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Attitudes and knowledge level of teachers in ICT use: The case of Turkish teachers

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Abstract
This research aims to determine teachers' influence in the use of Information and Communication Technologies (ICT) at schools. Various variables are examined such as years of experience, gender, the duration of computer and Internet use, and to determine the attitude, level of knowledge on and the frequency of ICT use among teachers. The study was conducted with 1540 primary school teachers using Knowledge, Use and Attitude Scales of ICT. The results show that the most commonly used and well-known ICT types among teachers are the Internet, e-mail and word processing, and teachers' attitudes towards computers and the Internet are generally positive. It was also found that their attitudes vary with their years of experience and levels of knowledge.

Keywords: Primary education, information and communication technology, teachers, teacher education, ICT use, attitudes, gender.

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Introduction

Developments about and widespread use of Communication and Information Technologies (ICT) influence all fields in life, one of which is education. Countries see ICT as potential tools for change and innovation in education (Eurydice, 2001; Papanastasiou & Angeli, 2008) and, thus, make investments in ICT. For instance, Turkey spent about $400 per person, and allocated 11.7% of its budget to ICT. However, this rate is lower than those of Europe and Central Asia, which allocate 22% of their budget to ICT, but higher than the rates in developing countries (World Bank, 2007). In other words, although a considerable quantitative increase has been observed in personal computer and Internet use in Turkey, the rate still has not reached the rates in developing countries. Moreover, according to a research carried out by the Turkish State Institute of Statistics (TSIS) (2008), while 3% of 21 million primary school graduates are Internet users, 69% of 3.5 million university graduates use Internet. The same study demonstrates that most of the Internet and computer users are in the age group of 16-24 years, who are followed by the 25-34 age group. In terms of educational status, higher-education graduates have the highest rate of computer and Internet use with about 88 percent. It has been determined that as the educational status decreased, the rate of Internet and computer use also declined; that males use the Internet and computers more commonly than females do; and the Internet is most often used to read newspapers and to send messages and e-mails.

Turkish Ministry of National Education (MNE) make attempts to disseminate ICT at schools as other countries do to overcome educational problems and to enable innovation in education. According to the objectives of Lisbon Submit in 2002, European Union has been preparing to make a shift to information-based economy and community and to develop digital literacy (Commission of European Communities, 2000). Therefore, the MNE attempts to set up computer labs and to provide Internet connection at schools. Statistically, the schools with Internet connection in 2005 rose from 40% (World Bank, 2007) to 68.1% in 2006 (SPO, 2008). In addition, by 2001, 67% of 520 thousand teachers were taught computer courses (MNE, 2002). Apart from the opportunities offered by schools, MNE set up 6412 computer labs and about 124 thousand computers were distributed to schools. By the end of 2007, this number amounted to 604,000. Finally, in 2008, approximately 87% of 45,973 schools in formal education have Internet connection (MNE, 2008a, 2008b).

Conclusively, it is aimed that %96 of students will have access to the Internet at schools in 2010 (SPO, 2006).

Education is a key element for ICT dissemination. Therefore, improving the ICT infrastructure in schools has been a high priority in Turkey, as in other countries. Both developed and developing countries adopted ICT investments in accordance with their policies in order to increase quality in education, to provide work power, and to educate individuals who have proficiency on ICT (Tondeur, van Braak & Valcke, 2007). When making such investments, the general assumption is that once hardware and software are available in schools, ICT integration will automatically follow. While ICT investments for educational innovations and developments have an important potential, it is neglected that there are teachers who will use it in the classrooms as a part of the curriculum (Cohen & Ball, 1990; Vacc & Bright, 1999; Niederhauser & Stoddart, 2001). Even though a school possesses ICT hardware and software, whether they are used efficiently or inefficiently depends on teachers. However, how these teachers perceive these reform efforts is closely related to certain variables such as belief and experience, level of knowledge, attitude toward ICT, educational applications, achievement expectations and learning-teaching approaches (Schug, 1998; Smerdon, Cronen, Lanahan, Anderson, Iannotti & Angeles, 2000; Kozma, 2003; Lim & Khine, 2006; Thomas & Stratton, 2006). As a result, integrating ICT investments with school curricula requires that teachers' knowledge, level of use and attitudes towards those technologies are determined and guided.

ICT Attitude and Use

Information and communication technologies appeared as a combination of information technologies (IT) and communication technologies (CT) and presently involves a variety of computer and Internet technologies and related software and applications (Marcelle, 2000; UNESCO, 2007). ICT provides the opportunity to gather, store, retrieve, process, analyze, and transmit information. Improvement and dissemination of ICT has begun to change the traditional class image (Tondeur, van Braak, & Valcke, 2007). ICT is regarded as an integral component of educational and curricular reforms. As an alternative to traditional teacher-centered classroom, it allows the formation of learner-centered classrooms (Jonassen, 1995). It has brought about changes not only in learning methods for learners, but also in the teaching approaches of instructors.

ICT is a tool that can be used across the curriculum or in separate subjects where the emphasis is on the development of ICT-related skills, knowledge, processes, and attitudes. It enhances students' learning outcomes within the limits of the existing curriculum. It is also a potential tool to transform the teacher-based classrooms into learner-focused, rich and interactive leaning environments. Teachers constitute the key element in this transformation based on the adoption of ICT learning and teaching tools in schools. Integrating ICT in the curricula requires an investment both in these technologies and in trained personnel.

One of the factors that determine educational development and innovation in general is teachers as they are the ones to use the ICT investments for educational development. Technology does not have an educational value in itself. It becomes important when teachers use it in learning-teaching process. Although there are some who claim that the presence of technology in the classroom creates a pressure and requires effective use (Kozma, 2003), research results show that these are also related to teachers' attitudes and levels of knowledge (Pelgrum, 2001; Garland & Noyes, 2004; Torkzadeh, Chang & Demirhan, 2006; Lim & Khine, 2006; Zhang, 2007; Paraskeva, Bouta & Papagianni, 2008). Teachers' positive views towards ICT applications or denying them all together are affect by their attitudes, (Tondeur, van Braak, & Valcke, 2007) as well as other important factors such as their information about and experience with ICT (Hong & Koh, 2002) their experiences on how to use these technologies in classroom environment (Keong, Horani & Daniel, 2005), information and experiences concerning the types of applications based on ICT, age (Hartley & Bendixen, 2001), and self-confidence (Ertmer, 2006). McKenzie (1993) and Stallard (1998) argue that the main problem in teachers' decision to use or not to use ICT concerns their attitudes. The results of their study demonstrate that an individual's attitudes have a significant impact on his/her behaviors in ICT use. Gelderman (1998) suggests handling ICT planning together with attitudes because attitudes allow us to understand and make inferences from an individual's behaviors toward an object or event (i.e., change) and to identify how his/her behaviors are affected (The Open University, 1977; Ajzen & Fishbein, 1977; Selwyn, 1997; Albirini, 2006). In other words, teachers' attitudes, whether positive or negative, affect how they respond to and use ICT. Therefore, information is required about teachers' attitudes for plans about and future investments in ICT.

Just as an individual's knowledge affects his/her attitude toward an object, his/her knowledge is also influenced by his/her attitudes. Given that attitudes have three main components, which are cognitive, affective, and behavioral (Kağıtçıbaşı, 1985; Freedman, Sears & Carlsmith, 1989), it is obvious that attitude is a multidimensional phenomenon, rather than being one-dimensional in itself. Because behaviors are affected by one's socio-cultural environment and emotions are under the influence of experiences. The affective component of attitude consists of emotions or feelings about objects, including like, dislike, prefer or reject. The cognitive component involves individuals' emotional responses to an object or a person, while the behavioral component concerns a person's behavior directed to an object or a person. All three components of attitude interact with each other (Freedman, Sears & Carlsmith, 1989).

An individual's knowledge and experience affect his/her attitudes towards a particular object; besides, the individual's knowledge is also affected by attitudes (Freedman, Sears & Carlsmith, 1989). Therefore, there are certain factors that affect ICT use and individual's attitudes towards ICT. These factors could be listed as follows, in accordance with related research in the literature:

ICT attitudes, knowledge and use (Jeong & Lambert, 2002; Garland & Noyes, 2004; Aral, Bütün-Ayhan, Ünlü, Erdoğan & Unal, 2006; Aydın, 2007a; Teo, Chai, Hug & Lee, 2008a),

Individual characteristics (gender, age, years of teaching experience) (Durndell, & Thomson, 1997; Hartley & Bendixen, 2001; Aydın, 2007b),

Self-efficacy (Karsten & Roth, 1998; Çelik & Bindak, 2005; Torkzadeh, Chang & Demirhan, 2006; Paraskeva, Bouta & Papagianni, 2008),

Anxiety (Igbaria, Parasuaman, & Baroudi, 1996; Hong & Koh, 2002),

Culture (Torkzadeh, Chang & Demirhan, 2006; Albirini, 2006; Li & Kirkup, 2007),

Beliefs (Lim & Chan, 2007; Teo, Chai, Hug & Lee, 2008a),

Experience of ICT use (Çelik & Bindak, 2005; Aral and et. al., 2006; Anderson, 2006; Bove´e, Voogt & Meelissen, 2007; İşman, Evirgen & Çengel, 2008; Paraskeva, Bouta & Papagianni, 2008),

Learning and teaching approach (Niederhauser & Stoddart, 2001; Teo, Chai, Hug & Lee, 2008b),

Access to technology and attitudes (Hong & Koh, 2002).

Teachers' attitudes toward computer technologies are also related to teachers' computer competence (Albirini, 2006: 377). Attitudes affect teachers' behaviors. Additionally, they have a considerable effect on openness to new experiences, as well as on reflecting and implementing change. Positive attitudes towards ICT, though too limited, support their use in classes. The effectiveness of ICT investments can be achieved with their effective application in the classroom as a part of the curriculum. By this way, learner-based learning environments can be created.

Study purpose

The literature suggests that the success of ICT integration in learning and teaching process depends partly on teachers' qualifications. In perspectives, the study aims to investigate the status of Turkey primary school teachers with regard to their levels of knowledge on and use of ICT, and their attitudes towards computers and the Internet. With those concerns in mind, the study examines the following research questions:

1. What are teachers' levels of knowledge on ICT?
2. What are the levels of ICT use in education among teachers?
3. What are their attitudes towards computers and the Internet?
4. What are the relationships between certain variables such as gender, teaching experience, Internet and computer use per hour each day, and the dependent variables highlighted above?

Methodology

In the study, the data were collected from primary school teachers using a survey method with a scale consisting of five sections.

Participants

The data collection was limited to public primary school teachers in Turkey. In the academic year 2007-2008, the total number of public primary schools was 33,226 and the number of teachers was 422,264 in 81 provinces of Turkey (MNE, 2008b). In order to determine the provinces, the basic results on "development ranking of regions and provinces" prepared by Dincer, Özaslan, & Kavasoğlu (2003) were used. According to the results of their research, provinces were divided into five regions. In the study, 41 provinces were randomly selected from five regions. Two provinces from the most developed region (5 in total), 10 from the

second most developed region (20 in total), 11 from the third most developed region (21 in total), 10 from the fourth most developed region (19 in total), 8 from the fifth most developed region (16 in total) were selected. The scale was administered to 1540 volunteer teachers who work in 330 schools with a computer lab in 41 provinces. Some part of the data was collected in the seminars and the rest by post and e-mail. 54.8% (844) of the participants is female and %45.2 (696) consists of male teachers.

The average number of years of experience in education was 6-10 years (in a range from 1-5 to 21 years and more). 83.7% (1289) of these teachers took a computer course previously. Classroom and branch teachers (all of whom work in primary schools) were included in this study: 676 classroom teachers and 864 branch teachers.

Instruments

Personal inquiry form: The personal background form used in the study was composed of five questions concerning teaching experience, gender, duration of daily Internet and computer use and previous participation in an ICT course.

Teachers' knowledge of ICT and frequency of ICT use: The second section of the questionnaire aimed to determine teachers' software knowledge and frequency of software use in education. The questionnaire used in the research was developed by Papanastasiou & Angeli (2008). The scale assessing teachers' ICT knowledge (ICT-K) consists of 14 items and is a 1-to-5 Likert-type scale (with response options as follows: I cannot use it, I can use it to a small extent, I can use it satisfactorily, I can use it well, I can use it very well) that assesses teachers' knowledge on various software. The questionnaire of frequency of ICT use in education (ICT-U) consists of 15 items. Teachers' response options in ICT-U are respectively "never, once or twice a semester, once or twice a month, once or twice a week, almost every day". The questionnaire was first translated from English to Turkish and the translation was scrutinized by 3 field and 2 linguist experts in both Turkish and English version. After the pilot study, it was administered to 272 teachers from various fields working in public primary schools.

The responses were analyzed using the exploratory factor analysis and principal components analysis, which were followed by the application of varimax rotation method (Foster, Barkus

and Yavorsky, 2006). The values of KMO obtained in ICT-K and ICT-U were high (.801 and .863) and the results of Barlett's test were significant ($p<0.000$), which indicated that the data were appropriate for the analysis. The results of varimax rotation method for ICT-K (14-items) revealed three factors (eigenvalue over 1.00). Papanastasiou & Angeli (2008) found the number of factors as two. The differences observed in the factor values are ascribed to the differences in knowledge levels. The analysis produced three factors that explained 58.032% of the variance of these 14 items. The first factor that explained 22.100% of the variance is composed of 5 items (publishing software, webpage, authoring software, programming languages, modeling software microworlds/simulations), the second factor that explained 20.059% of variance is composed of 5 items (word processing, Internet, email, graphics, presentation software) and third factor that explained 15.873% of variance is composed of 4 items (databases, spreadsheets, multimedia authoring software, concept mapping). Cronbach's reliability coefficient was calculated to be 0.83 for the entire ICT-K scale. Internal consistency was measured using Cronbach's alpha and these sub scales ranged from first 0.84, second 0.78, and third 0.69 indicating an acceptable level of reliability of the scales used in this study (The results of the factor and reliability analyses are presented in Appendix 1).

The results of varimax rotation method for ICT-U revealed two factors that explained 60.205% of the variance of these 15 items. The first factor that explained 32.479% of the variance is composed of 6 items (make presentations, process text, create graphics, communicate, access Internet, use educational CD), the second factor that was explained 27.726% of variance is composed of 9 items (play games, publish materials, prepare spreadsheets, develop web pages, develop multimedia, author microworlds/simulations, map concepts, model complex systems, program the computer). The factor number and the items of each factor were the same as calculated by Papanastasiou & Angeli (2008). Cronbach's reliability coefficient was calculated to be 0.88 for the entire ICT-U scale when it was administered to 272 teachers from various fields employed in public primary schools (The results of the factor and reliability analyses are presented in Appendix 2).

Computer and Internet attitude scale: The computer attitude scale (CAS) used in the scale was developed by Papanastasiou & Angeli (2008). The scales aim to assess teachers' beliefs about computers and Internet's value in educational use. The scale was 1-to-5 Likert-type

scales (from 1= completely disagree to 5= completely agree). CAS consists of 15 items developed by Papanastasiou & Angeli (2008). The scale was translated into Turkish. The translation was scrutinized by 3 field and 2 linguist experts in both Turkish and English version.

Subsequently, a 23-item Internet attitude scale was designed by the researcher. To develop the Internet Attitude Scale (IAS), a pool of items was collected from the literature. The initial version contained 25 items which were included upon the advice of five experts in Internet technology and technology education. Two items in the pool were later removed from the scale. As a result, the final version of the scale included a total of 23 items. The scale was a 1-to-5 Likert-type scale (from 1= completely disagree to 5= completely agree).

The two scales (CAS and IAS) were pilot-tested to be administered to 272 teachers from various fields employed in public primary schools for factor analysis. After the pilot study, the responses were analyzed using the exploratory factor analysis and principal components analysis, which were followed by the application of varimax rotation method (Foster, Barkus and Yavorsky, 2006). The Kaiser–Meyer–Olkin (KMO) coefficients for the CAS and IAS were .814 and .875, and a Barlett's Sphericity test value for the two scales was found to be significant ($p<0.000$). The results of varimax rotation method for CAS revealed two factors (eigenvalue over 1.00) that explained 56.946% of the variance of these 15 items. The factor numbers and item numbers in each factor were found to be different calculated by Papanastasiou & Angeli (2008). Papanastasiou & Angeli (2008) identified three factors in their study. The difference factor structures can be attributed to cultural views toward computers. The first factor that explained 30.962% of the variance is composed of 7 items (called "Anxiety"), and the second factor explaining 25.984% of variance is composed of 8 items (called "Value of Computers"). The alpha reliability coefficient of the entire CAS scale was calculated as 0.91. The Cronbach coefficient of sub-scales was 0.92 and 0.93 ((The results of the factor and reliability analyses are presented in Appendix 3).

The results of varimax rotation method for IAS revealed three factors (eigenvalue over 1.00) that explained 72.21% of the variance for these 23 items. The first factor consisting of nine items explained 30.90% of variance, the second consisting of eight items explained 24.19% of variance, and the third consisting of six items explained 17.12% of variance. The analysis

of subscales reveals first factor as "opportunities of Internet" (O); the second as the change in education (CE); and the third as the effects of daily life (EDL). The reliability of IAS and all other subscales was measured by the Cronbach's coefficient. The Cronbach's coefficient for the entire IAS (consist of 23 items) was 0.86. The Cronbach coefficient of subscales is as follows: first factor 0.93; second factor, 0.94; third factor, 0.94 (The results of the factor and reliability analyses are presented in Appendix 4).

In the upper-group and lower-group 27% analysis performed to determine the discriminativeness of each scales' items, it was determined that the lowest mean rating (1.79), the highest mean rating (4.92), and all items were significant at the level of .05.

Data analysis

In the data analysis, the mean standard deviation and *t*-test were used to calculate the differences between the means of the two groups, and one-way ANOVA was used for more than two groups in the analysis. The Tukey post hoc test was employed to determine the mean difference between the groups which proved to be significantly different from one another. To determine the relationship between variables, a correlation analysis was performed. The data were analyzed using SPSS 11.5 package program. The level of significance was determined as .05.

Results

Demographic variables

The study sample consists of 1540 teachers, of whom 844 (55%) were female and 696 (45%) were male. The data based on teachers' demographic variables showed that 83.7% (1289) of the respondents had previously received a computer course. Distribution of teaching experience was 1-5 years for 32%, 6-10 years for 25.4%, 11-20 years for 22%, and 21 years and more for 20.6%. The daily computer usage of teachers was almost never for 9.7%, 1-2 hours for 66%, 3-4 hours for 18%, 5-7 hours for 3.7%, and 8-10 hours for 6.2%. Computer use ranged from 0 to 10 hours daily (M=2.23, SD=.77). The daily Internet usage of teachers was almost never for 11.6%, 1-2 hours for 69.6%, 3-4 hours for 13.6%, and 5-7 hours for 5.2%. The rate of teachers with personal computers was 89.2% (1373). Locations of Internet access for teachers were home for 45.5%, school for 21.2%, both for 19.9%, Internet cafe for 8.7%, and other for 4.7%.

The demographic data on the participating teachers reveal that most of the teachers have a low level of professional experience. Again, most of them use computers and the Internet for 1-2 hours daily and a majority has personal computers and often access the Internet from their homes.

Teachers' levels of knowledge on ICT

Information levels about ICT among teachers were rated through responses including 14 statements from 1 to 5 (from 1 representing "I cannot use" to 5 representing "I can use it very well"). Scores ranged from 14 to 70. Mean levels of teachers' knowledge about ICT are given in Table 1.

Table 1: Teachers' knowledge of ICT use in education

Items	I cannot use it	I can use it to a small extent	I can use it satisfactorily	I can use it well	I can use it very well	M	SD
Word processing *	2.9	9.3	15	50.6	22.3	3,80	,98
Databases	37.1	20.9	22.8	15.5	3.7	2.28	1.21
Spreadsheets*	12.5	22.4	24.4	30.4	10.4	3.04	1.20
Graphics *	13.2	18.5	24.5	31.2	12.5	3.11	1.23
Multimedia authoring software	56.1	18.2	13.9	9.7	2.1	1.83	1.11
Presentation software*	13.1	18.8	20.7	30.0	17.4	3.20	1.29
Concept mapping	41.6	21.2	18.5	15.2	3.5	2.18	1.22
Internet*	1.2	4.9	11.3	49.6	33	4.08	.86
E-mail*	8.8	7.5	12.7	42.2	28.9	3.75	1.21
Publishing software	54.8	14.5	15.5	9.9	5.3	1.96	1.25
Webpage authoring software	59.7	15.4	12.2	8.2	4.4	1.82	1.19
Programming languages	72.1	11.9	9.0	5.1	1.9	1.53	.98
Modeling software	80.4	10	5.8	3.2	6	1.34	.78
Microworlds/Simulations	81.7	8.8	5.9	2.9	0.6	1.32	.77

* = indicates a high level of ICT knowledge

According to teachers' responses, the most widely used ICT type is the Internet (M= 4.08, SD= .86), which is followed by "word processing" (M=3.80, SD=.98). The least widely used ICT types are "microworlds/simulations" (M= 1.32, SD= .77) and "modeling software" (M= 1.34, SD= .78). The mean scores of the responses in relation to 14 items are close to having little information (M= 2.51, SD= .96). The results indicate that teachers had a high level of knowledge about six of ICT software while they had low levels of information on most of the software.

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Frequency of ICT use in Education

Teachers' responses on the use of ICT in education were scored from 1 to 5 (1= "I cannot use it" to 5= "Almost everyday") to expose an overall picture of computer "scores". The results are shown in Table 2.

Table 2: The means and distribution of the frequency of ICT use among teachers

Items	Never	Once or twice a semester	Once or twice a month	Once or twice a week	Almost every day	M	SD
Play games	31.3	25.6	18.8	19.3	5.5	2.42	1.26
Make presentations	15.8	40.5	28.1	14.4	1.2	2.45	.96
Process texts *	3.5	15.3	24.3	35.6	21.3	3.56	1.11
Publish materials	70.3	18.6	6.0	3.8	1.2	1.47	.86
Prepare spreadsheets	61.4	19.5	11.2	6.0	1.9	1.68	1.01
Create graphics	27.8	36.8	20.8	11.0	3.6	2.26	1.09
Communicate*	6..9	11.1	15.8	31.2	34.9	3.76	1.23
Access the Internet*	3.1	5..3	7.0	28.1	56.5	4.29	1.02
Develop web pages	69.7	16.5	6.4	4.4	3.0	1.55	1.00
Develop multimedia	71.8	17.0	6.5	3.6	1.1	1.45	.85
Author microworlds/ simulations	75.3	16.0	5.6	2.5	.5	1.37	.75
Map concepts	62.5	25.5	8.4	3.3	.5	1.54	.82
Model complex systems	83.6	11.0	3.3	1.6	.5	1.25	.64
Program the computer	81.4	10.8	3.8	3.0	.9	1.31	.76
Use educational CDs*	16.8	29.4	25.4	21.0	7..5	2.73	1.18

*= frequency of ICT use is at a high level

The results show that the most widely used ICT type was the Internet (M= 4.29, SD= 1.02), which was followed by communication (M= 3.76, SD=1.23) and processing text (M= 3.56, SD= 1.11), modeling complex systems (M= 1.25, SD= .64), programming the computer (M= 1.31, SD= .76) and authoring micro-worlds/simulations (M= 1.37, SD= .75). The software types frequently used by teachers are the Internet, communication, processing texts, and using educational CDs. Other ones are less frequently used.

Teachers' attitude towards computers

Each item was rated from 1 to 5 (from 1=completely disagree to 5= completely agree) (including positive and negative attitude items) to create overall scores (minimum 15, maximum 75). The results showed (Table 3) that scores ranged from 30 to 75 and the mean score was 56.97 (SD= 7.12).

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Table 3: The means and distribution of the teachers' CAS scores

Items	Mean	SD
1- I feel comfortable with the idea of the computer as a tool in teaching and learning.	3.94	.86
2- The use of computers in teaching and learning stresses me out.	3.52	1.01
3- If something goes wrong I will not know how to fix it.	3.17	1.11
4- The idea of using a computer in teaching and learning makes me skeptical.	3.79	.95
5- The use of the computer as a learning tool excites me.	3.40	1.08
6- The use of computers in teaching and learning scares me.	4.07	.90
7- The computer is a valuable tool for teachers.	3.52	1.15
8- The computer will change the way I teach.	3.66	.97
9- The computer will change the way students learn in my classes.	4.13	.81
10- I can do what the computer can do equally as well.	4.07	.83
11- The computer is not conducive to student learning because it is not easy to use.	4.21	.81
12- The computer helps students understand concepts in more effective ways.	3.90	.84
13- The computer helps students learn because it allows them to express their thinking in better and different ways.	3.82	.87
14- The computer helps teachers to teach in more effective ways.	3.95	.80
15- The computer is not conducive to good teaching because it creates technical problems.	3.82	.91

Teachers' attitudes towards computers were positive and at moderate levels. That is, the mean teacher attitude score is above 52.5. In terms of sub-dimensions, in the first sub-dimension (minimum 11, maximum 35), the mean score was 27.25 (SD=3.79), and in the second sub-dimension (minimum 8, maximum 40) the mean score was 29.72 (SD=4.76).

The teachers stated that they agreed and certainly agreed with all items concerning the attitude toward computers. However, given the items with negative meanings (item 11 with the highest mean value), it could be argued that they did not state positive views on all the items about computers.

Teachers' attitudes towards the Internet

Teachers' attitudes towards the Internet were assessed by an attitude scale made up of 23 positive and negative items rated 1-5 (1=completely disagree to 5= completely agree). Scores ranged from 52 to 115 and the mean was 83.87 (SD=9.30). The results are shown in Table 4.

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Table 4: The means and distribution of the teachers' IAS scores

Items	Mean	SD
1. makes life easier	4.24	.70
2. helps me with my job	4.27	.65
3. gives me the opportunity to follow daily events	4.36	.63
4. drives students toward laziness	2.91	1.089
5. makes access to information easier	4.32	1.32
6. causes estrangement to ourselves	3.47	1.01
7. its use causes problems	3.76	.93
8. reduces the time allocated to learning	3.02	1.15
9. relaxes students	3.76	.87
10. improves curiosity	4.03	.72
11. it excites me to reach the world from home and school	4.03	.79
12. makes finding friends easier	2.67	1.22
13. keeps me and my students away from bad habits	2.76	1.09
14. helps me improve myself by learning new things	3.99	.75
15. helps me get rid of boredom by performing various activities	3.69	.92
16. irritates me due to wrong information	3.51	.99
17. leads to addiction	2.72	1.13
18. offers new opportunities like distance learning	3.99	.73
19. helps me learn about different cultures	4.05	.70
20. enables equality in education	3.32	1.05
21. supports development in education	4.04	.68
22. supports perspective development	4.01	.71
23. causes estrangement of students to their values	2.99	1.10

Considering the attitude scores are 23 at the minimum and 115 at the maximum, teachers' average attitude scores are above medium level. In terms of sub-dimensions, in the O sub-dimension in particular (minimum 12, maximum 45), the mean score was 31.64 (SD=4.33), while in the CE (minimum 8, maximum 38) the mean score was 26.79 (SD=3.34), and in the EDL sub-dimension (minimum 9, maximum 30) the mean score was 22.71 (SD=2.69).

Gender and ICT

ICT-K, ICT-U, overall CAS and IAS scores, as well as the scores on the sub-dimensions of the CAS and the IAS, were analyzed to assess whether men held more favorable attitudes than women. The means, the standard deviations and the results of t-tests are presented in Table 5. The results showed that there were differences between male and female teachers in terms of their total scores on the frequency of ICT-U ($t= -7.617$, $p<0.05$), ICT-K ($t= -3.990$, $p<.05$) and overall Internet attitude ($t= -2.730$, $p<.05$), in favor of males. However, there were no differences between male and female teachers in terms of their both total CAS scores (CAS) ($t=-.774$, $p>.05$).

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Table 5: An analysis of the ICT scores according to gender

Scales	Gender	N	M	SD	df	t	p
ICT – K	Female	844	2.44	.66	1538	- 3.990	0.00*
	Male	696	2.59	.75			
ICT – U	Female	844	2.11	.49	1538	- 7.617	0.00*
	Male	696	2.32	.62			
Total scores of CAS	Female	844	2.98	.32	1538	-.774	.439**
	Male	696	2.99	.38			
Total scores of IAS	Female	844	3.50	.35	1538	-2.730	0.006*
	Male	696	3.56	.38			

*p<.05; **p>.05

Male teacher have high level of ICT-K and ICT-U than female teacher. Furthermore male teacher have more positive attitudes than female teacher towards Internet.

Teaching experience and ICT

ANOVA was used to find out whether the teachers' knowledge of ICT use, frequency of ICT use, computer and Internet attitudes varied with teaching experience and previous participation in a computer course. The results showed that there was a statically significant difference in all dependent variables. Tukey test was conducted so as to determine in which variable the difference was observed.

According to the results (Table 6) of the analysis information levels of teachers differ in accordance with their professional experience and level of ICT-K ($F_{(3–1536)}$= 82.321, p<.05), frequency of ICT-U ($F_{(3–1536)}$= 41.868, p<.05), overall computer attitudes ($F_{(3–1536)}$= 21.334, p<.05), and overall Internet attitudes ($F_{(3–1536)}$= 8.507, p<.05). From the perspective of the ICT-K, it is observed that knowledge levels decrease with increased instructional experience. As far as ICT-U is concerned, teachers with a professional experience of 1-5 and 6-10 years have statistically higher scores.

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Table 6: An analysis of professional experience and ICT

Scales	Teaching Experience	N	M	SD	df	F (one way ANOVA)	p	Tukey Test
ICT-K	a- 1-5	493	2.84	.71	3 1536 1539	82.321	.000*	a>b>c>d
	b- 6-10	391	2.51	.73				
	c- 11-20	339	2.36	.62				
	d- 20 and more	317	2.13	.56				
ICT-U	a- 1-5	493	2.41	.60	3 1536 1539	41.868	.000*	a>b>c;d
	b- 6-10	391	2.20	.60				
	c- 11-20	339	2.09	.50				
	d- 20 and more	317	2.01	.48				
Total scores of CAS	a- 1-5	493	3.08	.33	3 1536 1539	21.334	.000*	a>b;c;d
	b- 6-10	391	2.97	.31				
	c- 11-20	339	2.94	.36				
	d- 20 and more	317	2.91	.39				
Total scores of IAS	a- 1-5	493	3.59	.37	3 1536 1539	8.507	.000*	a>b;c;d
	b- 6-10	391	3.52	.33				
	c- 11-20	339	3.46	.33				
	d- 20 and more	317	3.51	.41				

*p<0.05

An examination of the findings in terms of the CAS and the IAS reveals that the difference is only between teachers with a professional experience of 1-5 years and those with a longer professional experience. The results of the study indicate that, the longer the teachers' professional experience, the lower their knowledge, use and attitude scores on ICT.

Participation in a computer course and ICT

In terms of participation in a computer course, the total attitude scores of the teachers on ICT knowledge and use were compared using the independent sample t-test. The results of the analysis are presented in Table 7.

Table 7: An analysis of previous participation in a computer course and ICT

Scales	Participation in a computer course	N	M	SD	df	t	p
ICT – K*	Yes	1289	2.22	.57	383.495	4.373	0.000**
	No	251	2.07	.50			
ICT – U*	Yes	1289	2.56	.71	393.926	7.555	0.000**
	No	251	2.32	.61			
Overall CAS	Yes	1289	3.00	.35	1538	2.685	0.007**
	No	251	2.93	.36			
Overall IAS	Yes	1289	3.53	.37	1538	1.770	0.077***
	No	251	3.49	.35			

* equal variances not assumed, ** p<.05; ***p>.05

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It was found that there exists a significant difference with regard to previous participation in a computer course and on ICT-K (t=4.373, p<.05), ICT-U (t=7.555, p<.05), and CAS (t=2.688, p<.05). Nevertheless it was that found there is not a significant difference with regard to previous participation in a computer course and on IAS (t=1.770, p>.05).

Examination of Relationships

Spearman's Rank Order Correlation analyses were conducted to examine possible relationships between the overall computer and Internet attitudes, knowledge of ICT use, frequency of ICT use, as well as the relationship between each of these and the variables used in the study. The results are shown in Table 8.

Table 8: Spearman's Rank Order correlation coefficients between certain variables

	Computer attitude	Internet attitude	ICT-K	ICT-U
Internet attitude	.347**			
ICT-K	.304**	.216**		
ICT-U	.332**	.232**	.703**	
Computer use daily per hour	.169**	.174**	.314**	.353**
Internet access daily per hour	.167**	.161*	.272**	.301**

** = correlation is significant at the 0.01 level (two-tailed).

The data showed that there was a significant relationship between computer and Internet attitudes, knowledge of ICT use, frequency of ICT use, and duration of computer and Internet access in hours. The most significant relationship appeared between ICT-K and ICT-U.

Conclusion and Discussion

The findings of the study can be summarized under six headings, which are the levels of knowledge on and the use of ICT, independent variables related to knowledge and use of ICT, attitudes towards the Internet and computers, the correlation between attitudes, knowledge and use of ICT, and same variables.

The first shows that teachers' ability in ICT and their ICT use in learning-teaching process are fairly low. The most common uses of ICT are the Internet, e-mail, word processing and educational CDs, though rarely used. The results seem similar to the results of previous

research (Schug, 1998; Garland & Noyes 2004; Thomas & Stratton, 2006; Alghazo, 2006; Tondeur, van Braak & Valcke, 2007). The study also revealed that ICT use in classroom is limited, a finding which is attributed to the level of experience; and the most commonly used ICT types were determined as the Internet, e-mail, word processing, and educational CDs. Teachers' low levels of software use for educational purposes might be strongly influenced by their low levels of expertise and lack of knowledge and experience about how to use and adapt themselves to the program. As a matter of fact, this result is confirmed by the fact that teachers have a low level of ICT knowledge and those previously trained about computers had higher levels of use than those who did not receive any training.

The second finding demonstrates that teachers' level of knowledge of ICT is low as well. According to the results of the study, most teachers know how to use the Internet, email, word processing, graphics and presentation software. The low levels of knowledge on ICT might result from the fact that these technologies require technical knowledge. In relation to these results, another finding is that there is a significant correlation between the levels of knowledge about ICT and the use of ICT in education. This is an important finding as it shows that the higher the level of knowledge on ICT, the higher its level of use in education. Another finding supporting this result is the significant differences observed between teachers in terms of their previous participation in a computer course. As demonstrated by Anderson (2006), Bove´e, Voogt & Meelissen (2007), İşman, Evirgen & Çengel (2008), Paraskeva, Bouta & Papagianni (2008) in their research on ICT, the higher the mean level of knowledge, the more the ICT use. Teachers with previous computer experience have higher levels of knowledge on ICT and their ICT use is more frequent. Teacher's levels of ICT use show that they use these technologies as information transmission-based tools. How teachers use ICT in teaching-learning process is affected by their teaching approaches, which is also supported by findings of study (Niederhauser & Stoddart, 2001; Alghazo, 2006; Teo, Chai, Hug & Lee, 2008b).

The third finding is related to attitudes. It shows that teachers' attitudes towards both the Internet and computers are at a medium level. However, their levels of attitude towards computers are lower than those towards the Internet. The findings of this research confirm those of Hong & Koh (2002), Paraskeva, Bouta & Papagianni (2008), Garland, & Noyes,

(2004), Aral et al., (2006); Torkzadeh, Chang & Demirhan (2006), Albirini (2006) on computers and the Internet. These researches concluded that teachers had positive attitudes.

The fourth finding concerns the gender variable. In the comparisons in terms of gender, ICT knowledge, their use in education and attitudes towards the Internet show statistical differences. Male teachers had higher scores than female teachers in terms of knowledge and usage. They had more positive attitudes than female teachers did. On the other hand, in terms of attitudes towards computers, there exist no significant statistical differences. There are similar findings revealed in the literature by Garland & Noyes (2004), Çelik & Bindak (2005), and Hong & Koh (2002). On the other hand, in their studies, Volman, van Eck, Heemskerk & Kuiper (2005) and Bove´e, Voogt & Meelissen (2007) demonstrated that females had more positive attitudes than males. In these researches, gender was found to be a significant variable itself but rather it can be assumed to be shaped by experience, as well as cultural and educational objectives. The results of the analysis indicate that, rather than an independent factor, it might be useful to treat gender together with other variables such as culture and upbringing. Li & Kirkup (2007), in their research, demonstrated that the different national cultures had an effect on attitudes and usage in terms of ICT.

The fifth finding involves teachers' experience. Teachers' levels of knowledge and use of ICT, and attitudes towards the Internet and Computers show the same difference according to years of experience. The less the years of experience, the higher their knowledge and ICT use. In addition, they have more positive attitudes, a finding which is, in fact, not surprising. In the framework of Lisbon Submit of 2002, the studies conducted at schools to disseminate ICT use and the growing of these youth with these technologies may be effective factors. Furthermore, openness of the youth to innovations may be another factor. The research conducted by the National Center for Educational Statistics (2006) indicated that teachers with less years of experience use ICT more for educational purposes. However, in the research conducted by Niederhauser & Stoddart (2001), no differences could be found. The teachers who received a course on computers in addition to their professional experience have higher positive attitudes than those who did not. In Turkey, studies by Aral, et al. (2006), İşman, Evirgen, & Çengel (2008) and Deniz (2005) concluded that positive attitudes increased with increasing experience with computers, and that those with less professional experience possess more positive attitudes. Those with lower professional experience are

young teachers. Since they are in the early years of their career, young teachers lack the feeling of "exhaustion", which means that they are more open to new technologies.

The last finding of the research is the positive correlation between teachers' experience and knowledge of ICT, computer and Internet attitudes. These findings reveal that the more the teachers' level of knowledge, the more their positive attitudes. Furthermore, as the duration of Internet and computer use increases, experiences and attitudes toward ICT also improve. These results are similar to those of Hong & Koh (2002), Garland & Noyes (2004), Alghazo (2006), Torkzadeh, Chang & Demirhan (2006), Paraskeva, Bouta & Papagianni (2008). These studies also argue that, along with the levels of knowledge and use, attitude level increases as individuals have greater knowledge and experiences about computer and the internet.

Teachers' knowledge on how to use these technologies in the learning-teaching process has an important effect on using them effectively. Attitudes have also important effects on teachers' use of these technologies. Given that those with less years of experience had higher levels of knowledge and more positive attitudes, as ICT experience increases, their attitudes also improve, which is a very important result as it shows that teacher training will be a significant factor in the effective use of ICT in learning-teaching process.. Although most of the teachers received computer courses, it is difficult to say that they are good enough to use ICT. Despite the opportunities offered by these technologies, teachers use these for informational purposes. This is too far from forming a learner-based learning environment. Because the teachers have low levels of knowledge about ICT and use of related software, they are far from creating a student-centered learning environment. Technology supports a creative and constructivist classroom environment. However, this could only be possible with an approach that is far from focusing on simply transmitting knowledge (Jonassen, 1994). As revealed by the study results, although teachers may have a positive and high level of attitudes towards computers and the internet, low levels of ICT knowledge indicate that they cannot transfer these technologies to classroom use for educational purposes. One of the most significant factors behind that is insufficient experience, personal characteristics and attitudes. As a result of their studies, Çelik and Bindak (2005), Thomas and Stratton (2006) and Anderson (2006) identified the main factors of teacher use of ICT in the classroom for

educational purposes include user characteristics, sufficient technical information and positive attitudes.

In educational systems, the decision-makers and implementers should have enough knowledge on whether the investments for the integration of ICT in curricula reach its aims. The investments can be directed according to teachers' level of knowledge, how they use it in learning-teaching process, as well as their attitudes. As it is teachers who will use these technologies in the classroom to integrate them into the curricula, educating teachers will become a more important issue.

Furthermore, research activities could examine the impact of variables such as teachers' educational approaches and levels of ICT use, their self-efficacy about ICT, objectives of ICT use, objectives of using ICT and success expectations, cultural effect in ICT Internet and computer use. In addition, comparative studies could be conducted to examine that how the way teachers use ICT affects students' success.

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Appendix 1: Knowledge of ICT software (factor numbers and eigenvalues):

	Factor 1	Factor 2	Factor 3
13- Modeling software (e.g., Model-It, Stella)	.861		
14- Microworlds/Simulations (e.g., Stagecast Creator, Interactive	.839		
12- Programming languages (e.g., Logo, C)	.801		
11- Webpage authoring software (e.g., FrontPage)	.683		
10- Publishing software (e.g., Publisher)	.628		
9- Email		.788	
7- Internet		.769	
1- Word processing (e.g., Word)		.706	
6- Presentation software (e.g., PowerPoint)		.704	
4- Graphics (e.g., Paint, Photoshop)		.566	
8- Concept mapping (e.g., Kidspiration, Inspiration)			.780
2- Databases (e.g., Access)			.731
5- Multimedia authoring software (e.g., HyperStudio)			.630
3- Spreadsheets (e.g., Excel)			.540
% of variance	22.100	20.059	15.873
Eigenvalues	4.383	2.313	1.429
Cronbach's Alpha (Overall .83)	.84	.78	.69

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Appendix 2: Frequency of software use ICT (factor numbers and eigenvalues):

Items	Factor 1	Factor 2
11- Author microworlds/simulations	.830	
4- Publish materials (e.g., Publisher)	.822	
9- Develop web pages (e.g., FrontPage)	.815	
10- Develop multimedia (e.g., HyperStudio)	.813	
13- Model complex systems (e.g., Model-It, Stella)	.759	
14- Program the computer (e.g., Logo, C)	.752	
5- Prepare spreadsheets (e.g., Excel)	.667	
12- Map concepts (e.g., Kidspiration, Inspiration)	.630	
1- Play games (e.g., Solitaire)	.331	
2- Make presentations (e.g., PowerPoint)		.875
3- Process texts (e.g., Word)		.863
15- Use educational CDs		.804
6- Create graphics (e.g., Paint,)		.800
7- Communicate (e.g., e-mail)		.782
8- Access the Internet		.734
% of variance	32.479	27.726
Eigenvalues	5.893	3.138
Cronbach's Alpha (Overall= .88)	.91	.83

Appendix 3: Computer attitude scale (factor numbers and eigenvalues):

Items	Factor 1	Factor2
9- The computer will change the way students learn in my classes	.884	
11- The computer is not conducive to student learning because it is not easy to use	.874	
10- I can do what the computer can do equally as well	.854	
4- The idea of using a computer in teaching and learning makes me skeptical	.818	
6- The use of computers in teaching and learning scares me	.816	
15- The computer is not conducive to good teaching because it creates technical problems	.812	
3- If something goes wrong I will not know how to fix it	.521	
14- The computer helps teachers to teach in more effective ways		.767
12- The computer helps students understand concepts in more effective ways		.763
13- The computer helps students learn because it allows them to express their thinking in better and different ways		.735
1- I feel comfortable with the idea of the computer as a tool in teaching and learning		.674
2- The use of computers in teaching and learning stresses me out		.664
5- The use of the computer as a learning tool excites me		.637
7- The computer is a valuable tool for teachers		.614
8- The computer will change the way I teach		.564
% of variance	30.962	25.984
Eigenvalues	5.550	2.992
Cronbach's Alpha (Overall .91)	.92	.93

Tezci, E. (2010). Attitudes and knowledge level of teachers in ICT use: The case of Turkish teachers. *International Journal of Human Sciences* [Online]. 7:2. Available: http://www.insanbilimleri.com/en

Appendix 4: Internet attitude scale (factor numbers and eigenvalues)

Items	Factoactor 1 Opportunities of Internet	Factor 2 change in education	Factor 3 effects of daily life
Internet			
18. offers new opportunities like distance learning	.897		
15. helps me get rid of boredom by performing varrious activites	.897		
14. helps me improve mself by learning new things	.887		
22. supports perspective development	.879		
9. relaxes students	.875		
5. makes access to information easier	.779		
16. irritates me due to wrong information	.740		
13. keeps me and my students away from bad habits	.726		
12. makes finding friends easier	.687		
21. supports development in education		.888	
19. helps me learn about different cultures		.876	
10. improves curiosity		.857	
7. its use causes problems		.828	
20. enables equality in education		.820	
4. drives students toward laziness		.799	
23. causes estrangement of students to their values.		.764	
8. reduces the time allocated to learning		.746	
2. helps me with my job			.951
3. gives me the opportunity to follow daily events			.950
1. makes life easier			.940
11. it excites me to reach the world from home and school			.900
17. leads to addiction			.786
6. causes estrangement to ourselves			.735
% of variance	26.991	24.047	21.129
Eigenvalues	4.383	2.313	1.429
Cronbach's Alpha (overall .86)	.93	.94	.94