	239	54.1	203	45.9

4.8 Students' perceptions on the effectiveness of the ICT Student Workbook.

In this section, it was aimed to investigate the effectiveness of the ICT Student Workbook. Students were given 7 statements with four point scale items: 4=strongly agree, 3=agree, 2=disagree, 1=strongly disagree. The percentages and mean scores for students' perceptions on the course workbook were presented in Table 39.

It can be derived from the table that students had mostly positive perceptions on the course workbook. The least positive perception was achieved on the item 4 (The activities enhance my interest towards the course) while the most positive perception was achieved on the items 1 (The language of the workbook is clear) and 6 (The pictures/graphs/figures are related to the subjects).

On item 1, regarding the language of the workbook, over 80% of students agreed or strongly agreed that the language of the workbook was clear. Only 7.5% strongly disagreed and 12.4% disagreed.

On item 2, students generally agreed that the explanations provided in the workbook helped them understand the subjects. A wide margin of students (79%) either agreed or strongly agreed.

Approximately three-quarters of students (74.5%) agreed with the statement "The activities are related to real life" (item 3), however the percentage of students who agreed or strongly agreed decreased to 66.3% for the statement "The activities enhance my interest towards the course" (item 4).

A clear majority (79.6%) indicated that they did not have any difficulty in implementing the activities in the workbook (item 5). Only 20.4% of students agreed or strongly agreed with the statement “I have difficulty in implementing the activities”.

The last two items were related to the pictures, graphs and figures in the workbook. On item 6, 82.2% students either agreed or strongly agreed with the statement “The pictures/graphs/figures are related to the subjects”. Just 9% said “strongly disagree” and 8.8% stated that they disagreed with the statement.

Similarly, over three-quarters of students (77.4%) either agreed or strongly agreed with the statement “The pictures/graphs/figures enhance my interest towards the course” (item 7). 9.7% of students strongly disagreed while 12.9% disagreed with the statement.

Table 39. Students’ perceptions on the effectiveness of the ICT Student Workbook

Item	%				M	SD
	SDA	D	A	SA		
Item 1. The language of the workbook is clear.	7.5	12.4	38.5	41.6	3.14	.91
Item 2. The explanations help me understand the subjects.	6.5	14.5	45.2	33.8	3.06	.86
Item 3. The activities are related to real life.	7.2	18.3	37.3	37.2	3.04	.92
Item 4. The activities enhance my interest towards the course.	10.9	22.8	36.4	29.9	2.85	.97
Item 5. I have difficulty in implementing the activities	37.1	42.5	13.6	6.8	1.90	.88
Item 6. The pictures/graphs/figures are related to the subjects.	9.0	8.8	40.7	41.5	3.14	.92
Item 7. The pictures/graphs/figures enhance my interest towards the course.	9.7	12.9	36.0	41.4	3.09	.96

SDA: Strongly Disagree, D: Disagree, A: Agree, SA: Strongly Agree.

CHAPTER V

CONCLUSION AND IMPLICATIONS

The final chapter deals with the discussion of the results, conclusions drawn from the findings, and implications for practice and future research.

5.1 Discussion of the Results

In this study, it was aimed to describe the current status of ICT education in public primary schools through investigating Grade 8 students' perceived ICT competencies and their attitudes towards the ICT course, the characteristics of the teaching-learning process of the course, the deficiencies of the IT classrooms in terms of their appropriateness to successful implementation of the ICT program, and students' perceptions on the ICT Student Workbook about its effectiveness.

The results showed that approximately two-third of 442 Grade 8 students (61.3%) had a computer at home and that almost half of them (45.5%) had home access to the Internet. However, the previous studies providing country-wide data (Aydın, Johari, & McIsaac, 2004; OECD, 2005b; State Statistics Institute [SSI], 2006) revealed different findings. For example, according to SSI (2006), 11.62% of households in Turkey had home computers, and only 5.86% had access to the Internet at home. Hence, this study indicated much higher levels of home access to computers and the Internet. Given that the sample of this study comprises participants in the metropolitan area of Izmit which is one of the most industrialized cities in Turkey, the reason for this sharp difference could be ascribed to family income (Haisken-DeNew, Pischner, & Wagner, 2001; Venegas, 2007) and geographic region (SSI, 2006; Zappalà, 2003) as the factors which influence availability of computers and the Internet at home.

While 65.7% of boys owned a home computer, the percentage of girls having a computer at home was found to be 56.9%. However, the results showed no significant relationship between gender and computer ownership. This does not support the previous literature which suggests that access to home computers is an indicator for gender differences

(Culley, 1993; Newton & Beck, 1993; Reinen & Plomp, 1997). This finding appears to be similar to that of Baloğlu and Çevik (2008). In their study, they revealed no correlation between home computing and gender even though they indicated that more boys had access to home computers than girls. They stated that since the sibling status in the students' families was not examined, it cannot be derived from their study that parents prefer to purchase a computer if the child is a boy. This assumption gained some support in the present study.

The results also provided evidence that the level of parental education is strongly associated with availability of home computers for students. This finding is consistent with the findings of Zappalà and McLaren (2002) who revealed significant correlation between the education level of parents and computer and Internet access at home. Similarly, the present study also suggests that students with more educated parents are more likely to get support and help at home from their parents for the ICT course. This seems to support the early view of Giacquinta, Baucer, and Levin (1993) and Zappalà and Considine (2001) that highly educated parents are more likely to become involved in their children's education at home.

5.1.1 Students' perceived competencies

Since new technologies are introduced continually and existing ones turn out to be outdated almost as soon as they appear (Roberts, Cover, Davies, Schneider, & Sloan, 2002), new ICT competencies appear regularly. Hence, it seems crucial for students to have these competencies in order to have a successful future and cope with changing world. The first aim of this study was to investigate perceived competencies of Grade 8 students on specific ICT tasks. Through this aim, the researcher tried to provide a clear picture of if students have required ICT competencies.

Participants were provided with a list of 17 ICT competencies drawn from the objectives of the new ICT program after examining the related literature. The results generally showed that students perceived themselves "usually competent" in implementing the listed tasks. More specifically, in the level of competence, the students perceived the highest two levels for (1) use the Internet to make search, and (2) send/receive e-mail. The reason for students' perceptions might be considerable increase in accessibility of the Internet in recent years (OECD, 2001a) which results in a new electronic environment and a new culture characterizing a generation of young people who are growing up and

living with the Internet (Wilhelm, 2002). On the other hand, the lowest perceived competencies were: (1) use HTML codes to design a website, and (2) write a simple program using a programming language. Those topics were not included in the previous ICT program (MoNE, 2006), and participants were introduced to those topics for the first time just a few months before the implementation of the questionnaire. Hence, the reason for their low perceptions might result from their lack of familiarity and experience with HTML codes and programming languages.

Although the findings of the present study revealed that students generally perceived themselves proficient for both basic and advanced ICT skills, much lower perceptions were reported for advanced ICT tasks, which may be attributed to inadequately implemented lessons through which students would gain those skills or insufficient amount of time spent on those subjects. Furthermore low perceptions of students may result from their lack of practice in those subjects; hence these skills may not be familiar to them.

Students were also asked to state their perceived competencies on some applications software: word processor (MS Word), presentation application (MS PowerPoint), spreadsheet software (MS Excel), database application (MS Access), and operation system. Students' perceptions on the software were mostly high. For all the software except for "database application", they perceived themselves competent. Their perceptions were a bit lower for "database application"; they perceived themselves "slightly competent" in MS Access.

The highest perceptions were reported for word processing software which is used to write, edit, and print texts. In point of fact, this was not a surprising result since a large body of research emphasizes the pervasiveness of word processor for computer use (Kılıç, 2001; Cuban, 2001; Öztok, 2007; Turnbull & Lawrence, 2002; Volman et al., 2005). Their great experience with word processing may be the reason for students' reporting high perceived proficiency in using MS Word. This assumption may also help understand the reason for lower perceptions on "database application"; students' low experience with the application may be the reason for their perceived weaknesses in MS Access.

The effects of gender, educational background of parents, availability of home computer, and availability of ICT assistance at home on students' perceived ICT competencies were also examined in the present study. The results showed that there was no significant

difference between boys and girls regarding perceived basic ICT skills. However, the difference between girls and boys -in favor of boys- was found significant for perceived higher order ICT skills. That is to say, girls perceive themselves less competent than boys on advanced ICT tasks, which appears to support the findings of Busch's (1995) study that gender does affect the perception of their competencies for certain tasks, however complex tasks seem to generate more gender differences than simple computational tasks.

The previous research concerning gender difference in computer-related skills, in general, has shown that males perceive themselves to be more competent than females (Durndell & Haag, 2002; Hakkarainen et al., 2000; OECD, 2005b; Rosen & Weil, 1995; Schottenbauer, 2004, Whitley, 1997; Young, 2000). For instance, in their study, Hakkarainen et al. (2000) found significant differences between self-assessed ICT skills of boys and those of girls. Likewise, a similar difference was indicated by the PISA study of OECD (2005b), which compiled data about the performance levels of pupils worldwide.

In the literature, there are different approaches to explain gender differences in ICT. For instance, as Watson (1997) mentioned, the finding which underlines boys' dominance in ICT skills may result from that girls are more likely to express negative feelings about computers than boys are. Shashaani and Khalili (2001) also commented on this issue and stated that boys are more likely to overestimate their abilities in computer technology.

Another reason for this finding might be low interest of girls in advanced ICT applications, which could help understand why fewer girls than boys enroll in computer classes, especially in programming and advanced computer courses (Collis, Kass, & Kieren, 1989; Shashaani, 1994), and why fewer women work in high-tech jobs (Volman & van Eck, 2001).

In the present study, the effects of educational background of parents on students' self-reported ICT skills were also investigated. The results suggest that educational background of mothers has a significant effect on students' perceptions for their basic and advanced ICT competencies. More specifically, although no general trend was revealed, significant differences among some of the groups were determined in favor of students with higher educated mothers. For instance, the results suggest that students whose mothers graduated from high school consider themselves to have significantly

higher basic ICT competencies than students whose mothers graduated from elementary school and students whose mothers are literate but have no diploma.

The findings show parallelism with the comments of Bowen (1978) on the effect of educational background of parents on students. He states that "*an abundance of evidence based on major national studies with huge samples indicates a very strong and positive relationship between the education of parents and the measured intelligence, academic achievement, and extracurricular participation of children in school or college*" (Bowen, 1978, p. 197). The reason for the impact of parental education may be that more educated parents are more likely to involve in activities which promote their children's learning (Stevenson & Baker, 1987, cited in Bogenschneider, 1997, p. 720) while less-educated parents are less willing or unable to become involved in their children's education (Epstein, 1989, cited in Bogenschneider, 1997, p. 720). In their study, Zappalà and Considine (2001) underlined that parents with higher educational background are more likely to encourage the value of higher levels of achievement, and also more likely to provide with the psychological and educational support including materials which students need to excel in school.

Through the light of these explanations, the reason for this finding may be explained as that more educated mothers are more likely to enhance their children's learning with providing more educational support and/or more involvement in their learning activities. However, the study revealed no significant difference in students' perceived ICT competencies with respect to education level of father. Fathers' educational background appeared with ability to explain variation in neither basic nor advanced ICT tasks.

As this study has shown, computer ownership affects students' ICT competencies. The results indicated that home computer users perceived themselves to have significantly higher competencies in basic and advanced ICT tasks than their non-home using peers. Furthermore, the impact of having a home computer connected to the Internet was found stronger than a home computer without connection.

These are not unexpected results since a number of studies have confirmed the effect of home computers on ICT proficiency (Geissler & Horridge, 1993, Göktaş, 2006; Linn, 2005; Nichols, 1992; Selwyn, 1998; Underwood, Billingham, & Underwood, 1994). The reason for this difference may be explained with the benefits students can derive from greater use of computers at home. As relying on their own computers, rather than a

shared facility, students may enjoy ease of access and use, and ultimately enhance their ICT skills (Moule, 2003).

The results of the present study also suggest that availability of ICT assistance at home affect students' ICT competencies. Students who had ICT assistance at home reported significantly higher perceptions for their competencies in both basic and advanced ICT tasks than those of students who were not provided with such assistance by their families. The impact of availability of home assistance for the ICT course indicated by this study was parallel to the impact of families' support and involvement in students' learning at home (Epstein & Becker, 1982; Hao & Bonstead-Bruns, 1998). The results suggest that as involving in learning activities of students at home and providing support to their children while they do their homework or implement the assignments given by their teachers, families may help them develop ICT skills in subjects to which students are introduced during the ICT course. As stated by Bleeker and Jacobs (2004), such an involvement may guide students' interpretations of their own learning experiences and shapes their beliefs about their abilities to learn and the value of their learning.

5.1.2 The characteristics of the teaching-learning process of the course

One of the aims of this study was to examine the teaching-learning process of the ICT course. The introduction of the new ICT program in primary schools has leaded a decrease in the teacher-oriented activities and encouraged the student-centered strategies. Teachers now must take place in the process as facilitators and team leaders rather than the sole source of knowledge. As Özden (2002) stated, the new program implies new learning strategies and assessment techniques, which requires combining the traditional and constructivist approaches. Teachers need to consider individualistic differences of students in order to attain the most effective learning environment for the course (cited in MoNE, 2007, p.9).

Working as a member of a team is one of the competencies which have gained in importance recently (MoNE, 2007). As Petraglia (1998) stated that "*the presence of other learners provides students with the means to gauge their own progress which, in turn, assists them in identifying their relative strengths and weaknesses and permits them the insight necessary to improve their own learning*" (p. 55). The results revealed that students were extensively asked to work in groups during the ICT course. This finding may also help understand why there is a high level of noise during lessons which

influences students' learning. Students generally stated that they experienced a high level of noise during the ICT course. This may be interpreted as an indicator of more interaction among students in IT classrooms (Maor, 1999).

IT classrooms are scheduled for 40 minutes per week for each of 6th, 7th and 8th grades. The present study revealed that the lesson time appears to be an obstacle for students to make in-class practice on subjects. This shows parallelism with the findings of Seferoğlu's (2007) study. In his study, IT teachers considered 40-minute-lesson time per week to be not sufficient to accomplish the determined activities of the program. Teachers stated that they already needed to spend some of the lesson time for classroom routines and procedures such as maintaining laboratory order, attendance check, and starting up computers etc. The study conducted under the authority of Ministry of National Education also suggests that 40 minutes per week does not satisfy students; in the study, most Grade 8 students stated that more class hour of the ICT course (ÖBSS, 2004).

The results also showed that students were generally provided with real life examples related to lesson subjects by their teachers. Therefore, it can be argued that teaching-learning process in the course was based on real life situations which can help students' learning be more meaningful for them (Grobecker, 1999). On the other hand, the present study also revealed that the ICT Student Workbook was not included in the teaching-learning process all the time and not used very effectively. The reason for this finding can be that teachers may implement different activities other than the ones in the workbook. They are allowed to expand the workbook activities or can implement different activities that they have developed (İnce, Şenyüzlü, & Uğur, 2007).

The results showed that teachers generally control and assess students' works. In order to ensure that learning occurs, teachers are asked to use various assessment methods. One of methods to assess students' learning is digital portfolios (MoNE, 2007). A majority of participants stated that they saved their works to put them into their digital portfolios. This finding suggests that in order to monitor students' efforts, progress and achievements, digital portfolios are one of the assessment techniques teachers employ during the course. It can be argued that in this way, teachers could also help students develop abilities to closely monitor their own progress (Tillema, 1998).

This study also suggests that teachers perform the tasks themselves at first, and then ask students to do. This method seems to be in contradiction with the role of teachers in a constructivist environment. They are expected to act as facilitators rather than the sole source of knowledge in this approach (Poole, 2000). It can be argued that demonstrating students exactly what they will perform may lessen students' exploratory efforts to reach knowledge and may direct them just to repeat their teachers' actions. Lastly, the results reveal that when there appears a problem in a computer case, teachers try to resolve it immediately. Since students engage in activities which require using computers, it is quite possible to face with software or hardware problems during the course. This finding may imply that teachers try to lessen the influence of those problems on students' learning as they try to overcome them immediately.

5.1.3 Students' attitudes towards the ICT course

Another purpose of this study was to investigate Grade 8 students' attitudes towards the ICT course. The results showed that students had favorable attitudes towards the course across all domains. This is an encouraging finding since students' attitude towards a subject as a key factor which influences the amount of learning time and effort spent in a particular subject can affect achievement (Vermeer & Seegers, 1998, cited in Broeck, Damme, & Opdenakker, 2004, p. 89).

This finding appears to be in conflict with the findings of Akbaba-Altun (2006) who reported unfavorable attitudes of students towards the course. In her study, she stated that since the course curriculum for 4^{th} to 8^{th} graders was almost the same, upper grades did not build upon their knowledge. Hence, students had lack of interest and motivation towards the course as a result of outdated and overlapping content. The reason for students' positive attitudes revealed in the present study might be the revision of the curriculum. The new content now includes much more current topics such as web-design, programming languages, spreadsheet and database applications, and it has been divided into eight steps each of which covers different subjects related to ICT.

The effects of gender, educational background of parents, home computer, and availability of ICT assistance at home on students' attitudes towards the course were also examined in the present study. Previous research concerning gender difference in ICT attitudes, in general, has shown that boys had more favorable attitudes towards ICT than girls (Meelissen & Drent, 2008; Shaw & Marlow, 1999; Whitley, 1997; Young, 2000). This

study provided parallel evidence only for confidence domain when research shifted the focus of analyses from ICT attitudes to the ICT course attitudes. The results showed that boys perceived themselves more confident than girls in the ICT course. On the other hand, it is encouraging that no significant gender differences across liking and usefulness domains were noted. Similarly, no significant effect of educational background of parents on students' attitudes towards the ICT course was revealed.

There is a large body of research reporting the effect of home computing on students' attitudes towards ICT (Colley, Gale & Harris, 1994; Göktaş, 2006; Kirkman, 1993; Nichols, 1992; Selwyn, 1998). Although this study appears to provide parallel evidence regarding the ICT course attitudes, significant differences were found only when home computers were connected to the Internet. The results suggest that students who have home computers with the Internet connection display significantly more favorable attitudes towards the course across all domains than non-home using students, however, no significant difference between non-owners and home users without connection to the Internet was indicated. The reason might be that in the new program students are supposed to extensively use the Internet to prepare their projects and do their homework, and are encouraged to make use of it as a source of information (Karadağ, Yılmaz & Aktay, 2006). Students who own home computers not connected to the Internet seem to be unable to use their computers for those purposes. Hence, this may lessen the impact of computer ownership on the ICT course attitudes of those students.

The results of the present study also suggest that availability of ICT assistance at home affect students' attitudes towards the ICT course. Students who had ICT assistance at home were found to have significantly more favorable attitudes towards the ICT course across all domains than students who were not provided with such support by their families. The reason for this difference may be explained by the findings of Epstein (1987, cited in Cairns, 1994) that when parents help their children with school work at home, they increase interaction with their children as a student at home, support and encourage school work more and become participants in their children's education, in turn, these students display more positive attitudes towards school. Through the light of Epstein's comments, it may be said that when families assist their children at home to do their studies or homework related to the ICT course, they can help their children develop positive attitudes towards the course.

5.1.4 IT Classroom deficiencies

In this study, the deficiencies of IT classrooms were also examined from the perspective of students. In spite of the substantial amounts of money, time and energy into attempting to increase students' access to ICT in primary education, the results revealed that schools were still not able to offer effective ICT facilities to students. IT classrooms have been established in order to familiarize the students with ICT, however, the present study suggest that they do not appear to be places where students can take full benefits of computer technologies.

The results indicated that the major deficiency which could limit students' use of computers was that students generally had to share a computer with their classmates. This finding provided support to the previous studies (Akbaba-Altun, 2006; OECD, 2005b; OECD, 2007). It can be argued that since the classrooms are crowded and the number of computers is limited, 2 or 3 students may need to share a computer during the lessons.

This study also showed that approximately half of students (45.9%) did not perceive their IT classrooms to be large enough. This was an expected finding since as Akbaba-Altun (2006) reported, "*The IT classrooms at schools were placed in existing older classrooms that were not designed according to the needs of IT classrooms at schools*" (p.185). In her study, almost all participants including primary school supervisors, principals and computer coordinators disagreed that IT classrooms were large enough and suitable for students. The results of the present study revealed that almost half of students had the similar opinions for their IT classrooms.

Computer processor speed is one of the factors used to assess the quality of the infrastructure currently available in schools. A higher processor speed allows for a wider range of computer use and quicker response times (Plante & Beattie, 2004). According to the results, computers equipped with low processor speed seemed to be another obstacle in meeting the full potential of IT classrooms in schools. Almost half of students stated that the processor speed of the computers they used in the IT classroom was not high enough to do their studies. Similarly, it was found that many students frequently suffered from computer hardware malfunction during lessons.

As compared to the previous studies (OECD, 2005b; World Bank, 2006b), the results show that more students (76.5) have a school access to the Internet. Similarly, it is

encouraging that computers generally have necessary software for students to do their studies, and CD and diskette drivers of most of computers work properly.

5.1.5 The ICT Student Workbook

In this study, it was also aimed to examine the effectiveness of the workbook provided for the use of students. Students generally reported positive perceptions on the workbook. This study showed that a clear majority of students agreed that the language of workbook was appropriate to their level; the explanations provided in the workbook helped them have a better understanding of the subjects and the workbook activities were based on authentic tasks. Similarly, students had positive perceptions on the visual elements of the workbook. The results indicated that the pictures/graphs/figures were related to the subjects and they enhanced students' interest towards the ICT course. Furthermore, students mostly believe that they did not have any difficulty in implementing the course activities.

5.2 Implications for Practice

In recent years ICT has had, and is continuing to have, a gradually more significant impact on all aspects of society. There are only a few areas of life where ICT has not made an impact yet. This technology expands access to, and understanding of, the world at large. It also allows people in all areas of life to make use of the power of computer systems as personal tools and to communicate locally and globally (OECS, 2002). Hence, with its increasing importance, it has become significant to ensure that students who are tomorrow's employees and adults will not grow up as ICT illiterates.

This study revealed that although students generally perceive themselves to be competent in using ICT, their perceived high order ICT skills were not found high enough. Teachers should give more emphasis on advanced ICT tasks, and knowledge, skills and understandings that students develop in regard to ICTs need to be nurtured, developed and expanded.

This study indicated significant gender differences among students in perceived advanced ICT competencies. Boys perceived themselves to be more competent than girls in advanced ICT tasks. There hardly seems to be a gender gap in the area of ICT competencies of primary school students. In order to close the gender discrepancy with

respect to ICT, girls' level of involvement in ICT should be expanded by their teachers, and they must be motivated to have more engagement in computing. Volman and van Eck (2001) highlight this concern and suggest that it is important for females to not only grow familiar with ICT, but also to develop an interest in the field too. Education could be one of the instruments to make ICT more attractive to females. Schools should not only prepare students by equipping them with the required ICT knowledge and skills, but present ICT in such a way that it is attractive and interesting for both genders. In addition, parents must become aware of their daughters' potential, and must encourage them to participate in computing since their attitudes and behaviors are important factors in motivating their children to use computers (Shashaani & Khalili, 2001).

Home computers also seem to have a significant effect on students' perceived ICT competencies. The results highlighted that students who lacked of a personal computer at home were at a disadvantaged position. School seems to play an important role in the relation of students to ICT, since almost half of students stated that they do not have a home computer. In ICT education in primary schools, the computer is not considered as a teaching tool, but rather a subject that needs to be taught. Hence, the ICT course benefits students without a home computer as providing them with access to computers. However, significant differences between non-owners and owners showed that schools need to do more for those students and provide them with more opportunities other than access to school computers for 40 minutes a week. For example, schools can compensate for the lack of computer experience at home by allowing students to benefit from IT classrooms outside lesson hours. Also, parents should be informed of the importance of having a computer at home and advised to purchase a personal computer for their children. It is important to ensure that all students have the opportunity and are stimulated to acquire adequate amount of computer experience.

This study also suggests that the more educated parents are, the more ICT competent students perceive themselves. This may be in association with that less educated parents are less likely to involve in their children's learning (Epstein, 1989, cited in Bogenschneider, 1997, p. 720). Likewise, students who had home assistance related to the ICT course reported higher perceptions for their ICT competencies. These two findings seem to emphasize the importance of parental involvement in students' learning. Parents should be informed of how they can involve in and provide support to their children's learning, and also should be encouraged to take more part in learning activities at home. In this way, parents can help their children develop ICT skills.

One of the aims of this study was to examine the teaching-learning process of the ICT course. According to the results, students think that lesson time which is 40 minutes per week is not enough to make practice of what they have learned. Therefore, policy makers should rethink about adequateness of the lesson time of the course. Students should have a sufficient amount of time for their in-class practices. The results also reveal that during lessons, students generally are shown what they will do. Teachers widely perform the activities themselves first, and then ask students to do the same. There can be various reasons for this finding. For example; teachers may not be aware of the philosophy of constructivism. As it is, they should be informed of the constructivist philosophy with in-service training, and told methods that they can employ in their lessons. On the other hand, because of the crowded classes and limited lesson time, they may see this technique as a good way to teach subjects in much less time. In that case, decrease in class sizes, increasing the lesson time or releasing the intensity of the ICT program should be taken into consideration.

In the present study, students' attitudes towards the ICT course were also investigated. It is encouraging that students were found to have favorable attitudes towards the course. The results suggest that students generally feel confident in the course, they perceive the course to be useful for them, and they like to attend the lessons. As similar to students' perceived ICT competencies, students' attitudes were also affected by gender, educational background of parents and availability of home assistance for the course. On the other hand, the analysis on the effect of computer ownership emphasized the importance of having home access to the Internet. Having Internet connection is a significant variable that affects students' course attitudes positively. Although most of students (76.5) had school access to the Internet during the ICT course; the results suggest that schools should also strive to play a more active role in equalizing access to the Internet for students who do not have a home access to the Internet. Parents should be also informed of the advantages of home access to the Internet and advised to provide their children with Internet accessibility at home.

Over the last two decades, Turkey has spent substantial effort and money in acquiring ICT equipment for schools. However, the results showed that educationally the full potential is far from being met. Schools are not able to offer learning environments in which students can fully benefit from the potentials of information technologies. Computer hardware malfunctions and computers with slow processors are two of the main deficiencies of the IT classrooms. Therefore, technical and financial support should be

provided to maintain the IT classrooms to the necessary extent and standards (Özdemir & Kılıç, 2007). In order to sustain quality use and enhance the quality of students' experience with ICT, the initial installation of ICT needs to be followed by continuing maintenance and technical support since school computers are aging (Plante & Beattie, 2004). On the other hand, IT classrooms have too few computers with respect to the number of students. Decreasing class sizes could be a vital step since students generally have to share a computer with their classmates. The provision of the ICT facilities should be such as to allow for a high computer-student interaction ratio. The study also showed that IT classrooms were not found large enough by almost half of students. The IT classrooms at schools were placed in existing older classrooms that were not appropriate to the needs of IT classrooms (Akbaba-Altun, 2006). It may not be possible to redesign existing classrooms in schools but future schools should be designed by taking into consideration the needs of IT classrooms.

Some students stated that the activities provided in the course workbook did not enhance their interest towards the course. Similarly, it was found that the workbook was not used effectively during lessons. Since many students think that the workbook activities not interesting enough, teachers might choose to develop different activities other than employing the ones in the workbook. Therefore, policy makers should reevaluate the activities provided in the workbook and may develop new ones which can attract students' interest.

5.3 Implications for Further Research

This study only describes one moment in time in this rapidly changing field of study. Regarding the speed of the technological developments in the ICT sector and continuous investments to improve ICT facilities at schools, the expiration date of the data may pass by soon. That is why it is recommendable to periodically assess the state of affairs investigated in this study.

Since the researcher aimed to provide a general snapshot of ICT education in primary schools, future studies may focus on the different parts of this study and make in-depth analysis to provide more detailed information. For example, future studies based on qualitative research methods such as direct observations and interviews could light up the hidden depths of the characteristics of the teaching-learning process of the ICT course.

In this study, a self-reported questionnaire was used to determine students' ICT competencies; hence the results are a measure of how students perceived their own skills. Students perceived competencies may not be accurate when compared with actual competencies; they may overestimate their skills. Further studies can make use of different measures in determining ICT competencies. For example computer-based or paper-based performance tests can be employed. On the other hand, students can be provided tasks to be completed within a specified time using related computer applications. The results may indicate different outcomes since students have personally to prove themselves.

As students' attitudes towards the course were investigated, gender differences were only detected at the factor level. The reason may be that gender differences in students' ICT attitudes may not reflect their course attitudes on account of some factors such as relations with teachers and peers, parental encouragement, learning environment of the course, and the curriculum etc. Further studies can focus on these concerns and their effect on students' ICT course attitudes.

Lastly, since the accessible sample cannot be considered representative of the whole of Turkey, future studies are suggested with more diverse populations.

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APPENDICES

Appendix A

Primary Schools given part in the study

Bekirpasa Vakif Primary School
Fevzi Çakmak Primary School
Ford Otosan Primary School
Ibni Sina Primary School
Ibrahim Süreyya Primary School
Inkılap Primary School
Kılıçarslan Primary School
Mimar Sinan Primary School
Ulugazi Primary School
Yenimahalle Primary School
50. Yıl Primary School

Appendix B

The Study Questionnaire

Sevgili Öğrenci,

Bu çalışmanın amacı, sizlerin Bilişim Teknolojileri dersine yönelik düşünceleriniz hakkında bilgi edinmektir. Elde edilen bilgiler tamamen bilimsel amaçlar için kullanılacak ve kimliğiniz kesinlikle gizli tutulacaktır. Bu nedenle, çalışmanın amacına ulaşabilmesi için **lütfen samimiyetle cevap veriniz** ve **hiçbir ifadeyi cevapsız bırakmayınız.**

Yardımlarınız için teşekkür ederiz.

Yalçın ÇETİNKAYA

Ortadoğu Teknik Üniversitesi
Eğitim Bilimleri Yüksek Lisans Öğrencisi

Okulunuz	
Yaşınız	

Cinsiyetiniz □ Erkek □ Kız

Annenizin en son bitirdiği okul:

□ Okuryazar değil
□ Okuryazar ama bir okulu bitirmedi
□ İlkokul mezunu (5 yıllık)
□ Ortaokul mezunu
□ Lise mezunu
□ Üniversite mezunu
□ Üniversite üstü (Yüksek lisans veya doktora)

Babanızın en son bitirdiği okul:

□ Okuryazar değil
□ Okuryazar ama bir okulu bitirmedi
□ İlkokul mezunu (5 yıllık)
□ Ortaokul mezunu
□ Lise mezunu
□ Üniversite mezunu
□ Üniversite üstü (Yüksek lisans veya doktora)

Evinizde bilgisayarınız var mı? □ Var □ Yok

Varsa İnternet'e bağlı mı? □ Bağlı □ Bağlı Değil

Evde size Bilişim Teknolojileri dersi ile ilgili yardımcı olan biri var mı? □ Var □ Yok

Bu bölümde sizlerin Bilgi Teknolojileri dersinde geliştirdiğiniz becerilerinize ilişkin görüşleriniz sorulmaktadır. Lütfen her ifade için, size en uygun seçeneği, **çarpı (X)** koyarak işaretleyiniz.		**Her Zaman Yapabiliyorum**	**Çoğu Zaman Yapabiliyorum**	**Bazen Yapabiliyorum**	**Hiçbir Zaman Yapamıyorum**
1.	Klavye üzerindeki tuşların görevlerini biliyor ve amacına uygun olarak kullanabiliyorum.				
2.	Bilgisayarda çalışırken meydana gelen donanım (klavye, monitör, fare, yazıcı vb.) ile ilgili oluşan problemleri çözebiliyorum.				
3.	Bilgisayarda çalışırken meydana gelen yazılım (kullandığınız programlar, Windows XP vb.) ile ilgili oluşan problemleri çözebiliyorum.				
4.	Bilgisayara yardım almadan bir program kurabiliyorum.				
5.	Bilgisayardaki bir programı yardım almadan kaldırabiliyorum.				
6.	E-posta (elektronik posta) gönderebiliyor ve bana gönderilen e-postayı açabiliyorum.				
7.	İnternette araştırma yaparak istediğim bilgilere ulaşabiliyorum.				
8.	İnternette bulduğum bilgilerin doğru, uygun ve eksiksiz olup olmadığını araştırarak belirleyebiliyorum.				
9.	İstenilen içerikte ve biçimde basit bir web sayfası tasarlayabiliyorum.				
10.	Bir programlama dilinde (Visual Basic, Pascal, C vb.) değişkenlerin ne anlama geldiğini biliyorum.				
11.	Bir programlama dilinde basit bir program (örneğin iki sayının toplamını bulma) yazabiliyorum.				
12.	Hazırladığım bir dosyayı istenilen şekilde yazıcıdan çıkartabiliyorum.				
13.	Teknoloji araçlarını (dijital kameralar, tarayıcı, web araçları vb.) ihtiyaç duyduğumda kullanabiliyorum.				
14.	HTML etiketlerini web sayfası tasarlamak amacıyla kullanabiliyorum.				
15.	Bilişim Teknolojileri'ni (bilgisayar, İnternet, programlar vb.) kullanırken uymam gereken etik kurallarını biliyorum.				
16.	Bilgisayarı kullanırken almam gereken güvenlik önlemlerini biliyorum.				
17.	CD, disket ve flash bellek gibi kayıt birimlerine dosya kaydedebilir ve bu birimlerdeki kayıtlı dosyaları bilgisayara aktarabilirim.				

Aşağıdaki programları kullanma konusunda kendinizi ne kadar yeterli gördüğünüzü, size en uygun seçeneğe **çarpı (X)** koyarak belirtiniz.		**Çok Yeterliyim**	**Yeterliyim**	**Biraz Yeterliyim**	**Yetersizim**	**Çok Yetersizim**
1.	Microsoft Word (Kelime İşlemci Programı)					
2.	Microsoft PowerPoint (Sunu Hazırlama Programı)					
3.	Microsoft Excel (Elektronik Çizelge Programı)					
4.	Microsoft Access (Veritabanı Hazırlama Programı)					
5.	Windows XP					

Bu bölümde, Bilişim Teknolojileri dersinin işlenişi hakkında ifadeler verilmiştir. Her ifade için, inandığınız ya da düşündüğünüz en uygun seçeneği, **çarpı (X)** koyarak işaretleyiniz.		**Her Zaman**	**Çoğu Zaman**	**Bazen**	**Hiçbir Zaman**
1.	Derste, gerçek hayatta uygulayabileceğimiz örnekler sunuluyor.				
2.	Derste grup çalışması yapıyoruz.				
3.	Ders kitabını etkin bir şekilde kullanıyoruz.				
4.	Öğretmenimiz yapacaklarımızı önce kendisi yaparak bize gösteriyor.				
5.	Öğrendiklerimizi derste uygulayabilmek için yeterince zamana sahibiz.				
6.	Yaptığımız çalışmaları ürün dosyamıza koymak üzere kaydediyoruz.				
7.	Ders esnasında çalışmama engel olacak düzeyde gürültü oluyor.				
8.	Bilgisayarımızda sorun olduğunda öğretmenimiz hemen müdahale ediyor.				
9.	Bilgisayarda yaptığımız çalışmaları/ödevleri öğretmenimiz kontrol ediyor değerlendiriyor.				

Bu kısımda Bilişim Teknolojileri dersi hakkındaki duygu ve düşüncelerinize ilişkin ifadeler verilmektedir. Her ifade için, size en uygun olan seçeneği, **çarpı (X)** koyarak işaretleyiniz.		**Kesinlikle Katılıyorum**	**Katılıyorum**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
1.	Derste öğrendiklerimin günlük hayatımda bana faydalı olacağını düşünüyorum.				
2.	Derste yaptığımız çalışmalarda başarılı olduğumu düşünüyorum.				
3.	Dersi eğlenceli buluyorum.				
4.	Bilişim Teknolojileri dersi, bilgisayara yönelik ilgimi arttırıyor.				
5.	Dersi seviyor ve katılmaktan keyif alıyorum.				
6.	Dersin gelecekte iş bulma olasılığımı arttıracağını düşünüyorum.				
7.	Derste öğrendiklerim, diğer dersler için hazırladığım ödev, proje vb. için fayda sağlamaktadır.				
8.	Derste etkinlikleri yapamamaktan korkuyorum.				
9.	Derste not verilmediği için çalışmasam da olur.				
10.	Derste öğrendiklerimizin ilgi çekici olduğunu düşünüyorum.				

Bu kısımda ise Bilgisayar Laboratuarınızın genel durumu hakkında bir takım ifadeler verilmiştir. Lütfen aşağıdaki her ifade için Evet ya da Hayır seçeneklerinden birini işaretleyiniz.

- Kullandığım bilgisayar sorunsuz çalışmaktadır. □ Evet □ Hayır
- Kullandığım bilgisayarda İnternet bağlantısı vardır. □ Evet □ Hayır
- Kullandığım bilgisayarı tek başıma kullanıyorum. □ Evet □ Hayır
- Kullandığım bilgisayarın işlemci hızı çalışmalarımı yapmak için yeterlidir. □ Evet □ Hayır
- Kullandığım bilgisayarda dersimiz için gerekli olan programlar yüklüdür. □ Evet □ Hayır
- Kullandığım bilgisayarda CD ve disket sürücüleri çalışmaktadır. □ Evet □ Hayır
- Bilgisayar laboratuarımız yeterince büyüktür. □ Evet □ Hayır

Bu kısımda Bilişim Teknolojileri ders kitabınıza ilişkin ifadeler verilmiştir. Her ifade için, size en uygun olan seçeneği **çarpı (X)** koyarak işaretleyiniz.		**Kesinlikle Katılıyorum**	**Katılıyorum**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
1.	Ders kitabının dili açık ve anlaşılırdır.				
2.	Ders kitabında yer alan açıklamalar konuları anlamama yardımcı olmaktadır.				
3.	Ders kitabındaki etkinlikler gerçek hayatta karşılaşabileceğimiz niteliktedir.				
4.	Ders kitabındaki etkinlikler derse olan ilgimi arttırmaktadır.				
5.	Ders kitabındaki etkinlikleri yapmakta zorlanıyorum.				
6.	Ders kitabındaki resimler/grafikler/şekiller işlediğimiz konularla ilişkilidir.				
7.	Ders kitabındaki resimler/grafikler/şekiller konuya olan ilgimi arttırmaktadır.				

Yukarıda belirtilen konular ile ilgili başka belirtmek istedikleriniz varsa yazınız.

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Anket soruları bitmiştir. Zaman ayırdığınız için teşekkür ederim.

Appendix C

Students' ICT competencies by education level of parents

Basic ICT Competencies by education level of mother

Item	Education level of mother	%				Mean	SD
		N	S	U	A		
I1. Identify keys on a keyboard	Not literate	.0	23.1	61.5	15.4	2.92	.62
	Literate but no diploma	.0	29.6	37.1	33.3	3.03	.80
	Elementary school	1.2	18.5	28.7	51.6	3.30	.81
	Middle school	1.4	8.7	29.0	60.9	3.49	.71
	High school	1.9	11.3	22.6	64.2	3.49	.77
	University	.0	15.8	26.3	57.9	3.42	.76
I6. Send/receive e-mail	Not literate	3.8	15.4	61.6	19.2	2.96	.72
	Literate but no diploma	.0	22.2	25.9	51.9	3.29	.82
	Elementary school	12.1	10.5	15.7	61.7	3.27	1.06
	Middle school	2.9	7.2	21.7	68.2	3.55	.75
	High school	.0	3.8	5.7	90.5	3.86	.44
	University	.0	.0	15.8	84.2	3.84	.37
I7. Use the Internet to make search	Not literate	.0	15.4	50.0	34.6	3.19	.69
	Literate but no diploma	.0	7.4	22.2	70.4	3.62	.62
	Elementary school	2.0	8.9	15.3	73.8	3.60	.73
	Middle school	1.4	4.3	26.1	68.2	3.60	.64
	High school	.0	3.8	7.5	88.7	3.84	.45
	University	.0	5.3	10.5	84.2	3.78	.53
I8. Identify the accuracy of information found	Not literate	7.7	30.8	46.2	15.3	2.69	.83
	Literate but no diploma	11.1	11.2	29.6	48.1	3.14	1.02
	Elementary school	5.6	12.9	31.9	49.6	3.25	.88
	Middle school	.0	15.9	33.4	50.7	3.34	.74
	High school	.0	11.3	17.0	71.7	3.60	.68
	University	.0	5.3	42.1	52.6	3.47	.61
I12. Use a printer to take print-out	Not literate	11.5	19.2	46.2	23.1	2.80	.93
	Literate but no diploma	11.1	18.5	18.5	51.9	3.11	1.08
	Elementary school	8.1	10.9	22.1	58.9	3.31	.96
	Middle school	4.3	8.7	18.8	68.2	3.50	.83
	High school	3.8	3.8	13.2	79.2	3.67	.72
	University	.0	10.5	15.8	73.7	3.63	.68
I13.Use technology devices when needed	Not literate	.0	34.6	57.7	7.7	2.73	.60
	Literate but no diploma	7.4	7.4	18.5	66.7	3.44	.93
	Elementary school	8.1	14.1	16.5	61.3	3.31	.99
	Middle school	5.8	8.7	26.1	59.4	3.39	.87
	High school	.0	7.5	17.0	75.5	3.67	.61
	University	.0	10.5	10.6	78.9	3.68	.67
I15. Identify ethical issues related to use of ICT	Not literate	3.8	30.8	34.6	30.8	2.92	.89
	Literate but no diploma	25.9	14.8	11.2	48.1	2.81	1.30
	Elementary school	5.2	18.1	29.5	47.2	3.18	.91
	Middle school	2.9	20.3	21.7	55.1	3.28	.89
	High school	5.7	5.7	13.2	75.4	3.58	.84
	University	10.5	10.5	10.5	68.5	3.36	1.06

Basic ICT Competencies by education level of mother (continued)

Item	Education level of mother	%				Mean	SD
		N	S	U	A		
I16. Identify the safety rules using computers	Not literate	7.7	23.1	19.2	50.0	3.11	1.03
	Literate but no diploma	18.5	11.1	22.2	48.1	3.00	1.17
	Elementary school	4.4	12.1	23.8	59.7	3.38	.86
	Middle school	5.8	8.7	29.0	56.5	3.36	.87
	High school	1.9	7.5	11.3	79.3	3.67	.70
	University	.0	10.5	5.3	84.2	3.73	.65
I17. Save a file to external memories	Not literate	.0	38.5	19.2	42.3	3.03	.91
	Literate but no diploma	14.8	22.2	25.9	37.1	2.85	1.09
	Elementary school	10.9	12.9	14.1	62.1	3.27	1.05
	Middle school	5.8	4.3	23.2	66.7	3.50	.83
	High school	1.9	3.8	17.0	77.3	3.69	.63
	University	.0	10.5	5.3	84.2	3.73	.65

N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Advanced ICT Competencies by education level of mother

Item	Education level of mother	%				Mean	SD
		N	S	U	A		
I2. Solve hardware problems	Not literate	.0	65.4	23.1	11.5	2.46	.70
	Literate but no diploma	.0	55.6	29.6	14.8	2.59	.74
	Elementary school	7.3	29.8	30.6	32.3	2.87	.94
	Middle school	2.9	39.1	20.3	37.7	2.92	.94
	High school	1.9	15.1	32.1	50.9	3.32	.80
	University	.0	15.8	57.9	26.3	3.10	.65
I3. Solve software problems	Not literate	11.5	61.5	19.2	7.8	2.23	.76
	Literate but no diploma	11.1	59.3	14.8	14.8	2.33	.87
	Elementary school	16.9	32.3	27.4	23.4	2.57	1.02
	Middle school	8.7	37.7	31.9	21.7	2.66	.91
	High school	1.9	26.4	34.0	37.7	3.07	.85
	University	.0	36.8	31.6	31.6	2.94	.84
I4. Install a program	Not literate	15.4	34.6	38.5	11.5	2.46	.90
	Literate but no diploma	14.8	51.9	18.5	14.8	2.33	.91
	Elementary school	14.5	27.0	22.2	36.3	2.80	1.08
	Middle school	17.4	24.6	18.8	39.2	2.79	1.14
	High school	5.7	20.8	18.9	54.6	3.22	.97
	University	.0	26.3	36.8	36.9	3.10	.80
I5. Uninstall a program	Not literate	15.4	30.8	38.5	15.3	2.53	.94
	Literate but no diploma	18.5	25.9	37.0	18.6	2.55	1.01
	Elementary school	9.7	16.5	22.2	51.6	3.15	1.02
	Middle school	5.8	21.7	30.5	42.0	3.08	.93
	High school	5.7	15.1	13.2	66.0	3.39	.94
	University	5.3	10.5	21.1	63.1	3.42	.90
I9. Design a website	Not literate	3.8	50.0	30.8	15.4	2.57	.80
	Literate but no diploma	18.5	37.0	18.6	25.9	2.51	1.08
	Elementary school	21.0	35.5	21.7	21.8	2.44	1.05
	Middle school	13.0	34.8	15.9	36.3	2.75	1.09
	High school	15.1	24.5	26.4	34.0	2.79	1.08
	University	10.5	36.8	21.1	31.6	2.73	1.04

Advanced ICT Competencies by education level of mother (continued)

Item	Education level of mother	%				Mean	SD
		N	S	U	A		
I10. Define variables in a programming language	Not literate	19.2	50.0	30.8	.0	2.11	.71
	Literate but no diploma	11.1	51.9	7.4	29.6	2.55	1.05
	Elementary school	6.5	32.3	23.0	38.2	2.93	.98
	Middle school	10.1	30.4	34.8	24.7	2.73	.94
	High school	9.4	28.3	22.6	39.7	2.92	1.03
	University	10.5	52.6	26.3	10.6	2.36	.83
I11. Write a simple program using a programming language	Not literate	19.2	57.7	19.2	3.9	2.07	.74
	Literate but no diploma	29.6	33.3	18.5	18.6	2.25	1.09
	Elementary school	17.7	41.9	18.1	22.3	2.44	1.02
	Middle school	31.9	30.4	23.2	14.5	2.20	1.05
	High school	13.2	39.6	18.9	28.3	2.62	1.04
	University	.0	47.4	36.8	15.8	2.68	.74
I14. Use HTML codes to design a website	Not literate	23.1	50.0	19.2	7.7	2.11	.86
	Literate but no diploma	37.0	29.7	14.8	18.5	2.14	1.13
	Elementary school	25.8	33.5	23.0	17.7	2.32	1.04
	Middle school	24.7	21.7	31.9	21.7	2.50	1.09
	High school	22.6	20.8	22.6	34.0	2.67	1.17
	University	26.3	31.6	10.5	31.6	2.47	1.21

N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Basic ICT Competencies by education level of father

Item	Education level of father	%				Mean	SD
		N	S	U	A		
I1. Identify keys on a keyboard	Literate but no diploma	.0	23.0	38.5	38.5	3.15	.80
	Elementary school	1.2	18.2	37.0	43.6	3.23	.78
	Middle school	.8	22.0	26.0	51.2	3.27	.83
	High school	1.0	11.8	24.8	62.4	3.48	.74
	University	2.5	7.5	27.5	62.5	3.50	.75
I6. Send/receive e-mail	Literate but no diploma	.0	23.0	38.5	38.5	3.15	.80
	Elementary school	13.9	12.1	21.3	52.7	3.12	1.09
	Middle school	5.7	8.9	20.4	65.0	3.44	.87
	High school	1.0	7.9	13.9	77.2	3.67	.66
	University	5.0	2.5	10.0	82.5	3.70	.75
I7. Use the Internet to make search	Literate but no diploma	.0	7.7	46.1	46.2	3.38	.65
	Elementary school	.6	7.9	18.8	72.7	3.63	.65
	Middle school	2.4	6.5	25.2	65.9	3.54	.72
	High school	2.0	7.9	9.9	80.2	3.68	.70
	University	.0	10.0	7.5	82.5	3.72	.64
I8. Identify the accuracy of information found	Literate but no diploma	.0	23.1	53.8	23.1	3.00	.70
	Elementary school	5.5	15.2	33.8	45.5	3.19	.88
	Middle school	4.9	13.0	29.3	52.8	3.30	.87
	High school	4.0	14.9	23.7	57.4	3.34	.87
	University	.0	5.0	40.0	55.0	3.50	.59
I12. Use a printer to take print-out	Literate but no diploma	.0	15.4	38.4	46.2	3.30	.75
	Elementary school	10.3	11.5	30.9	47.3	3.15	.99
	Middle school	7.3	8.1	17.9	66.7	3.43	.92
	High school	5.0	11.9	11.8	71.3	3.49	.89
	University	.0	10.0	12.5	77.5	3.67	.65
I13.Use technology devices when needed	Literate but no diploma	.0	7.7	61.5	30.8	3.23	.59
	Elementary school	9.1	18.8	18.8	53.3	3.16	1.03
	Middle school	4.9	12.2	26.0	56.9	3.34	.87
	High school	5.0	8.9	13.8	72.3	3.53	.85
	University	.0	5.0	12.5	82.5	3.77	.53
I15. Identify ethical issues related to use of ICT	Literate but no diploma	7.7	38.5	30.7	23.1	2.69	.94
	Elementary school	7.3	18.8	24.8	49.1	3.15	.97
	Middle school	7.3	18.7	28.5	45.5	3.12	.96
	High school	4.0	13.9	20.7	61.4	3.39	.87
	University	5.0	7.5	20.0	67.5	3.50	.84
I16. Identify the safety rules using computers	Literate but no diploma	15.4	15.4	30.7	38.5	2.92	1.11
	Elementary school	6.1	12.7	24.2	57.0	3.32	.91
	Middle school	7.3	10.6	21.1	61.0	3.35	.94
	High school	2.0	12.9	17.8	67.3	3.50	.79
	University	.0	5.0	22.5	72.5	3.67	.57
I17. Save a file to external memories	Literate but no diploma	.0	23.1	30.7	46.2	3.23	.83
	Elementary school	11.5	17.0	12.7	58.8	3.18	1.09
	Middle school	10.6	11.4	19.5	58.5	3.26	1.03
	High school	3.0	6.9	20.8	69.3	3.56	.75
	University	2.5	7.5	7.5	82.5	3.70	.72

N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Advanced ICT Competencies by education level of father

Item	Education level of father	%				Mean	SD
		N	S	U	A		
I2. Solve hardware problems	Literate but no diploma	.0	84.6	15.4	.0	2.15	.37
	Elementary school	4.2	40.0	28.5	27.3	2.78	.89
	Middle school	8.9	30.9	28.5	31.7	2.82	.98
	High school	3.0	23.8	24.7	48.5	3.18	.90
	University	.0	12.5	57.5	30.0	3.17	.63
I3. Solve software problems	Literate but no diploma	.0	84.6	15.4	.0	2.15	.37
	Elementary school	18.2	40.0	24.2	17.6	2.41	.98
	Middle school	14.6	33.3	27.7	24.4	2.61	1.01
	High school	6.9	28.7	32.7	31.7	2.89	.93
	University	.0	30.0	35.0	35.0	3.05	.81
I4. Install a program	Literate but no diploma	.0	61.5	30.8	7.7	2.46	.66
	Elementary school	15.2	32.1	25.4	27.3	2.64	1.04
	Middle school	16.3	22.7	22.0	39.0	2.83	1.11
	High school	12.9	24.8	16.8	45.5	2.95	1.10
	University	2.5	22.5	25.0	50.0	3.22	.89
I5. Uninstall a program	Literate but no diploma	.0	53.8	30.8	15.4	2.61	.76
	Elementary school	10.9	18.8	22.4	47.9	3.07	1.05
	Middle school	11.4	18.6	28.5	41.5	3.00	1.03
	High school	7.9	15.8	22.8	53.5	3.21	.98
	University	2.5	10.0	20.0	67.5	3.52	.78
I9. Design a website	Literate but no diploma	.0	69.2	30.8	.0	2.30	.48
	Elementary school	17.0	38.2	21.8	23.0	2.50	1.02
	Middle school	23.6	28.4	17.1	30.9	2.55	1.01
	High school	14.9	36.6	19.8	28.7	2.62	1.05
	University	12.5	27.5	37.5	22.5	2.70	.96
I10. Define variables in a programming language	Literate but no diploma	15.4	76.9	7.7	.0	1.92	.49
	Elementary school	8.5	36.3	17.0	38.2	2.84	1.03
	Middle school	7.3	20.3	28.5	43.9	3.08	.96
	High school	10.9	35.6	31.7	21.8	2.64	.94
	University	5.0	55.0	30.0	10.0	2.45	.74
I11. Write a simple program using a programming language	Literate but no diploma	7.7	69.2	23.1	.0	2.15	.55
	Elementary school	20.0	38.8	21.8	19.4	2.40	1.01
	Middle school	31.7	30.9	15.4	22.0	2.27	1.13
	High school	12.9	46.5	17.8	22.8	2.50	.98
	University	.0	52.5	30.0	17.5	2.65	.76
I14. Use HTML codes to design a website	Literate but no diploma	23.1	69.2	7.7	.0	1.84	.55
	Elementary school	27.9	38.2	21.8	12.1	2.18	.97
	Middle school	28.5	20.2	29.3	22.0	2.44	1.12
	High school	17.8	31.7	19.8	30.7	2.63	1.10
	University	30.0	17.5	22.5	30.0	2.52	1.02

N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Appendix D

Students' ICT competencies by computer ownership

Basic ICT Competencies by computer ownership

Item	Computer ownership	%				Mean	SD
		N	S	U	A		
I1. Identify keys on a keyboard	Yes (CI)	1.0	9.5	26.3	63.2	3.51	.70
	Yes (NCI)		10.0	32.9	57.1	3.47	.67
	No	1.8	28.7	33.8	35.7	3.03	.84
I6. Send/receive e-mail	Yes (CI)	3.0	7.0	14.9	75.1	3.62	.74
	Yes (NCI)	11.4	4.3	22.9	61.4	3.34	1.00
	No	11.1	15.2	21.7	52.0	3.14	1.04
I7. Use the Internet to make search	Yes (CI)	.5	4.5	14.9	80.1	3.74	.55
	Yes (NCI)		12.9	22.8	64.3	3.51	.71
	No	2.9	9.4	20.4	67.3	3.52	.78
I8. Identify the accuracy of information found	Yes (CI)	3.5	8.0	32.8	55.7	3.40	.78
	Yes (NCI)	2.9	11.4	40.0	45.7	3.28	.78
	No	5.8	21.6	26.4	46.2	3.12	.94
I12. Use a printer to take print-out	Yes (CI)	2.5	5.5	16.9	75.1	3.64	.69
	Yes (NCI)	5.7	14.3	24.3	55.7	3.30	.92
	No	12.9	15.2	25.7	46.2	3.05	1.06
I13.Use technology devices when needed	Yes (CI)	2.5	5.0	20.9	71.6	3.61	.69
	Yes (NCI)	7.1	15.7	15.7	61.5	3.31	.98
	No	9.4	21.6	21.6	47.4	3.07	1.03
I15. Identify ethical issues related to use of ICT	Yes (CI)	1.0	11.9	24.9	62.2	3.48	.74
	Yes (NCI)	4.3	18.6	27.1	50.0	3.22	.90
	No	13.5	22.8	23.4	40.3	2.90	1.08
I16. Identify the safety rules using computers	Yes (CI)	1.0	6.5	20.4	72.1	3.63	.64
	Yes (NCI)	1.4	10.0	27.1	61.5	3.48	.73
	No	11.7	18.1	21.6	48.6	3.07	1.06
I17. Save a file to external memories	Yes (CI)	3.5	8.0	16.9	71.6	3.56	.78
	Yes (NCI)	1.4	4.3	10.0	84.3	3.77	.59
	No	16.4	21.1	18.7	43.8	2.90	1.14

CI= Connected to the Internet, NCI= Not connected to the Internet
N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Advanced ICT competencies by computer ownership

Item	Computer ownership	%				Mean	SD
		N	S	U	A		
I2. Solve hardware problems	Yes (1)	2.5	22.4	34.3	40.8	3.13	.84
	Yes (2)	4.3	32.9	22.8	40.0	2.98	.95
	No	7.6	44.4	27.5	20.5	2.60	.89
I3. Solve software problems	Yes (1)	10.9	27.4	34.3	27.4	2.78	.97
	Yes (2)	4.3	44.3	30.0	21.4	2.68	.86
	No	17.5	42.7	19.3	20.5	2.42	1.00
I4. Install a program	Yes (1)	10.4	18.9	22.4	48.3	3.08	1.04
	Yes (2)	8.6	22.9	37.1	31.4	2.91	.94
	No	18.7	40.3	17.0	24.0	2.46	1.05
I5. Uninstall a program	Yes (1)	3.5	12.9	20.9	62.7	3.42	.84
	Yes (2)	5.7	8.6	31.4	54.3	3.34	.86
	No	17.5	28.7	25.1	28.7	2.64	1.07
I9. Design a website	Yes (1)	15.9	29.2	24.9	29.9	2.68	1.06
	Yes (2)	12.9	42.9	17.1	27.1	2.58	1.02
	No	21.1	38.5	19.9	20.5	2.39	1.03
I10. Define variables in a programming language	Yes (1)	6.0	34.8	25.4	33.8	2.87	.95
	Yes (2)	15.7	24.3	21.4	38.6	2.82	1.01
	No	8.8	38.5	24.6	28.1	2.71	.97
I11. Write a simple program using a programming language	Yes (1)	13.9	43.3	21.4	21.4	2.50	.98
	Yes (2)	25.7	32.9	25.7	15.7	2.31	1.02
	No	23.4	40.3	15.8	20.5	2.33	1.05
I14. Use HTML codes to design a website	Yes (1)	15.4	31.8	28.9	23.9	2.61	1.01
	Yes (2)	32.9	30.0	24.2	12.9	2.17	1.03
	No	35.1	29.8	15.8	19.3	2.19	1.01

CI= Connected to the Internet, NCI= Not connected to the Internet
N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Appendix E

Students' ICT competencies by availability of ICT assistance at home

Basic ICT competencies by availability of ICT assistance at home

Item	ICT assistance at home	%				Mean	SD
		N	S	U	A		
I1. Identify keys on a keyboard	Yes	.0	10.7	28.9	60.4	3.49	.68
	No	1.7	20.1	31.1	47.1	3.23	.82
I6. Send/receive e-mail	Yes	4.0	6.0	16.8	73.2	3.59	.77
	No	9.2	11.6	19.8	59.4	3.29	.99
I7. Use the Internet to make search	Yes	1.3	5.4	10.7	82.6	3.74	.61
	No	1.4	8.8	22.2	67.6	3.55	.71
I8. Identify the accuracy of information found	Yes	3.4	12.7	33.6	50.3	3.30	.82
	No	4.8	14.3	30.4	50.5	3.26	.87
I12. Use a printer to take print-out	Yes	4.7	6.0	19.5	69.8	3.54	.80
	No	8.2	13.0	22.5	56.3	3.26	.97
I13.Use technology devices when needed	Yes	3.4	7.3	16.8	72.5	3.58	.77
	No	7.2	16.0	22.2	54.6	3.24	.96
I15. Identify ethical issues related to use of ICT	Yes	3.4	10.0	23.5	63.1	3.46	.80
	No	7.8	20.8	25.3	46.1	3.09	.98
I16. Identify the safety rules using computers	Yes	4.0	8.1	20.1	67.8	3.51	.81
	No	5.8	13.3	22.9	58.0	3.33	.91
I17. Save a file to external memories	Yes	4.7	8.1	14.7	72.5	3.55	.83
	No	9.9	14.7	17.4	58.0	3.23	1.03

N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Advanced ICT competencies

Item	ICT assistance at home	%				Mean	SD
		N	S	U	A		
I2. Solve hardware problems	Yes	2.1	24.8	32.2	40.9	3.12	.85
	No	6.1	36.5	28.7	28.7	2.79	.92
I3. Solve software problems	Yes	2.6	26.2	40.3	30.9	2.99	.82
	No	17.4	41.0	21.5	20.1	2.44	1.00
I4. Install a program	Yes	5.3	20.8	28.9	45.0	3.13	.92
	No	17.4	31.4	19.5	31.7	2.65	1.01
I5. Uninstall a program	Yes	2.0	16.8	22.8	58.4	3.37	.83
	No	13.0	19.1	24.9	43.0	2.97	1.06
I9. Design a website	Yes	9.3	30.9	24.2	35.6	2.85	1.01
	No	21.5	37.2	20.5	20.8	2.40	1.02
I10. Define variables in a programming language	Yes	6.0	33.6	28.2	32.2	2.86	.94
	No	9.9	35.2	22.5	32.4	2.77	1.01
I11. Write a simple program using a programming language	Yes	13.5	40.9	22.1	23.5	2.55	.99
	No	22.5	40.3	18.8	18.4	2.33	1.02
I14. Use HTML codes to design a website	Yes	15.5	24.8	27.5	32.2	2.76	1.06
	No	31.1	33.8	20.8	14.3	2.18	1.03

N= Never Competent, S=Sometimes Competent, U= Usually Competent, A= Always Competent

Appendix F

Students' attitudes towards the ICT course by gender

Item	Gender	%				Mean	SD
		SDA	D	A	SA		
Item 1	Female	1.4	3.2	31.2	64.2	3.58	.62
	Male	2.2	6.3	33.9	57.6	3.46	.71
Item 2	Female	2.3	5.5	51.8	40.4	3.30	.67
	Male	4.0	6.7	49.1	40.2	3.25	.75
Item 3	Female	2.4	12.8	33.9	50.9	3.33	.78
	Male	4.0	14.7	34.4	46.9	3.24	.84
Item 4	Female	2.7	10.6	36.7	50.0	3.33	.77
	Male	5.4	15.6	29.9	49.1	3.22	.90
Item 5	Female	1.8	13.3	34.9	50.0	3.33	.77
	Male	4.9	15.6	30.4	49.1	3.23	.88
Item 6	Female	1.4	6.0	35.3	57.3	3.48	.67
	Male	2.7	17.4	30.8	49.1	3.26	.84
Item 7	Female	2.3	6.4	25.7	65.6	3.54	.71
	Male	3.6	14.3	33.0	49.1	3.27	.83
Item 8	Female	31.3	44.0	19.7	5.0	1.98	.84
	Male	44.7	31.7	20.5	3.1	1.82	.86
Item 9	Female	36.7	34.9	15.6	12.8	2.04	1.01
	Male	28.1	29.9	17.4	24.6	2.38	1.13
Item 10	Female	2.8	12.8	35.8	48.6	3.30	.79
	Male	3.6	14.7	36.2	45.5	3.23	.83

SDA= Strongly disagree, D= Disagree, A= Agree, SA= Strongly agree

Appendix G

Students' attitudes towards the ICT course by education level of parents

Students' attitudes towards the ICT course by mother education level

Item	Education level of mother	%				Mean	SD
		SDA	D	A	SA		
Item 1	Not literate	3.8	3.8	19.3	73.1	3.61	.75
	Literate but no diploma	.0	7.4	37.0	55.6	3.48	.64
	Elementary school	1.6	4.4	32.7	61.3	3.53	.66
	Middle school	.0	5.8	33.3	60.9	3.55	.61
	High school	5.7	5.7	39.5	49.1	3.32	.83
	University	.0	.0	21.1	78.9	3.78	.42
Item 2	Not literate	.0	3.8	34.7	61.5	3.57	.58
	Literate but no diploma	14.8	7.4	55.6	22.2	2.85	.95
	Elementary school	2.8	6.9	54.4	35.9	3.23	.70
	Middle school	1.4	8.7	52.2	37.7	3.26	.68
	High school	3.8	1.9	43.4	50.9	3.41	.72
	University	.0	.0	26.3	73.7	3.73	.45
Item 3	Not literate	.0	3.8	38.5	57.7	3.53	.58
	Literate but no diploma	11.2	14.8	44.4	29.6	2.92	.96
	Elementary school	3.2	10.1	36.3	50.4	3.33	.79
	Middle school	1.4	24.6	33.4	40.6	3.13	.84
	High school	3.8	20.8	20.8	54.6	3.26	.92
	University	.0	15.8	26.3	57.9	3.42	.77
Item 4	Not literate	.0	11.5	30.8	57.7	3.46	.71
	Literate but no diploma	11.1	18.5	37.0	33.4	2.92	1,00
	Elementary school	2.8	14.9	35.5	46.8	3.26	.81
	Middle school	4.3	5.8	31.9	58.0	3.43	.79
	High school	7.5	13.2	30.2	49.1	3.20	.95
	University	5.3	10.5	15.8	68.4	3.47	.90
Item 5	Not literate	3.8	15.4	26.9	53.9	3.30	.88
	Literate but no diploma	.0	3.7	55.6	40.7	3.37	.56
	Elementary school	3.6	12.1	31.9	52.4	3.33	.83
	Middle school	2.9	20.3	31.9	44.9	3.18	.86
	High school	3.8	22.6	30.2	43.4	3.13	.90
	University	5.3	15.8	26.3	52.6	3.26	.93
Item 6	Not literate	.0	19.2	7.7	73.1	3.53	.81
	Literate but no diploma	.0	22.2	37.0	40.8	3.18	.79
	Elementary school	2.0	11.7	30.2	56.1	3.40	.77
	Middle school	2.9	7.2	43.5	46.4	3.33	.74
	High school	3.8	13.2	34.0	49.0	3.28	.84
	University	.0	.0	57.9	42.1	3.42	.51

Students' attitudes towards the ICT course by mother education level (continued)

Item	Education level of mother	%				Mean	SD
		SDA	D	A	SA		
Item 7	Not literate	3.8	7.7	34.6	53.9	3.38	.80
	Literate but no diploma	3.7	11.1	29.6	55.6	3.37	.84
	Elementary school	2.4	11.7	29.9	56.0	3.39	.79
	Middle school	2.9	8.7	33.3	55.1	3.40	.77
	High school	3.8	11.3	17.0	67.9	3.49	.85
	University	5.3	.0	36.8	57.9	3.47	.77
Item 8	Not literate	50.0	30.8	11.5	7.7	1.76	.95
	Literate but no diploma	29.6	37.0	29.7	3.7	2.07	.87
	Elementary school	34.7	35.9	25.0	4.4	1.99	.88
	Middle school	44.9	37.7	15.9	1.5	1.73	.78
	High school	41.5	45.3	7.5	5.7	1.77	.82
	University	42.1	52.6	5.3	.0	1.63	.60
Item 9	Not literate	26.9	34.6	15.4	23.1	2.34	1,13
	Literate but no diploma	22.2	25.9	29.6	22.3	2.51	1,09
	Elementary school	33.1	31.9	15.3	19.7	2.21	1,11
	Middle school	36.2	31.9	17.4	14.5	2.10	1,06
	High school	35.8	32.1	15.1	17.0	2.13	1,09
	University	21.1	47.3	15.8	15.8	2.26	.99
Item 10	Not literate	.0	15.4	30.8	53.8	3.38	.75
	Literate but no diploma	11.1	14.8	22.2	51.9	3.14	1,06
	Elementary school	2.8	13.7	31.5	52.0	3.32	.82
	Middle school	2.9	5.8	53.6	37.7	3.26	.70
	High school	3.8	20.8	39.6	35.8	3.07	.85
	University	.0	21.1	47.3	31.6	3.10	.74

SDA= Strongly disagree, D= Disagree, A= Agree, SA= Strongly agree

Students' attitudes towards the ICT course by father education level

Item	Education level of father	%				Mean	SD
		SDA	D	A	SA		
Item 1	Literate but no diploma	.0	7.7	38.5	53.8	3.46	.66
	Elementary school	2.4	5.5	30.3	61.8	3.52	.71
	Middle school	.8	4.1	32.5	62.6	3.57	.62
	High school	3.0	5.9	36.6	54.5	3.43	.74
	University	.0	.0	30.0	70.0	3.70	.46
Item 2	Literate but no diploma	.0	7.7	69.2	23.1	3.15	.55
	Elementary school	4.2	6.7	54.6	34.5	3.19	.74
	Middle school	3.3	7.3	48.7	40.7	3.27	.74
	High school	3.0	5.9	46.5	44.6	3.33	.72
	University	.0	.0	42.5	57.5	3.58	.50
Item 3	Literate but no diploma	.0	7.7	38.5	53.8	3.46	.66
	Elementary school	4.2	8.5	34.6	52.7	3.36	.81
	Middle school	4.1	16.3	34.1	45.5	3.21	.86
	High school	2.0	15.8	35.7	46.5	3.27	.80
	University	.0	25.0	27.5	47.5	3.23	.83
Item 4	Literate but no diploma	.0	30.8	23.0	46.2	3.15	.90
	Elementary school	3.6	11.5	40.7	44.2	3.25	.80
	Middle school	4.9	12.2	27.6	55.3	3.33	.87
	High school	4.0	14.9	33.6	47.5	3.25	.85
	University	5.0	12.5	22.5	60.0	3.38	.90
Item 5	Literate but no diploma	.0	15.4	23.1	61.5	3.46	.78
	Elementary school	4.3	10.9	30.9	53.9	3.35	.84
	Middle school	1.6	17.9	31.7	48.8	3.28	.81
	High school	4.0	14.8	38.6	42.6	3.20	.84
	University	5.0	17.5	30.0	47.5	3.20	.91
Item 6	Literate but no diploma	.0	15.4	15.4	69.2	3.54	.78
	Elementary school	1.2	11.5	31.5	55.8	3.42	.74
	Middle school	3.3	10.5	35.0	51.2	3.34	.80
	High school	3.0	15.8	30.7	50.5	3.29	.84
	University	.0	5.0	45.0	50.0	3.45	.60
Item 7	Literate but no diploma	7.7	15.4	23.1	53.8	3.23	1.01
	Elementary school	3.0	8.5	30.9	57.6	3.43	.77
	Middle school	3.3	16.2	25.2	55.3	3.33	.86
	High school	2.0	9.9	32.7	55.4	3.42	.75
	University	2.5	.0	30.0	67.5	3.63	.63

Students' attitudes towards the ICT course by father education level (continued)

Item	Education level of father	%				Mean	SD
		SDA	D	A	SA		
Item 8	Literate but no diploma	30.8	53.8	7.7	7.7	1.92	.86
	Elementary school	33.3	38.2	21.2	7.3	2.02	.92
	Middle school	43.9	35.0	19.5	1.6	1.79	.81
	High school	38.6	36.6	22.8	2.0	1.88	.83
	University	40.0	42.5	15.0	2.5	1.80	.79
Item 9	Literate but no diploma	30.8	38.4	7.7	23.1	2.23	1.17
	Elementary school	35.2	27.2	17.6	20.0	2.22	1.13
	Middle school	33.3	29.3	17.9	19.5	2.24	1.12
	High school	31.7	38.6	15.8	13.9	2.12	1.01
	University	20.0	45.0	12.5	22.5	2.38	1.05
Item 10	Literate but no diploma	.0	23.1	23.1	53.8	3.31	.85
	Elementary school	5.5	15.7	26.7	52.1	3.25	.91
	Middle school	1.6	8.9	39.1	50.4	3.38	.71
	High school	3.0	12.9	44.5	39.6	3.21	.77
	University	.0	20.0	47.5	32.5	3.13	.72

SDA= Strongly disagree, D= Disagree, A= Agree, SA= Strongly agree

Appendix H

Students' attitudes towards the ICT course by computer ownership

Item	Computer ownership	%				Mean	SD
		SDA	D	A	SA		
Item 1	Yes (1)	1.0	4.5	27.4	67.1	3.61	.62
	Yes (2)	1.4	1.4	38.6	58.6	3.54	.61
	No	2.9	6.4	36.3	54.4	3.42	.74
Item 2	Yes (1)	1.0	3.5	46.8	48.7	3.43	.61
	Yes (2)	1.4	4.3	55.7	38.6	3.31	.63
	No	6.4	9.9	52.6	31.1	3.08	.81
Item 3	Yes (1)	2.0	10.0	33.8	54.2	3.40	.75
	Yes (2)	2.9	17.1	34.3	45.7	3.23	.84
	No	4.7	17.0	34.5	43.8	3.18	.88
Item 4	Yes (1)	4.0	10.0	23.4	62.6	3.45	.83
	Yes (2)	2.9	14.2	48.6	34.3	3.14	.77
	No	4.6	16.4	38.6	40.4	3.15	.86
Item 5	Yes (1)	2.5	10.0	30.8	56.7	3.42	.77
	Yes (2)	1.4	17.1	38.6	42.9	3.23	.78
	No	5.3	18.7	32.2	43.8	3.15	.91
Item 6	Yes (1)	2.0	3.5	35.8	58.7	3.51	.66
	Yes (2)	.0	12.9	30.0	57.1	3.44	.71
	No	2.9	21.1	31.0	45.0	3.18	.87
Item 7	Yes (1)	3.0	6.0	29.4	61.6	3.50	.74
	Yes (2)	.0	11.4	37.2	51.4	3.40	.69
	No	4.1	15.2	26.3	54.4	3.31	.88
Item 8	Yes (1)	44.3	32.3	17.9	5.5	1.85	.91
	Yes (2)	37.1	34.3	27.2	1.4	1.93	.84
	No	31.0	45.6	19.9	3.5	1.96	.81
Item 9	Yes (1)	36.8	29.4	15.4	18.4	2.15	1.11
	Yes (2)	27.1	27.1	20.0	25.8	2.44	1.15
	No	29.2	38.0	16.4	16.4	2.20	1.04
Item 10	Yes (1)	2.5	10.9	39.8	46.8	3.31	.76
	Yes (2)	1.4	11.4	38.6	48.6	3.34	.74
	No	4.7	18.1	30.4	46.8	3.19	.90

1= Connected to the Internet, 2= Not connected to the Internet
SDA= Strongly disagree, D= Disagree, A= Agree, SA= Strongly agree

Appendix I

Students' attitudes towards the ICT course by availability of ICT assistance at home

Item	ICT assistance at home	%				Mean	SD
		SDA	D	A	SA		
Item 1	Yes	.7	6.0	27.5	65.8	3.58	.64
	No	2.4	4.1	35.1	58.4	3.49	.69
Item 2	Yes	1.3	5.4	43.0	50.3	3.42	.66
	No	4.1	6.5	54.2	35.2	3.20	.73
Item 3	Yes	.7	14.1	30.2	55.0	3.40	.75
	No	4.4	13.7	36.2	45.7	3.23	.85
Item 4	Yes	2.0	6.7	31.6	59.7	3.49	.71
	No	5.1	16.4	34.1	44.4	3.18	.89
Item 5	Yes	2.7	9.4	33.5	54.4	3.40	.77
	No	3.8	17.1	32.0	47.1	3.23	.86
Item 6	Yes	2.7	6.0	32.9	58.4	3.47	.73
	No	1.7	14.7	33.1	50.5	3.32	.79
Item 7	Yes	2.7	4.0	24.2	69.1	3.60	.70
	No	3.1	13.7	32.0	51.2	3.31	.82
Item 8	Yes	40.9	38.9	16.8	3.4	1.83	.83
	No	36.5	37.2	21.9	4.4	1.94	.87
Item 9	Yes	36.9	27.5	15.5	20.1	2.19	1,14
	No	30.0	34.8	17.1	18.1	2.23	1,07
Item 10	Yes	2.7	12.1	36.2	49.0	3.32	.79
	No	3.4	14.7	35.8	46.1	3.25	.83

SDA= Strongly disagree, D= Disagree, A= Agree, SA= Strongly agree