

outline of the logical steps required to obtain a solution. In many cases the logical steps are conveniently expressed as mathematics. Fourth, you must determine a solution by actually executing the logical step outlined in your plan. Finally, you must evaluate how well the solution resolves the original problem.

Each profession has its own specialized knowledge and patterns of thought. The knowledge and thought process that you use in each of the steps will depend on the discipline in which you operate. Taking into account the specific nature of physics, we choose to label and interpret the five steps of the general problem solving strategy as follows:

1. Focus on Problem: In this step you develop a qualitative description of the problem. First visualize the events described in the problem using a sketch. Write down a simple statement of what you want to find out. Write down the physics ideas which might be useful in the problem and describe the approach you will use. When you finish this step, you should never have to refer to the problem statement again.

2. Describe the Physics: In this step you use your qualitative understanding of the problem to prepare for a quantitative solution. First simplify the problem situation by describing it with a diagram in terms of simple physical objects and essential physical quantities. Restate what you want to find by naming specific mathematical quantities. Using the physics ideas assembled in step 1, write down equations which specify how these physical quantities are related according to the principles of physics or mathematics. The results of this step contain all of the relevant information so you should not need to refer to step 1 again.

3. Plan the Solution: In this step you translate the physics description into a set of equations which represent the problem mathematically by using the equations assembled in step 2. Each equation should have a specific goal to find a single unknown quantity in the problem. An equation thus used may involve a new unknown quantity which must be determined using another equation. In other words, solving the original problem usually involves creating and solving sub-problems. As you do the mathematical operations to isolate your unknown quantities, you create an outline of how to arrive at a solution. You will find that most of your effort will go into deciding how to construct this logical chain of equation with less effort spent on mathematical operation.

4. Execute the Plan: In this step you actually execute the solution you have planned. Plug in all of the known quantities into the algebraic solution, which is the result of step 3, to determine a numerical value for the desired unknown quantities.

5. Evaluate the Answer: Finally, check your work to see that it is properly stated, not unreasonable, and actually answers the question asked.

At this research, experimental procedures were carried out on the second year upper secondary school students who attended a lower socio-economic status secondary school at fall semester of 2005-2006 academic year in Izmir. In this study, strategy teaching group consisted of 25 and control group contained 21 students. Research data were collected by Physics Achievement Test, The Scale of Problem-Solving Strategies and problem solving sheets. During this study, Cooperative problem-solving strategies were used with the experiment group (the strategy teaching group) and the control group was instructed with traditional teaching methods. In conclusion, the fact that the average of strategy teaching groups' achievement and problem solving is much more higher than control groups' achievement was found.

THE KEYS FOR ICT INTEGRATION IN K-12 EDUCATION: TEACHERS' PERCEPTIONS AND USAGE*

BİLİŞİM TEKNOLOJİLERİNİN İLKÖĞRETİM VE ORTAÖĞRETİM İLE BÜTÜNLEŞTİRİLMESİNDEKİ ANAHTARLAR: ÖĞRETMENLERİN ALGILARI VE KULLANIMLARI

Yüksel GÖKTAŞ**, Zahide YILDIRIM***, Soner YILDIRIM****

ÖZET: Bu çalışmanın amacı, ilköğretim ve ortaöğretim okullarındaki öğretmenlerin Bilişim Teknolojileri'ne (BT) karşı algılarını ve derslerinde BT'yi kullanımlarını ılgılı ve olan durumu ortaya çıkarmaktır. Araştırmacılar veri toplama ve verilerin analizinde nitel ve nicel yaklaşımları birlikte kullanmışlardır. Nitel veriler, 12 bölge, 35 il ve 92 okuldaki 1429 öğretmenle uygun örneklem yöntemi kullanılarak anketler yoluyla toplanmıştır. Nitel veriler ise aynı anketlerdeki açık uçlu sorularla ve 6 öğretmenle yapılan görüşmelerden elde edilmiştir. Bulgular, öğretmenlerin BT'nin ilk ve orta öğretime bütünleştirilmesi konusundaki algılarının olumlu olduğunu göstermektedir. Öğretmenlerin %25'i bilgisayar laboratuvarını kullanmakta ve derslerine BT'yi bütünleştirmektedir. Diğer öğretmenler ise ya BT'yi derslerinde kullanmamakta veya yeterli BT kaynaklarına erişememektedirler.

Anahtar Kelimeler: BT kullanımı, BT'ye karşı ilgi, ilk ve orta öğretim öğretmenleri

ABSTRACT: The purpose of this study is to investigate the current status of K-12 teachers' information and communication technologies (ICT) perceptions and ICT usage in their courses. The researchers used both quantitative and qualitative research approaches within data collection and analysis section. Quantitative data were collected with a questionnaire from 1429 K-12 teachers in 92 K-12 schools at 35 provinces of 12 different regions in Turkey through a representative convenience sampling method. Qualitative data were collected through open-ended items in the questionnaire from the same participants and through interviews with 6 K-12 teachers. The results provided some evidence that there are positive perceptions about the integration of ICT into K-12 schools. The results also showed that at least one-fourth of the K-12 teachers used computer laboratories and integrated ICT into their courses. The remaining teachers either do not integrate ICT into their courses or they lack of sufficient ICT facilities.

Keywords: ICT usage, ICT perceptions, K-12 teachers

1. INTRODUCTION

Since the beginning of this century, education has faced important challenges. For example, there are a large number of people to educate, insufficient economic conditions, and low quality of education. In the information age, how to provide high quality education and training has become a critical question to be answered for all who need education and can benefit from it in the most cost-effective way. Educational systems have attempted to overcome the challenges by developing new approaches. Information and Communication Technologies (ICT) represent a new approach for enhancing the dissemination of information and helping to meet these challenges (Lever-Duffy, McDonald, & Mizell, 2003; USDE, 2000).

A predetermined process has a considerable importance for integration of ICT in classroom, curriculum, school management, library, and any educational settings. Integration of ICT is important to enhance the quality of education and how ICT might enable educators to create alternative pathways. Therefore, educational policymakers have associated reform with the infusion of ICT into schools particularly since the publication of "A Nation at Risk" in 1983. For that reason, billions of dollars have been spent on actualizing this policy by the whole countries in the world (ISTE, 1999; Koc, 2005).

* This article is based on the first author's PhD. dissertation.

** Assist. Prof. Dr., Atatürk University, e-mail: yuksel.goktas@nolmail.com

*** Assoc. Prof. Dr., Middle East Technical University, e-mail: zahidey@metu.edu.tr

**** Assoc. Prof. Dr., Middle East Technical University, e-mail: soner@metu.edu.tr

Recently, the role of ICT in education is shifting dramatically. The traditional role of ICT in schools as a minor curricular subject has been called computer literacy or informatics. On the other hand, it has been used as an instructional aid to help students learn other subjects, such as biology or chemistry (Kozma, 2002). In this context, teachers' shifting role in the 21st century involves an essential mission, which is to be the frontier for applying technological innovations to teaching/learning process. With this aim, teachers should be equipped with the adequate skills and knowledge to perform their profession effectively. Every year, new teachers start their teaching profession, and are required to be furnished with the skills to merge today's ICT into teaching/learning process that will stimulate and maintain students' interest while preparing them for the future. Teachers are expected to integrate a wide variety of ICT into the curriculum effectively, and to be ICT leaders and role models for appropriate use of emerging types of ICT (Heinich, Molenda, Russell, & Smaldino, 2002; Özgeçil, 2002).

In Turkey, implementation schedule for typical ICT projects at primary and secondary education levels started in 1984. In 1992, "a special unit was created within the General Directorate of Computer Education and Services (BİLGEİM) to take responsibility for the Computer Experimental Schools (CES) Project" (Schwartz & Jaramillo, 2004, p.1). The purpose of CES project was to integrate ICT into the teaching/learning processes to enhance education (Schwartz & Jaramillo, 2004). The number of similar projects increased since 1998 in order to provide instructional technology rooms and the Internet access for all basic education schools. One of the objectives of these development projects is to ensure each student and teacher become at least literate in ICT (Göktaş & Yıldırım, 2007; MoNE, 2001). At this point, there have been a variety of action plans for effective ICT integration into K-12 schools, and many factors such as society, policy, school, curricular/course, teachers, and student that affect ICT integration exist in practice. To facilitate these plans, these factors need to be revealed.

Positive perceptions of teachers toward ICT integration into their schools and ICT usage in their classrooms are some of the key factors in the implementation process of new ICT policies (Sugar, 2002). The literature contains various studies about ICT perceptions of K-12 teachers. For example, Çelik and Bındak (2005) conducted a study with 261 primary school teachers in Siirt. According to their findings, the teachers had positive perceptions toward ICT in general. Deniz (2005) also carried out a study with K-12 teachers to determine their perceptions of ICT particularly computers. His sample consisted of 564 primary school teachers from 20 different primary schools in Istanbul. He found out that K-12 teachers had positive perceptions of ICT. Similarly, Erkan (2004) examined the perceptions of 164 pre-school teachers' attitudes toward computers. The findings of her data analysis indicated that the attitudes of most of the preschool teachers towards computers were positive. Another key factor that affect ICT integration is teachers' knowledge about both the basic computer applications and the ways of using these applications for instructional purposes (Göktaş & Yıldırım, 2007). However, Aşkar and Usluel (2002), based on their study, mentioned that rather than using computers for instructional purposes, teachers used computers for administrative tasks.

Even though there have been some works going on related with integration of ICT in Turkey's K-12 school system, the field lacks of extensive research studies to determine the existing situation of K-12 teachers regarding to both ICT perceptions and ICT usage in their courses together. The primary focus in this study is to form a picture about integration of ICT into K-12 schools by presenting current status in terms of their ICT perceptions and ICT usage in their courses. Consequently, the research questions addressed in this study are:

- 1) What are the K-12 teachers' perceptions of ICT integration into their schools?
- 2) What is the current situation of K-12 teachers' ICT usage in regard to
 - 2.1) teachers' computer laboratory usage,
 - 2.2) integration of ICT by the teachers in their courses,
 - 2.3) hardware the teachers use in their courses,

- 2.4) software the teachers use in their courses,
- 2.5) use of the Internet as supportive tool by the teachers in their courses.

2. METHOD

2.1. Design

In order to answer the research questions, a multi method approach was used in the design of this study. The data were collected through questionnaires and interviews from K-12 teachers by using representative convenience and purposeful sampling techniques. The reason for convenience sampling techniques was to increase the credibility of the research. In data collection process, the questionnaires were distributed and collected with the assistance of volunteers, most of whom were ICT experts. It was also intentional that, while filling the questionnaires, they could help participants who need assistance for the terminology used in the questionnaire.

2.2. Participants

According to Ministry of National Education (MoNE) statistics of 2004, there were 558,876 primary and secondary school teachers in Turkey. The teacher population was clustered into twelve statistical regions using Nomenclature of Units for Territorial Statistics (NUTS) level 1 and sample was selected 6% of the teachers from each region to be representative of the population. After that, 92 K-12 schools in 35 provinces were selected through a convenience sampling method. In May 2005, a representative sample of 3,353 teachers was selected from the total population requesting their participation in completing the questionnaire. In June and July 2005, follow-up questionnaires were sent to teachers who did not respond to the first query. Thus, 1,429 questionnaires were returned, yielding a 43 percent return rate (see Figure 1).

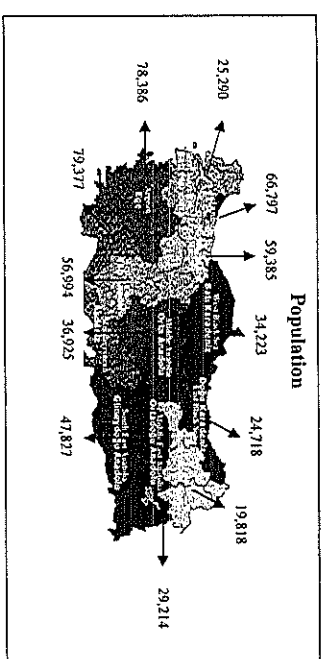


Figure 1: The Number of K-12 Teachers in Terms of NUTS Level 1

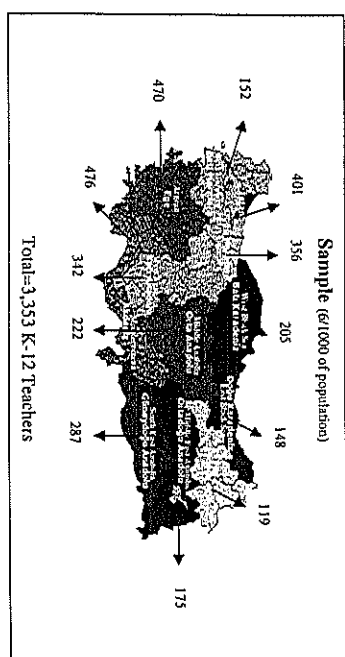


Figure 2: The Number of K-12 Teachers (Sample) in Terms of NUTS Level I

For the qualitative data collection, the capital city (Ankara) was selected by a convenience sampling method. Then, 6 K-12 teachers were chosen through purposive sampling approach from 4 K-12 schools. The criteria used for selection of the teachers were 1) having at least two years of teaching experience in K-12 schools, 2) having basic knowledge and skills about ICT integration into education, 3) having experience in ICT integration into education, 4) having been taken ICT related courses in their undergraduate education, and 5) having been graduated from a faculty of education.

2.3. Data Collection Instruments

The questionnaire was used to obtain data from the K-12 teachers and consisted of 16 items with 5 multiple choices items, 7 five-point Likert-type items, and 4 open-ended questions. The questionnaire was developed by the researchers based on a review of related literature (MirandaNet, 2000; Orhun, 2000; Queizsch, 1997; SCRTec, 1998) in 2004. After peer review by four graduate students, seven experts examined the questionnaire, and based on their feedback, the instrument was revised. It was then checked by a Turkish language expert for clarity of the language. After the revision, a pilot test was conducted in April 2005 with 121 teachers in three different provinces (Ankara, Konya and Çankırı), and the Cronbach alpha coefficient was calculated as 0.81 denoting a satisfactory reliability. After gathering data from 1,429 K-12 teachers, the Cronbach alpha coefficient was re-calculated as 0.97 indicating a satisfactory reliability.

In this study, semi structured interviews were also used to collect data. For these reasons, an interview guide was developed by the researchers based on issues investigated in this study, a review of related literature, and format used in previous studies by Smith (2002) and Zayim (2004). The interview guide was examined first by three graduate students and then by four experts for the clarity of the questions, and how well they addressed the themes. After experts' reviews, the interview guide was piloted with two K-12 teachers in order to determine if interview procedures were acceptable, and to determine if any additional interview questions were needed in order to answer the research questions. After the pilot sessions, interview guide was modified and a few interview questions were added. Then a Turkish language expert revised the interview guides for language clarification.

2.4. Data Analysis

In this study, the quantitative responses were analyzed through descriptive statistics. The descriptive analysis was used to investigate the current situation of K-12 teachers' ICT usage in their courses. The data were coded and prepared for analysis using the statistical analysis software SPSS 12.0. Frequencies, means, percentages, and standard deviations of questionnaire items were calculated.

The qualitative data gathered through the interviews were transcribed into text first, and then, analyzed through content analysis. The content analysis was used to examine the K-12 teachers' perceptions of ICT integration into their schools. In content analysis, the procedure which involves data reduction, data display, and conclusion drawing / verification phases suggested by Miles and Huberman (1994) were used. The resulting interpretations were discussed by the researchers through the process of reading and re-reading the transcripts.

3. RESULTS

3.1. Perceptions of K-12 Teachers about ICT Integration into K-12 Schools

The purpose of the first research question in this study is to examine K-12 teachers' perceptions of ICT integration into their schools. About ICT integration into K-12 education, the findings from open-ended responses and interviews revealed three main themes which were 1) features of ICT in general, 2) what ICT provides for education in terms of students, teachers, and instruction in class, and 3) limitations of the ICT integration process. In the following section, the findings related with these themes are presented.

The first issue that the teachers put forward was the "general features" of ICT. They stated that ICT provides people with access to a variety of information and communication opportunities. They also remarked that in this Information Age, it was a necessity for people to catch up with developments in ICT in order to become a member of Information Society. Therefore, the young population of the society, especially students, has curiosity to use these technologies in their lives. One participant stated this as:

"... Everywhere we go, we see computers around within every range of everyday life issues. Young people are more enthusiastic since this technology arouses their curiosity very much."

The second issue teachers stressed was that what ICT provides for education in terms of the "benefits for students, teachers, and instruction" in class. For the students' benefits, for the use of ICT in their courses, almost all teachers argued that it provided motivation and concentration for the content of the course, since students are very enthusiastic to use ICT tools. Some participants also stated that using ICT in courses challenges students to do research, which leads them to improve their critical thinking skills. One participant also mentioned that one of the most important advantages was improving students' problem solving and analysis-synthesis skills. In addition to these, almost all participants stated that with the wide range of information access, ICT provides students with the knowledge of how to access necessary information rather than just to gather information. One interviewee also remarked on another concern as individual development by saying the following:

"I believe that students feel themselves as unique individuals of this world when supported by the use of ICT in our courses effectively. The reason is, they get rid of rote memorizing, and express their own ideas. And this enhances to develop their critical thinking skills, which is, I believe, the core of individual development."

For teachers' benefits, for the use of ICT in their courses, the common theme was expressed as the motivation of teachers to use ICT in their courses. Almost all teachers mentioned that it provides permanent learning and rapid information gathering, which supports them with practical solutions in effective and efficient courses. They also believed that with appropriate in-service and preservice training, teachers could be more comfortable in integrating ICT in their courses. They stated that ICT integration provides them with updated information and a variety of sources.

Another benefit of integrating ICT in education is stated as the total benefits regarding instruction. The teachers believed that the integration of ICT in education enhances knowledge permanence, learning effectiveness and efficiency, and increases learning quality in the courses. The reason for this was stated as supporting audio-visual features together and incorporating multiple senses into learning. One participant expressed this in her open-ended responses as:

"... In our era, music is even visualized. Visual applications in education increase the quality of education for sure. Learning by hearing is not the same thing with learning by seeing. Nobody knows how "Mount Kaf" [imaginary and mythical expression which is used for impossible objectives to reach in Turkish literature] was formed. Why? Because, she has not seen at all. But, everyone knows "Mount Everest". Why? Because she has seen it in TV. Just an example, ICT provides contributions to education since it incorporates visualization that is concretization, not due to its electrical working feature."

The last issue that the teachers mentioned about the integration of ICT in education was its "imitations". They stated that current curriculum was too loaded for them to be involved in such an integration process. One participant stated that he believed this process could be more successful for informal education than formal education in the future. Another participant stated that the role of ICT was important in support services, but its role was overemphasized for in-class activities.

A Turkish language teacher noted that the major limitation of ICT integration was in the lack of appropriate transfer of terminology into Turkish. He also argued that machines should be "in" education, but not be the whole education itself. He was resistant to use ICT that would hinder socialization, but rather cause individualization. Another participant also remarked that it was important to use ICT effectively and efficiently, otherwise it can keep students away from socialization.

One other argument was about the integration process. One participant argued that instead of short-term solutions, long-term plans should be undertaken. Another teacher stated that since he believed our society to have low-level reading abilities, information retrieved from the Internet is not being read. Therefore, he argued that research in verbal subjects (i.e., literature, history) should be directed to printed materials.

3.2. ICT Usage in the Courses by K-12 Teachers

The purpose of the second research question in this study is to investigate situation of K-12 teachers' ICT usage in regard to computer laboratory usage, ICT integration in their courses, hardware and software that the K-12 teachers use in their courses, and use of the Internet as a supportive tool in their courses. The data were collected with multiple choice items and five-point scales.

Use of Computer Laboratories: The results related to computer laboratory usage of the teachers are presented in Table 1. The findings of the study indicated that more than 1/3 of the teachers (35%) do not use the computer laboratories at all. While 1/4 of the teachers (25%) use the laboratories, almost 1/5 of the teachers (19%) use the laboratories rarely. The results also showed that 16 percent of the teachers stated that their computer laboratories were insufficient or their schools did not have any computer laboratory.

Table 1: K-12 Teachers' Computer Laboratory Usage

Computer Laboratory Usage	N	%
None	490	35
Use	361	25
Rarely use	267	19
The schools do not have any/sufficient computer laboratories	233	16
No Response	78	5
TOTAL	1429	100

Integration of ICT into Courses: The teachers were asked if they were integrating ICT into their courses. As it is presented in Table 2, 37.5% of the teachers did not integrate ICT in their courses. While 1/4 of the teachers (25%) indicated they were integrating ICT in their courses, 1/3 of the teachers (34%) were partially integrating ICT in their courses. 4% (N=51) did not respond to this question.

Table 2: K-12 Teachers' ICT Integration in their Courses

ICT Integration into Courses	N	%
No	536	37.5
Partially	482	34.0
Yes	360	25.0
No Response	51	3.5
TOTAL	1429	100

Hardware and Software Used: The teachers who were using ICT in their courses ranked the frequency (5 indicating "All the time", 4 indicating "Often", 3 indicating "Rarely", 2 indicating "Never", and 1 indicating "don't know what it is") of their hardware and software usage in their courses. As it is shown in Table 3, the most frequently used hardware by the teachers in their courses is computer (M=3.69), and then printer (M=3.53). The least frequently used hardware by the teachers in their course is camera (M=2.50).

Table 3: Hardware Used by K-12 Teachers in their Courses

Hardware	M	SD
Computer	3.69	0.96
Printer	3.53	0.97
Television	3.15	0.95
LCD Projector	3.10	0.97
OHP	3.09	0.94
Scanner	2.93	0.97
Video	2.90	0.91
IC Recorder	2.81	1.03
Camera	2.50	0.82

The results, related with the teachers' use of software in their courses, are presented in Table 4. The teachers use "word processing" software (M=3.57) at the highest level, "Internet" (M=3.31) for the information search at the second level, and then "receiving/sending e-mail" (M=3.21) at the third level. Results indicate that the use of "LMS" (M=1.97) by the teachers in their courses is listed as the least used application.

Table 4: Software Used by K-12 Teachers in their Courses

Software	M	SD
Word Processor (e.g., Word)	3.57	1.09
Web Browser (e.g., Internet Explorer)	3.31	1.17
Receiving/sending e-mail	3.23	1.22
Spreadsheet (e.g., Excel)	3.20	1.07
Operating System (e.g., Windows)	2.93	1.28
Presentation Program (e.g., PowerPoint)	2.88	1.02
Game	2.51	0.91
Image Editing (e.g., Photoshop)	2.47	0.95
Chat	2.39	0.90
Database (e.g., MS Access)	2.36	0.88

Web Programming (e.g., HTML)	2.27	0.93
Reference Program (e.g., Dictionary)	2.27	0.91
Forum	2.26	0.87
Animation Program (e.g., Flash)	2.25	0.85
Web Page Development (e.g., FrontPage)	2.22	0.83
Simulation	2.18	0.83
Programming Language (e.g., Visual Basic)	2.16	0.90
Desktop Publishing (e.g., Corel Draw)	2.12	0.75
Video Conference Programs	2.08	0.73
Tutorials	2.06	0.74
Authoring Language (e.g., Authorware)	1.99	0.69
Learning Management System (e.g., Web CT)	1.97	0.67
Overall mean	2.72	

Internet Usage: As it is presented in Table 5, one-fourth of the teachers (25%) stated that they use the Internet as a supportive tool in their courses, and one-third of the teachers (34%) mentioned that they use the Internet partially in their courses. However 37.5% of the teachers do not use the Internet at all.

Table 5: K-12 Teachers Use of the Internet as a Supportive Tool in their Courses

Internet Usage	N	%
None	548	37.5
Partial use	428	34.0
Use	317	25.0
No Response	136	3.5
TOTAL	1429	100

The teachers who were using the Internet in their courses as a support tool were asked questionnaire items about how they were using the Internet by selecting more than one item. As indicated in Table 6, 676 teachers mentioned they use web pages to prepare their lectures, 514 teachers use search engines to prepare their courses. The least used tools by the teachers are forum (65 teachers) and chat (51 teachers).

Table 6: K-12 Teachers' Internet Tools Usage as a Supportive Tool in their Courses

Tools	Use		Not Use	
	f	%	f	%
Web pages for lecture preparation	676	47.3	753	52.7
Search engines	514	36.0	915	64.0
Web page for supporting lessons	323	22.6	1106	77.4
E-mail	259	18.1	1170	81.9
Forum	65	4.5	1364	95.5
Chat	51	3.6	1378	96.4

4. CONCLUSIONS AND DISCUSSION

The findings provided some evidence that there are positive perceptions about the integration of ICT into K-12 schools. According to Sugar (2002), positive perceptions of teachers toward ICT integration into the classroom is the most important motivation. By changing teachers' perceptions toward the use of ICT in schools, they could potentially remove several barriers to effective ICT

integration. From the findings of this study it might be implied that K-12 teachers believed ICT integration would provide a lot of advantages and disadvantages to K-12 schools. These can be categorized under three major themes as: 1) features of ICT in general, 2) what ICT provides for education in terms of students and teachers 3) limitations of the ICT integration process. The initial results are corroborated by Çelik and Bındak (2005), Deniz (2005), Erkan (2004), and Williams, Wilson, Richardson, Tuson, and Coles (1998). They stated summarily that K-12 teachers have positive perceptions about ICT integration into K-12 schools.

The first issue the participants put forward was the features of ICT in general. K-12 teachers believed that ICT can provide people with access to a variety of ICT opportunities. They also remarked that it was a necessity for people to catch up with developments in ICT in order to become an information society.

The second issue the participants mentioned was about the advantages of ICT for students and teachers. The most important advantage of K-12 teachers pointed out was about helping students for individual development and to be digital citizens. They believed ICT can improve students' critical thinking skills, problem solving skills, and analysis-synthesis skills. They supported the idea that ICT helps students be active learners in a student-centered learning environment. K-12 teachers believed ICT can help teachers in this process by enhancing teaching skills. They also believed that ICT can help teachers be highly motivated in their courses parallel to their students' increased motivation. Since incorporating different learning materials into a classroom environment is a difficult process for teachers, ICT can enable them to reach more concrete learning materials.

The last issue the participants revealed was about the limitations of the ICT integration process. K-12 teachers also have some negative perceptions. The main reasons for negative perceptions were that ICT 1) keeps students away from socialization, and 2) transfers a lot of foreign terminology into Turkish Language.

The findings of the study for K-12 teachers are inline with the discussions made by Roblyer and Edwards (2000), Kraut, Patterson, Lundmark, Kiesler, Mukhopadhyay and Scherlis (1998), Nite and Ebring (2000). The authors stated respectively that computers, especially with the Internet, has led to decreased levels of socialization, increased levels of depression, and increased levels of isolation. They considered ICT harmful to the development of relationships and social skills of children. On the other hand, this study indicated contradictory results with the studies of Wellman, Quan-Haase, Witte, and Hampton (2001) and LaRose, Eastin, and Gregg (2001). The authors found dramatically different results such that computers, especially with the Internet, led to decreased levels of depression and isolation. It can be concluded that ICT might have different effects on different users in different context. Therefore, in the integration process of ICT, related stakeholders (e.g., parents, K-12 teachers, prospective teachers, and students) should be aware of those different effects, and the methods of effective ICT integration should be considered in accordance with the instructional context.

The results for the second research question show that at least one-fourth of the K-12 teachers use computer laboratories and integrate ICT into their courses. The remaining teachers either do not integrate ICT into their courses or they lack of sufficient ICT facilities or knowledge. While some of the literature (Schiller, 2003; Scottish Executive, 2002; SERTEC, 1998; SERTEC, 1999; USDE, 2000) indicates the usage of computer and computer related hardware, word processing, Web browsing, and communication software by the majority of teachers, some other (Williams et al., 1998) found the use of Internet and e-mail to be very low. This can be explained by the difference in data collection context and date, which had certain impacts in light of the increased availability of ICT in schools and homes, and extensive use of ICT in other sectors in the society corroborated by Schiller (2003).

Approximately half of the teachers use the Internet to support their courses, and they use some Web sites, search engines, and e-mail. This might imply that the high degree of using Web sites, search engines, and e-mail is not surprising as these are being used by most sectors of society, corroborated by Schiller (2003). According to a survey, the majority of teachers in more than 50% of

public K-12 schools in the USA used the Internet for instructional purposes, which are similar to the results of this study (Lai, 2002).

Even though one needs to be cautious in generalizing these results, it is interesting that while teachers rated the Learning Management System (LMS) as the least used application, 22% of the teachers use Web pages to support their lessons. This result can be promising for diffusion of ICT into education. It can be argued that with appropriate infrastructure, guidance, leadership, and commitment, the teachers may both increase their level of ICT competencies and may integrate ICT into education. According to Cuban (2001), technological devices and programs can be useful when teachers sufficiently understand the technology themselves, and believe it will enhance learning. This result may indicate that the teachers did not have access to LMSs which relate them not to recognize the benefits of the integration of LMSs into their courses. If such a system is provided by MoNE, they may use and integrate it into their courses. The results showed almost 1/4 of teachers were using Web pages to support their courses. Rather than expecting all activities related with ICT integration to come from the teachers, MoNE may form an online support system that includes a variety of ICT-based instructional/learning activities and materials. Teachers may download these activities, modify, and use them in their courses. They may also upload their own activities for other teachers' use. MoNE started such a project, but the variations of the resources need to be enriched. Another act that needs to be performed by MoNE is that all schools should be provided with appropriate facilities so that ICT related resources could be accessible to the teachers.

REFERENCES

- Aşkar, P., & Usluel, Y. K. (2002). Teknolojinin yayılım sürecinde öğretmenlerin bilgisayarı kullanma düzeyleri. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 22, 14-20.
- Cuban, L. (2001). *Overload and underuse: Computers in classroom*. Harvard University Press.
- Çelik, H. C., & Birtürk, R. (2005). İlköğretim okullarında görev yapan öğretmenlerin bilgisayara yönelik tutumlarının değişimleri üzerine bir araştırma. *İstanbul Üniversitesi Eğitim Fakültesi Dergisi*, 6(10), 27-38.
- Deniz, L. (2005). İlköğretim okullarında görev yapan sınıf ve alan öğretmenlerinin bilgisayarı kullanma. *The Turkish Online Journal of Educational Technology - TOJET*, 4(4), Article 22. Retrieved February, 2007, from <http://www.tojet.net/articles/4422.htm>
- Ekan, S. (2004). Öğretmenlerin bilgisayara yönelik tutumları üzerine bir inceleme. *Manas Üniversitesi Sosyal Bilimler Dergisi*, 17(12).
- Göktaş, Y., & Yıldırım, Z. (2007). ICT integration in primary education and teacher education programs in Turkey and in EU Countries. *Education and Science*, 32(143), 55-67.
- Heinich, R., Molenda, M., Russell, J.D., & Smaldino, S.S. (2002). *Instructional media and technologies for learning*. New Jersey: Merrill Prentice Hall.
- International Society for Technology and Education (ISTE). (1999). *Will new teachers be prepared to teach in a digital age? A national survey on information technology in teacher education*. Eugene, Oregon: International Society for Technology and Education.
- Koc, M. (2005). Questioning technology use in educational reform: From ideological, theoretical and practical perspectives. *Mediterranean Online Journal of Instructional Technology*, 2(2), 72-81. Retrieved February 2006, from <http://ppj.usm.my/mojit>
- Kozma, R. (2002). *ICT and educational reform in developed and developing countries*. Center for Technology in Learning, CA: SRI International.
- Kraut, R., Lundmark, W., Patterson, M., Kiesler, S., Mukhopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist* 53(9), 1017-1031.
- Lai, K. W. (2002). Role of the Teacher. In H. Adelberger, B. Collins & J. Pawlowski (Eds), *Handbook on Information Technologies for Education and Training* (pp.343-354). Berlin: Springer-Verlag.
- LaRose, R., Essin, M. S., & Gregg, J. (2001). Reformulating the Internet paradox: Social cognitive explanations of Internet use and depression. *Journal of Online Behavior*, 1(2), Retrieved September, 2006, from <http://www.behavior.net/OJB/v1n2/paradox.html>
- Lever-Duffy, J., McDonald, J., & Mizell, A. (2003). *Teaching and learning with technology*. Boston: Pearson Education.
- Miles, M.B., & Huberman, A.M. (1994). *An expanded sourcebook: Qualitative data analysis (2nd ed.)*. Thousand Oaks, California: Sage Publications.
- Mitradoni, (2000). *Teachers as innovators: An evaluation of the motivation of teachers to use ICT*. Preston, Cox & Cox.
- MoNE. (2001). *National education at the beginning of 2002*. Republic of Turkey MoNE Research, Planning and Coordination Board. Retrieved December, 2005, from <http://www.meb.gov.tr>
- MoNE. (2004). *Millî eğitim survey verileri 2003 - 2004*. Millî Eğitim Bakanlığı Araştırma, Planlama ve Koordinasyon Kurulu Başkanlığı, Ankara:MEB Yayınları Dairesi Başkanlığı.
- Nie, N. H., & Ehring, L. (2000). *Internet and society: A preliminary report*. Stanford, CA: Stanford Institute for the Quantitative Study of Society.
- Öktem, E. (2000). *Türkiye'de eğitimde bilgisayar teknolojileri yeniliği: İleri ve orta okullarda yapılan bir araştırma*. Ankara: Türkiye Bilimsel ve Teknolojik Araştırma Kurumu.
- Özgen, G. (2002). *A qualitative assessment of a technology training course offered to pre-service English language teachers: A case study*. Unpublished Master Thesis, METU, Ankara, Turkey.
- Quintess, M. (1997). *The Northwest regional profile: Integration of technology in preservice teacher education programs*. Northwest Educational Technology Consortium. Retrieved January, 2005, from <http://www.nwetc.org/preservicechallenge.html>
- Roby, M.D., & Edwards, J. (2000). *Integrating educational technology into teaching (2nd ed.)*. Upper Saddle River, New Jersey: Merrill.
- Schiller, J. (2003). Working with ICT: Perceptions of Australian principals. *Journal of Educational Administration*, 41(3), 171-185.
- Schwartz, R., & Jaramillo, A. (2004). *Technology in education: the Turkish Experiment*. The World Bank Report, retrieved October, 2004 from <http://www.worldbank.org/umid/pdp/techne/turk-ed.htm>.
- Scottish Executive. (2002). *Interchange 79 connecting schools, libraries and community education centres with ICT: An evaluation of the CREATIS project*. Edinburgh: Scottish Executive Education Department.
- South Central Regional Technology in Education Consortium (SCRETEC). (1998). *Technology and preservice teacher education program survey*. Texas: South Central Regional Technology in Education Consortium.
- South East and Islands Regional Technology in Education Consortium (SEIRETEC). (1998). *Integration of technology in preservice teacher education programs*. Atlanta: South East and Islands Regional Technology in Education Consortium.
- SEIRETEC. (1999). *Educational software use: results of a 1999 regional survey*. Atlanta: South East and Islands Regional Technology in Education Consortium.
- Smith, T. C. (2002). *An analysis of teacher educators and technology integration projects at four universities*. Unpublished PhD. Thesis, Arizona State University, UMI3043832
- Sugar, W. (2002). Applying human-centered design to technology integration three alternative technology perspectives. *Journal of Computing in Teacher Education*, 19(1), 12-17.
- United States Department of Education (USDE). (2000). *Teachers' tools for the 21st century*. Washington, D.C.: United States Department of Education • Office of Educational Research and Improvement.
- Weinman, R., Quan-Haase, A., White, J., & Hampton, K. (2001). Does the Internet increase, decrease, or supplement social capital? Social networks, participation, and community commitment. *American Behavioral Scientist* 43(3), 436-455.
- Williams, D., Wilson, K., Richardson, A., Tison, J., & Coles, L. (1998). *Teachers' ICT skills and knowledge needs*. (Final Report to SOEID). Aberdeen: The Robert Gordon University.
- Zayin, N. (2004). *Instructional technology adoption of medical school faculty in teaching and learning: Faculty characteristics and differentiating factors in adopter categories*. Unpublished Ph. D. Thesis, METU, Ankara, Turkey.

GENİŞLETİLMİŞ ÖZET

Özellikle kişisel bilgisayarların hayatımıza girmeye başlamasından sonra, bilgisayar teknolojilerinde (BT) görülen hızlı gelişmeler, günümüz toplumlarının tüm sistemlerini önemli ölçüde etkilemiştir. Bu gelişmelerden etkilenen sistemlerden birisi de hiç şüphesiz eğitim sistemidir. Eğitimde, bilgisayar teknolojileri (BT) kullanımına önemli tüm dünyada gün geçtikçe artmaktadır. Uluslararası uygulamalara paralel olarak, Türkiye'de de 1984 gibi erken sayılabilecek bir dönemden itibaren bu konudaki çalışmalar başlamıştır. BT'yi eğitime bütünlük içinde kullanmak ya da bilgisayarla etkilenen bir çok etkin vardır. Bu etkilerin en önemlilerinden birisi öğretmenlerin BT'ye karşı bakış açılarını ve BT'yi öğretim süreçlerinde uygulamalarınıdır. Bu bağlamda, öğretmenlerin BT'ye karşı algılarını ve BT'yi desteklerinde kullandıklarını bilerek inceleyen araştırmalara ihtiyaç duyulmaktadır. Bu çalışmanın amacı da bu konudaki durumu ortaya çıkarmaktır. Çalışmada, aşağıdaki araştırma sorularına cevap aranmaktadır:

Öğretmenlerin BT'nin ilköğretim ve ortaöğretim okullarına bütünleştirilmesi konusundaki algıları nelerdir?

Öğretmenlerin aşağıda belirtilenlere göre derslerinde BT'yi kullanım düzeyleri ne durumdadır?

Öğretmenlerin bilgisayar laboratuvarı kullanımı,

Öğretmenlerin dersleri ile BT'yi bütünleştirebilmeleri,

Öğretmenlerin derslerinde kullandıkları donanımlar,

Öğretmenlerin derslerinde kullandıkları yazılımlar,

Öğretmenlerin İnternet'i derslerini destekleyici bir araç olarak kullanması.

Araştırmacılar yukarıdaki soruları cevaplamak için, veri toplama ve verilerin analizinde nitel ve nicel yaklaşımları birlikte kullanmışlardır. Nicel veriler, 12 bölge, 35 il ve 92 okuldaki 1429 öğretmeninden uygun örnekleme tekniği kullanılarak anketler yoluyla toplanmıştır. Nitel veriler ise aynı anketlerdeki açık uçlu sorularla ve 6 öğretmenle yapılan görüşmelerden elde edilmiştir. Veri toplama sürecinde kullanılan anket ve görüşme rehberleri alan ile ilgili kaynaklardan yararlanılarak araştırmacılar tarafından geliştirilmiştir. Hazırlanan anket, öncelikle 4 doktora öğrencisi ve 7 uzman tarafından incelenmiştir. Ankette, onların önerileri doğrultusunda gerekli düzeltmeler yapıldıktan sonra, Türkiye dil uzmanı tarafından kontrol edilmiş ve anlaşılması zor olan kısımları düzeltilmiştir. Daha sonra, 121 öğretmenle pilot çalışması yapılmış, elde edilen verilerle göre güvenirlik sonuçları hesaplanmıştır. Uygun örnekleme tekniği ise, araştırmanın inandırıcılığını arttırmak için kullanılmıştır. Zira veri toplama sürecinde, anketler gönüllü kişilerin yardımı ile dağıtılmış ve toplanmıştır. Bu gönüllülerin hemen hemen hepsi bilgisayar öğretmenleridir. Bu kişilerin ulaşabileceği öğretmenlerden veri toplanarak; anket toplama sürecinde, BT'ye ilişkin teknolojiye kaynaklanabilecek multemele problemlerin önüne geçilmeye çalışılmıştır. Böyle ki, gönüllü öğretmenler gerekli görülün ya da talep edilen noktalarda devreye girerek katılımcıların anketi daha sağlıklı cevap vermelerine yardımcı olmuşlardır. Elde edilen nicel veriler betimsel istatistik yöntemlerle (ortalama, yüzde, frekans ve standart sapma); nitel veriler ise içerik çözümleme yöntemleri kullanılarak analiz edilmiştir.

Araştırma bulguları, öğretmenlerin BT'nin ilköğretime ve orta öğretime bütünleştirilmesi konusundaki algılarının olumlu olduğunu göstermektedir. Sugar'a (2002) göre olumlu algı, öğretmenlerin BT'yi derslerine bütünleştirmeleri sürecindeki en önemli etkenlerden biridir. Olumlu algıya sahip olmaları, aynı zamanda karşılaşılan engelleri aşmalarında öğretmenlere önemli bir katkı sağlamaktadır. Bulgular, katılımcıların büyük çoğunluğunun BT'nin kullanımına öğrenme ve öğretme sürecinin daha etkin olacağına inandıklarını göstermektedir. Ayrıca öğretmenler BT'nin bütünleştirilmesinin, okullarda birçok yararları ve sınırlılıkları olacağına inanmaktadırlar. Bunlar üç ana başlık altında toplanabilir: (1) BT'nin genel özellikleri, (2) BT'nin öğrenci ve öğretmene sundukları, (3) BT'nin bütünleştirilme sürecinde ortaya çıkan sınırlılıkları.

İkinci araştırma sorusuyla ilgili bulgulara baktığımızda, öğretmenlerin dörtte biri bilgisayar laboratuvarlarını kullanmakta ve derslerine BT'yi bütünleştirmektedir. Diğer öğretmenler ise ya BT'yi derslerinde kullanmamakta veya yeterli BT kaynaklarına erişememektedirler. En fazla kullanılan donanımın bilgisayar; en fazla kullanılan yazılımların ise kelime işlemci programları, İnternet tarayıcı programları ve iletişim amaçlı elektronik posta programlarının olduğu görülmektedir. Bu bulguların tersine, Williams ve diğerleri (1998) İnternet ve elektronik posta kullanımını çok düşük bulmuşlardır. Bu farklılık, günümüzde BT'nin yaygınlaşması ve kolay ulaşılabilir olmasından kaynaklanıyor olabilir.

Bulgular, öğretmenlerin çoğunluğunun İnternet'i derslerinde destekleyici bir araç olarak kullandıkları görülmektedir. Toplumun diğer kesimlerinde olduğu gibi öğretmenler de İnternet kullanırken en fazla kendi dersleriyle ilgili belli web sayfalarını, arama motorlarını ve e-posta yazılımlarını kullanmaktadırlar. Amerika'da yapılan benzer bir araştırmaya göre de, devlet okullarında çalışan öğretmenlerin yarısından fazlasının, İnternet'i eğitim amaçlı olarak okullarında kullandıkları görülmektedir.

Bulgulardan çıkarılabilecek ilginç sonuçlardan birisi de, öğretim yönetim sistemlerinin (ÖYS) öğretmenler arasında en az kullanılan uygulamalardan birisi olduğudur. Oysa öğretmenlerin %62,2'si, derslerine destek amaçlı web sayfaları kullanmaktadır. Uygun altyapı, rehberlik, liderlik ve sorumlulukla; öğretmenlerin BT konusundaki yeterlilikleri artırılabilir ve BT'yi derslerine daha iyi bütünleştirmelerine yardımcı olunabilir. Cuban'a (2001) göre, teknolojiye ilgili araç-gereç ve programlar öğretmenlerin kendi kendilerine anlayıp kullandıklarında ve bu yolla öğrenme/öğretme ortamlarının etkinliğinin artacağına inanıldığında daha verimli olabilir. Bulgular göstermektedir ki öğretmenler ÖYS programlarına erişim olanaklı bulamadıkları, ÖYS'yi derslerinde nasıl kullanacaklarını da bilmemektedirler. Milli Eğitim Bakanlığı (MEB) öğretmenlere bu yönde bir erişim olanaklı tanırsa, ÖYS'nin kullanımını artacağı varsayılabilir. Öğretmenlerin dörtte biri, Web sayfalarını derslerine destek amaçlı kullanmaktadır. Ayrıca BT'yi derslere bütünleştirmede her şeyin öğretmenlerden beklememesi gerekir. MEB, bu konuda geçitli öğretim etkinlikleri ve hizmetler hazırlayarak öğretmenlerin kullanımına sunabilir. Öğretmenler de bu etkinlikleri ilgili Web sayfalarından indirerek derslerinde yararlanabilir. Ayrıca onlar da kendi hazırladıkları etkinlikleri ilgili sayfaya ekleyerek o platformun zenginleşmesine katkıda bulunabilirler. Son olarak MEB, BT ile ilgili kaynaklara erişimlerinde öğretmenlere daha fazla yardımcı olmalı, gerekli olan olanakları ve hizmetleri sunmalıdır.