



Implementing tablet PCs in schools: Students' attitudes and opinions



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ARTICLE INFO

Article history:

Available online 15 December 2013

Keywords:

Computer attitudes
Young children
Tablet PC
Gender differences

ABSTRACT

In this study, the attitudes, expectations and views of 206 students in four high schools within the scope of the FATİH project in Turkey were assessed regarding tablet PC technology after six months of a pilot plan that included the distribution of tablet PCs to students. The research questions of this study are whether there is a meaningful difference between tablet PC use by male and female students and the effect of computer and Internet by students on attitudes toward tablet PC use. Qualitative and quantitative data collection tools were used in the research. The Computer Attitude Measure for Young students (CAMYS) developed by Teo and Noyes (2008) was used in evaluating the students' attitudes toward the tablet PC usage. Interviews were conducted with eight teachers at pilot schools concerning the integration of tablet PCs into their classes; the positive and negative dimensions of tablet PCs were analyzed. The findings indicate that students have a positive attitude toward tablet PCs. There was not a meaningful difference between the attitudes of male and female students toward tablet PCs. The length of computer and Internet by the students did not affect their attitudes toward tablet PCs. The ways that teachers used tablet PCs in classes, the positive and negative aspects of tablet PC usage and the students' expectations of tablet PCs were discussed in the study.

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1. Introduction

Computers have an active role at all educational levels today, and these devices are significant and indispensable dimensions of schools. Computers are beginning to be used effectively in education and learning environments, and computer use has different dimensions globally because of the spread of Internet use. Many countries aim at increasing the use of computers in education by making relatively high investments to increase the use of computer in schools (Organization for Economic Co-Operation and Development [OECD], 2001). The Australian government spent approximately 4.3 billion dollars on educational technology in 1999 and 2000. In America, the Department of Education spent more than 700 million dollars of its budget for educational technology (Hall & Higgins, 2005). According to the data of BECTA (2004) (British Educational Communications and Technology Agency), in England, 1 billion pounds were spent for educational technology products in 2001 and 2004.

Many investments have been made in Turkey for classroom educational technology tools. Since 1998, thousands of computers, projection devices, printers and other technology products have

been distributed, and there are many technology tools in primary schools and high schools in Turkey (Somyürek, Atasoy, & Özdemir, 2009). Considerable money has been spent on technology products in the scope of projects in Turkey. For the "Movement of Increasing Opportunities and Improving Technology", named the "FATİH project", that was started in 2010 by the Ministry of National Education (MNE) and will be completed in four years, 1.5 billion TL (approximately 750 million dollars) will be spent (MNE, 2010). In the scope of the project, smart boards, projection devices and computers will be distributed to all K-12 schools. The pilot plan began in the fall semester of 2011, and continued with the second stage of the project, the distribution of tablet PCs to students. At the end of the 2011 fall semester, 8500 tablet PCs were distributed to all the 9th grade students at 51 pilot high schools in Turkey (MNE, 2012). Approximately 400 teachers in the pilot schools were trained. In the tablet PCs that were distributed in scope of FATİH project. Electronic formats of all of the textbooks and 9th grade topic simulations were loaded onto the tablets, which have been updated regularly by MNE. The pilot scheme will be completed by 2014. After the pilot plan, tablet PCs will be distributed to all primary students (approximately 10,461,944), all secondary students (approximately 3,824,549) and all K-12 teachers (approximately 744,847) in the scope of the FATİH project (MNE, 2013).

The projects should be designed according to the views of students. In the pilot program, the attitudes and views of the students who use educational technology are as important as the

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distribution of the tablets. In studies of the educational use of computers, its effects on learners and their attitudes, teaching and the learning process should be researched (Morris, Gullekson, Morse, & Popovich, 2009; Teo & Noyes, 2008). Implementing computer and similar education technology products successfully to education system is connected to the acceptance of it and attitude towards it (Davies & Brember, 2001; Teo, 2006). Researchers researched the attitude towards computers as a critical factor in the acceptance of them in education (Huang & Liaw, 2005). Attitude towards computer is accepted to be a significant factor in the use of it in education (Myers & Halpin, 2002). Negative attitude towards the use of computer is accepted to be a deterrent factor in the use of computer in education (Teo, 2006). Briefly, efficiency of technology product in education is closely related to students' attitude towards them (Teo, Chai, & Lee, 2008).

1.1. Possible factors influencing computer attitudes

The literature reports factors that affect the attitudes of children towards computer (Ng & Nicholas, 2009; Sáinz & López-Sáez, 2010). Gender is the leading factor that determines these attitudes. Male students have more positive attitudes towards computers than female students (Colley, 2003; Comber, Colley, Hargreaves, & Dorn, 1997; Meelissen & Drent, 2008; Moore, 1994). It is hypothesized that male and female students have different attitudes because male students use computers on a greater larger scale (Van Eck & Volman, 2001). According to Robertson, Calder, Fung, and O'Shea (1995), among the reasons why female students have negative attitudes compared to male students is that female students have less interest and think that computer are less useful. According to Durndell and Thomson (1997), male students think that computers are more useful for them. Male students have more computers when the ratios of computers to children are taken into consideration, which supports the attitude difference between the sexes (Bovée, Voogt, & Meelissen, 2007). The family environment affects students' attitudes towards computers. In the families that have positive attitudes towards computer, children are affected positively (Shashaani, 1994).

Another factor that affects attitudes towards computers is "computer experience". Students that have use computers for a long time have positive attitudes towards computers (Moore, 1994). In the literature, it is mentioned that another factor that affects attitude towards computer is the ratio of using computer (Schumacher & Morahan-Martin, 2001). Because the Internet use of male students is higher than that of female students and they spend more time on computers playing games, their attitudes towards computers are more positive. Having a computer at home positively affects a student's attitude towards computer and computer use performance at school (Selwyn, 1998).

The major factors that affect attitudes towards computers are determined in the literature about the issue; but because of many reasons, including research and studies that were made in the previous years, increases in computer technologies, increases in Internet use, ease of the use of computer and ease of the buying a computer. It is impossible to know the factor and conditions of today about the use of computer. Some researchers have been adapting previously developed computer attitude scales into today's conditions (Morris et al., 2009; Teo & Noyes, 2008).

In terms of the acceptance and use of information technology (IT), several factors that influence educational technology use have been discussed in the literature (Teo & Noyes, 2008). According to Pelgrum (2001), the computer skills and knowledge of teachers are important determiners. Teacher demographics, such as age, gender, experience and personal factors, influence the efficient use of technology (Mohammed, 1994; Shapka & Ferrari, 2003). Gulbahar (2007), use of current hardware, software and suitable materials is

a key feature in user acceptance of technology. Technical support is another factor that influences technology use (Lim & Khine, 2006). Technical problems make it difficult to use technology in classrooms, and slow network performance and inadequate computers are an obstacle to using technology in education (Pelgrum, 2001). Conversely, Teo (2009) indicated that facilitating the conditions that affect integration to use technology tools indirectly. Even if users have access to well-supported infrastructures to use technology and technical support or a current device, they do not use technology more unless they possess positive attitudes toward it (Isik, 2009).

1.2. How do users come to accept and use a technology?

To investigate the factors influencing technology acceptance, Davis (1989) focused on internal factors such as awareness of benefits of IT tools, skills and/or a wide range of competencies to use a technology. Davis (1989) developed a model named the Technology Acceptance Model (TAM), which was extended in a number of different settings to explain user decisions of how and when to use a technology. The origins of the TAM came from Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA). TAM is less general than TRA and it provides a basis for attitude measures with two technology acceptance variables: perceived usefulness (PU) and perceived ease of use (PEU). PU refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). PEU is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 320). Research has shown that TAM has been one of the most influential models in explaining user acceptance of IT, and it has gained wide attention in the IT literature because it includes the psychological interaction of a user with technology (Isik, 2009). According to TAM, if users perceive a technology as useful and easy to use, they develop positive attitudes towards the technology.

TAM suggests that PEU and PU are the two most important factors that must be considered in technology use (Legris, Ingham, & Collette, 2003). More recently, Teo, Chai, Hung, and Lee (2008) conducted a comparative study and found that PEU and PU are significant determiners of Malaysian and Singaporean pre-service student intention to use technology. Similarly, Ngai, Poon, and Chan (2007) indicated that the PEU and PU are the main factors affecting the attitude of students in the use or technology. These findings explain why certain instrument developers consider these two important factors in the development of computer attitude surveys (Teo & Noyes, 2008).

1.3. Purpose of the study

The tablet PC user rate has increased in recent years, and sales continue to gain momentum (Statista, 2013). Tablet PC use for educational purposes has become widespread globally and the tablet PC has the potential to alter the educational process. This technology provides unique characteristics that provide educational benefits for teachers and students (Dündar & Akçayır, 2012). Many researchers have suggested the use of graphic tablets or tablet PCs as a supportive tool in the classrooms, however, there have been few studies focusing on the attitudes of users (Dündar & Akçayır, 2012; Galligan, Loch, McDonald, & Taylor, 2010; Loch & Donovan, 2006; Olivier, 2005).

Many developed and developing countries have allotted substantial amounts of money, time and energy into attempting to integrate IT into their educational systems in the expectation that new generations of students will learn to use these technologies effectively, critically, productively and creatively (World Bank, 1995). In Turkey, the government has invested extensive amounts

of money for tablet PCs. The size of the budget and buying computer devices are not enough for successful results from the project (Osin, 1998). It is clear that integrating technology has a relatively low success rate (Legris et al., 2003; Pelgrum, 2001). There are many aspects that should be taken into account. An important aspect in successfully implementing instructional technology in educational settings is user acceptance, which is greatly influenced by users' attitudes towards computers (Teo & Noyes, 2008). According to Rogers (2003), when a technology product is introduced, the attitude of the users of the product should be researched.

There is a need for further investigation of student attitudes and teachers views about the use of tablet PCs. The effect of gender differences and the extent of technology usage on attitudes toward this new technology must be researched. This study is also aimed at investigating the methods and extent of student use of tablet PCs use and the problems or drawbacks that emerged during the pilot stage of the project. An initial exploration of the usefulness, advantages and limitations of tablet PC should be conducted in the educational environment.

2. Method

2.1. Participants

There are 7 high schools in Ankara, the capital city of Turkey, within the scope of the FATİH project. Four of these high schools were used in the study because they were more easily accessible. Tablet PCs were distributed to all of the 9th grade students at the pilot schools. There are 237 9th grade students at the selected schools, and paper based questionnaires were distributed to all 237 students. However, 206 questionnaires were returned as a valid and non-response error, and the sample size decreased from 237 to 206. The sample size of this research consisted of 97 male (47.09%) and 109 female (52.91%) 9th grade students between the ages of 14 and 15.

In addition to the student survey, interviews were conducted with high school teachers at selected pilot schools who volunteered, agreed to the interview and related their views about the tablet PCs. These selected teachers are actively using tablet PCs during their lessons as are the teachers at the other pilot schools. During the interviews, the positive and negative effects of classroom tablet PC use, the ways that teachers use tablet PCs in their classes and their expectations of tablet PCs were discussed. Each teacher was interviewed (which took between 12 and 20 min) separately and made by researchers. Interviews allowed us to gain data about tablet PC usage during the lesson in their own words. Participant numbers, distributions according to schools and sex are presented in Table 1.

2.2. Instruments

Qualitative and quantitative data collection tools were used in the research. The Computer Attitude Measure for Young Students (CAMYS) developed by Teo and Noyes (2008) was used for evaluating the students' attitudes towards tablet PCs. The scale is composed of 12 items. The items were presented on a five-point Likert scale

Table 1
Number of students per school.

School	S1	S2	S3	S4	Total
<i>Student questionnaire</i>					
Female	6	34	36	33	109
Male	6	33	25	33	97
Teachers interview	1	3	3	1	8

(ranging from 'strongly agree' to 'strongly disagree'). The scale is composed of 3 factors, the PEU and PU that are important for TAM and the Affect towards Computer (ATC). The CAMYS is considered a valid instrument and has a documented reliability alpha coefficient of .85 (Teo & Noyes, 2008). For this study, the reliability alpha for the total score was .82 for the CAMYS.

According to Teo and Noyes (2008), this scale can be used in technology research or investigations of the implementation of a new pedagogy. In the scale, "tablet computer" is substituted for "computer", and the following aspects were added.:

- the demographic features of the students,
- the students' school,
- having/not having a tablet PC before,
- having/not having a desktop or laptop computer at home,
- having/not having an Internet connection at home,
- the average length of daily tablet PC use outside school (1 h, 2 h, 3 h, 4 h, 5 h, 6 h or more),
- the average length of daily Internet and computer use (1 h, 2 h, 3 h, 4 h, 5 h, 6 h or more),

To determine the views and expectations of the students, 2 open-ended questions (the expectations of students and the positive and negative sides of tablet PCs) were added to the scale.

2.3. Procedure

By MNE, the tablet PC distribution started in pilot schools at the beginning of the 2011–2012 academic year; the research was conducted approximately 6 months after the students started using the tablet PCs, during the spring semester of the 2011–2012 academic year at 4 selected schools. The selected schools are at different locations in central Ankara. The schools are public grade 9 to 12 high schools (as are the other pilot schools).

The students started to use their tablet PCs at the beginning of the 2011–2012 fall semester. Every student has the identical tablet PC. The distributed tablet PCs have an Android operating system, 1024 × 600 screen resolution, 7 inch screen size, touch screen and the capacity to open numerous electronic documents in many extensions (e.g., doc, docx, and pdf). The students have actively used their tablet PCs at school every day for all their lessons. They do not use any hard copy textbooks at schools because all the textbooks are electronic books. Some students use their tablet PCs for note taking, whereas other students continue to use notebooks. The tablet PCs are taken home each day after school.

In this study, the researchers went to schools. After the students were provided brief information about the survey, they were encouraged to answer all the items honestly. The data collection process took approximately 3 weeks, and the data were transformed to computers for analysis.

3. Results

In this section, the effects of sex and the length of computer and Internet use on the students' attitudes were analyzed, and the results are presented. Because most of the students who participated in the research had computer and Internet access (95.1–91.7%), a meaningful analysis on this issue was not possible, and its effect is not analyzed.

3.1. Profile of the students

According to the findings, before the project, most of the students did not have a tablet PC (94.7%), but most of them had a computer (95.1%) at home. Most students did not have a tablet PC at

Table 2
Profile of the students.

Characteristic	<i>f</i>	%
Ownership of tablet PC (before the project)	11	5.3
Ownership of computer (laptop or desktop PC)	196	95.1
Have internet access at home	191	92.7
<i>Frequency of tablet PC use at home (daily)</i>		
Never	62	30.1
1 h	64	31.1
2 h	40	19.4
3 h	16	7.8
4 h	9	4.4
5 h	8	3.9
6 h or more	7	3.4
<i>Frequency of laptop or desktop computer use at home (daily)</i>		
Never	12	5.8
1 h	43	20.9
2 h	50	24.3
3 h	46	22.3
4 h	23	11.2
5 h	8	3.9
6 h or more	24	11.7
<i>Frequency of Internet use at home (daily)</i>		
Never	11	5.3
1 h	33	16
2 h	45	21.8
3 h	50	24.3
4 h	23	11.2
5 h	11	5.3
6 h or more	33	16

home before the project, and their attitude towards tablet PCs is shaped by the project. A total of 92.7% of the high school students who participated in the study had an Internet connection at home. The overall profile of the participants is depicted in Table 2.

Table 2 shows that the students actively use computers and the Internet, and the length of time of computer use by the students parallels their use of the Internet. The students generally use computers for connection to the Internet. Approximately 6% of the students do not use the Internet and computer at home. The students were asked how often they use the tablet PCs at home. Although the students use their tablet PCs at school, they use them less at home. Computers are preferred instead of tablet PCs at home.

3.2. Students' tablet PC attitudes

The students who used tablet PC applications and electronic books instead of traditional books in the scope of the project had positive attitudes towards tablet PC technology (see Table 3). The students had high average points for 3 of the scale factors including

Table 3
Students' scores on CAMYS scale.

Gender	<i>N</i>	Mean (SD)
<i>PEU</i>		
Female	109	4.0 (0.8)
Male	97	4.1 (0.6)
<i>ATC</i>		
Female	109	3.9 (1.0)
Male	97	3.8 (0.8)
<i>PU</i>		
Female	109	3.4 (1.2)
Male	97	3.2 (0.9)
<i>CAMYS</i>		
Female	109	3.8 (0.8)
Male	97	3.7 (0.7)

Table 4
Independent *t*-test of students' scores on CAMYS scale.

Gender	<i>N</i>	<i>M</i>	<i>SD</i>	<i>T</i>	<i>p</i>
Female	109	3.8	204	184	.85
Male	97	3.7			

Table 5
The results of ANOVA for effect of computer use length.

Source of variation	Sum of squares	Mean square	<i>f</i>	<i>p</i>
Between groups	7.919	1.320	2.401	.077
Within groups	109.373	.550		
Total	117.292			

the following: the PEU factor (the highest score): "I use the tablet PC to learn things"; and the "Tablet PC is easy to use".

3.2.1. Gender differences in tablet PC attitudes

When the students' average scores on the scale were analyzed, the male and female students had almost equal average scores (see Table 4). The T-test was applied to determine whether there was a meaningful difference between the CAMYS scores of these groups (female-male).

At the end of the statistical analysis, a meaningful difference between the scores of the male and female students' attitudes towards tablet PCs was not found ($t(204) = 184, p > .05$). When the results for the 3 factors of the scale were analyzed, there was not a meaningful difference between the male and female students ($p > .05$). According to these findings, male and female students have positive attitude towards tablet PCs, and there is not a meaningful difference between them.

3.2.2. Effect of computer use length on tablet PC attitude

The length of the students' daily average use of their personal computers (laptop or desktop) was considered, and the students who participated in the research used their computers quite often (Mean 2.70, SD 1.68). To determine whether there was a meaningful difference between computer use length and attitudes towards tablet PC, ANOVA was used (see Table 5), and a meaningful difference was not found.

3.2.3. Effect of Internet use length on tablet PC attitude

Some students actively use the Internet every day in their homes (Mean 3.00, SD 1.77), and it was expected that there would be a meaningful difference between the attitudes of the student group that use the Internet actively and the student group that spends less time with this technology. ANOVA was used, which determined that there is not a meaningful difference between the length of the students' Internet use and their attitudes towards tablet PCs (see Table 6).

3.3. Wishes and expectations of students from tablet PCs

A total of 127 of students answered the open ended questions completely. The remaining students either did not answer any of

Table 6
The results of ANOVA for effect of Internet use length.

Source of variation	Sum of squares	Mean square	<i>f</i>	<i>P</i>
Between groups	7.310	1.218	2.204	.09
Within groups	109.982	.553		
Total	117.292			

Table 7
Comments of students about tablet PCs.

	Comments	Responses
Expectations from tablet PCs	Additional lesson materials should be presented for tablet PCs (video, animation, simulation, etc.)	97
	There should be office programs in tablet PCs (Word, Excel and PowerPoint)	61
	There should be games in tablet PCs	50
	There should be dictionary in tablet PCs (English–Turkish)	42
	Tablet PCs should have more durable batteries	33
	Tablet PCs hardware features should be enhanced (USB port, VGA output, etc.)	25
	I should be able to transfer documents to tablet PCs (story, novel, music, photograph, etc.)	19
Positive aspects of tablet PCs	Tablets free us from carrying books	88
	Tablet PCs are very practical	45
	It is enjoyable to use a tablet PC	40
	Doing homework is easier with a tablet PC	23
	My interest in classes increased by a tablet PC	23
	I finish my work in a short time with a tablet PC	15
Negative aspects of tablet PCs	The functions of tablet PCs are limited by the school (not being able to download any external computer or application)	58
	Tablet PCs have negative effects on health (radiation, eye fatigue, etc.)	51
	It is difficult to write because tablet PCs do not have pens	36
	Tablet PCs affect social communication negatively	30
	Tablet PCs decrease efficiency in class	21
	Tablet PCs distract a student's attention	10

the open-ended questions or stated that he/she had no ideas. The comments of the students provided an opportunity to analyze the reasons for their attitudes, and the themes constructed according to the students' comments are summarized in [Table 7](#).

3.4. Teacher expectations from tablet PCs and the ways that they use tablet PCs in their classes

Interviews about classroom tablet PC use were conducted with 8 teachers in pilot schools. In these interviews, there was an attempt to determine aspects of tablet PC use in classes, the teachers' expectations of tablet PCs and their positive and negative views of tablet PCs. All of the teachers mentioned that the use of tablet PC makes classes more entertaining and increases sample applications, it gives teachers chance to give more examples about a topic and make studies during classes, which are positive aspects. Teachers stated that with the use of tablet PCs, there was a positive change in the students' classroom focus and motivation. The teachers had to be prepared for classes, which gave them the opportunity and ability to use class time efficiently, provide more examples about the topics and plan and apply activities more efficiently. Negative aspects of tablet PC use for teachers was that lack of computer efficiency caused some teachers do not know how to use computer very well and as they do not have the ability to prepare presentation, they lose time; on the other hand, to prepare one hour course content, they have to spend three or four hours. The teachers said tablet PC usage has positive and negative aspects and that sometimes students focus on lessons more and use the opportunity for research, but that sometimes students just use the Internet for extracurricular activities send messages to each other. One interviewed teacher reported that when students started using tablet PCs, their study habits were affected negatively and their inquiring and analyzing abilities decreased. The teacher gave an example supporting this view and said that: "When we ask a question or tell them to make a research about a topic, only one type of answer is given as they all use the same tool –Internet-. Either we research the topic all together in class or they answer through tablet PC without thinking or questioning the topic." The teachers were questioned about their expectations for the use of tablet PCs, and they stated that training on using a tablet PC and preparing a presentation should be provided. They also said that for sample in-class application and research, MNE should develop a portal, which would enable teachers to research related shapes,

videos and other needed information. They added that the Ministry should change the protocol that limits the teachers' use of computers according to its agreement with a private software company, and that the students' tablet PCs should be controlled by teachers (i.e., when the airplane mode is on students would be able to use the Internet however they want).

4. Conclusions and discussion

This study investigated students' attitudes and expectations of tablet PCs in the first year after initial tablet use in four pilot high schools. Most of the students who participated in the research also had personal computers, and their attitudes were formed by the project. The results show that the 206 students who participated in the study had a positive attitude towards this technology that they had used for 6–7 months, they liked studying using tablet PC and they were happy about using this technology. According to the comments of the students, the underlying reason why they had a positive attitude is that they found this product useful. According to the students, tablet PCs should be used in schools as they make education entertaining, and it is highly meaningful that tablet PCs end the necessity of carrying books because the textbooks are on the tablet PCs. This finding is in agreement with other studies ([Dündar & Akçayır, 2012](#)). Tablet PCs are much lighter than the normal computers and the numerous textbooks that students carry. Using tablet PCs is said to be highly practical and enjoyable, and students mentioned that homework is easier with tablet PCs. A number of students stated that their interest in classes increased with the use of tablet PCs, but other students reported a decrease in interest because the tablet PCs distracted them. Most of the students used their tablets during breaks instead of spending time with their friends, which increased antisocial behavior and decreased communication with friends.

Studies show that in general, male students' attitudes towards computers and similar technology products are more positive than the attitudes of female students ([Nelson & Cooper, 1997](#); [Sáinz & López-Sáez, 2010](#)). In this research, a meaningful difference between the attitudes of male and female students was not found. This finding results from the students having backgrounds of the same social and economic levels, the status of the schools used in the research being similar and/or that most of the students had a computer at home. The social status of students and having

a computer influence computer attitudes (Bovéé et al., 2007; Deyoung & Spence, 2004; Moore, 1994).

It is simple and inexpensive to access technology today, and the percentage of people having a computer has increased. In analyzing ownership of computers and similar products, it has been shown that male students have computers more than female students (Ordidge, 1997). Today female and male students' lives are saturated with technology, and students' abilities, attitudes and preferences toward technology have been profoundly affected (Thompson, 2013). The gap between male and female students are closing in terms of having a computer, and females are as familiar with and have as positive attitudes towards computers as males. Male and female students had similar average lengths of time with a tablet PC, which showed that there was not a meaningful gender difference in their attitudes toward tablet PCs because attitude towards a technology product is closely related to the length of time spent with it (Selwyn, 1998). The male and female students used the tablet PCs for the same purposes, which had the same role in the male and female students' lives and caused similar attitudes. Recent research has revealed changing attitudes among female students, and according to the study by Teo (2008), the relationship between computer attitudes and gender is not a clear-cut one.

The effect of the length of the students' daily computer and Internet use on their tablet PC attitudes was analyzed. Time spent using computer and the Internet at home positively affects students' attitude (Selwyn, 1998). We did not find a meaningful difference between the length of computer or Internet use and attitudes towards tablet PCs. Almost all of the participants used the Internet and computer actively, which shows that the students in the research are the same. Students from the same background in terms of technology have the same attitudes toward technology products (Akçayır, 2011).

The students' expectations and desires for tablet PC usage were researched, and students primarily wanted the restrictions on downloading external applications and Internet constraints to be removed (the filters are imposed by the MNE for tablet PC security). Updates are installed and resources are added to the tablets by the MNE, but the students want to access more course materials (educational videos, animations, and e-books) and want to use the Internet freely. Students think that they will use the tablet PCs more at home if there are sufficient material, resources and Internet access. Johnson, Levine, Smith, and Stone (2010) show that accessing online resources plays a key role in the progress of technology adoption and technology use. Students want to download the applications they want from the Android market. Because most of the courses and materials students use are in English, the application that they want most is an English-Turkish dictionary. They want office applications for doing their homework, and they especially think that the office applications will facilitate their studies. Studies show that access to educational resources is a vital factor in the integration of technology (Ertmer, 2005; Hew & Brush, 2007). Students want to have distributed or be able to buy pens for tablet PCs because they think it would be easier for them to take class notes. They mentioned that they cannot take notes easily without tablet PC pens, especially in mathematics courses.

Students reported some technical disabilities with their tablet PC use, including wanting to use portable devices such as memory sticks for data transfer between a computers and tablet. The current tablet PCs have a USB port, but it is disabled by the manufacturer at the direction of MNE. The tablet PC battery life is another issue, and during a long lesson the battery could be depleted. Students cannot charge their tablet PCs at school and must remember to charge the tablet at home. Technical restrictions and lack of course materials decrease the rate of tablet PC use by students.

Teachers were interviewed to analyze students' attitude towards tablet PCs in detail and to research the teachers' expectations and wishes, and the teachers' and students' comments parallel each other. The teachers also mentioned that classes were more enjoyable and students' motivation increased by tablet PCs usage; they also want additional materials for the tablet PCs. Teachers want more resource materials, and they think that the number of regular training seminars on the use of technology should be increased. Some teachers do not know how to use a tablet PC very well, and according to the teachers a notebook or desktop computer is much easy to use than a tablet PC. Some teachers have difficulty in preparing content and spend considerable time learn how to use tablets. Studies have shown that using technology in classes creates an additional workload, and teachers must make some preliminary preparations (Al-Fudail & Mellar, 2008).

Some teachers mentioned problems about the use of tablet PCs: including the following: some students did not use exhibit appropriate education us of the tablet PCs; some teachers did not allows the use of the tablet PCs during lessons because they were perceived as a distraction from the lesson topic for some students; and some teachers want to be able to control students' tablet PCs during lessons because they cannot monitor the screens of all the students.

The teachers and their students are content with the use of tablet PCs in classes. The students have positive attitudes towards tablet PCs. The teachers and students have expectations that this technology will increase efficiency in education. The teachers and students want additional materials for the tablet PCs. An agreement has been made between the MNE and the corporation that designs course materials to provide tablet PC applications, but the number of applications may not be enough. There must be special platform for students and teachers to share their slides, documents and other course material, and students must be able to download additional applications for their tablet PCs. The technical restrictions and obstacles must be solved based on the perspectives of the students and teachers. Students can connect to Internet access everywhere; however, because of filters, tablet PCs can only connect to the Internet at school. Battery charging stations for the students' tablet PCs should be established at schools. Teachers want seminars to gain experience for technology use. In this sense, teachers should be trained more frequently and more qualified regarding how to use tablet PCs. In addition to seminars, educational videos and handbooks concerning the technology use could be prepared by MNE. It is thought that making certain updates in line with these goals will increase the efficiency of tablet PCs in education.

References

- Akçayır, M. (2011). *The effect of using interactive whiteboard in mathematic lesson upon students' motivation, academic success and motivations*. Unpublished Master's Thesis, Gazi University, Institute of Educational Sciences, Turkey.
- Al-Fudail, M., & Mellar, H. (2008). Investigating teacher stress when using technology. *Computers and Education*, 51, 1103–1110.
- BECTA (2004). *Enabling teachers to make successful use of ICT*. <http://dera.ioe.ac.uk/1604/1/becta_2004_enablingsuccessfuluse_litrev.pdf> Retrieved 20.02.13.
- Bovéé, C., Voogt, J., & Meelissen, M. (2007). Computer attitudes of primary and secondary students in South Africa. *Computers in Human Behavior*, 23, 1762–1776.
- Colley, A. (2003). Gender differences in adolescents' perceptions of the best and worst aspects of computing at school. *Computers in Human Behavior*, 19, 673–682.
- Comber, C., Colley, A., Hargreaves, D. J., & Dorn, L. (1997). The effects of age gender and computer experience upon computer attitudes. *Educational Research*, 39(2), 123–134.
- Davies, J., & Brember, I. (2001). The closing gap in attitudes between boys and girls: A 5-year longitudinal study. *Educational Psychology*, 21(1), 103–114.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- Deyoung, C. G., & Spence, I. (2004). Profiling information technology users: En route to dynamic personalization. *Computers in Human Behavior*, 20, 55–65.

- Dündar, H., & Akçayır, M. (2012). Tablet vs paper: The effect on learners' reading performance. *International Electronic Journal of Elementary Education*, 4(3), 441–450.
- Durndell, A., & Thomson, K. (1997). Gender and computing: A decade of change? *Computers and Education*, 28(1), 1–10.
- Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4), 25–39.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Galligan, L., Loch, B., McDonald, C., & Taylor, J. A. (2010). The use of tablet and related technologies in mathematics teaching. *Australian Senior Mathematics Journal*, 24(1), 38–51.
- Gulbahar, Y. (2007). Technology planning: A roadmap to successful technology integration in schools. *Computers and Education*, 49(4), 943–956.
- Hall, I., & Higgins, S. (2005). Primary school students' perceptions of interactive whiteboards. *Journal of Computer Assisted Learning*, 21, 102–117.
- Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Education Technology Research and Development*, 55(3), 223–252.
- Huang, H. M., & Liaw, S. S. (2005). Exploring user's attitudes and intentions toward the web as a survey tool. *Computers in Human Behavior*, 21(5), 729–743.
- Isık, O. (2009). *Turkish EFL teachers' attitudes towards ICT integration in language classrooms*. Unpublished Master's Thesis, Uludağ University, Institute of Social Sciences, Turkey.
- Johnson, L., Levine, A., Smith, R., & Stone, S. (2010). *The 2010 horizon report*. Austin, TX: The New Media Consortium.
- Legris, P., Ingham, J., & Collette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information and Management*, 40, 191–204.
- Lim, C. P., & Khine, M. S. (2006). Managing teachers' barriers to ICT integration in Singapore schools. *Journal of Technology and Teacher Education*, 14(1), 97–125.
- Loch, B., & Donovan, D. (2006). Progressive teaching of mathematics with tablet technology. *Australasian Journal of Educational Technology*, 9(2), 1–6.
- Meelissen, M. R. M., & Drent, M. (2008). Gender differences in computer attitudes: Does the school matter? *Computers in Human Behavior*, 24, 969–985.
- MNE (2010). Akıllı tahta toplantısı. <<http://www.meb.gov.tr/haberler/haberayrinti.asp?ID=7464>> Retrieved 22.09.10.
- MNE (2012). *Fatih projesi pilot okullar listesi*. <<http://fatihprojesi.meb.gov.tr/tr/duyuruincele.php?id=14>> Retrieved 15.03.12.
- MNE (2013). *Milli eğitim istatistikleri*. <<http://sgb.meb.gov.tr>> Retrieved 29.07.13.
- Mohammed, M. (1994). Media utilization by faculty at the University of Qatar. *Educational Technology Research and Development*, 42(4), 108–119.
- Moore, C. (1994). Attitudes toward computers: the influence of sex stereotypes, experience, ownership and mathematics. *Unisa Psychologia*, 21(1), 20–27.
- Morris, S. A., Gullekson, N. L., Morse, B. J., & Popovich, P. M. (2009). Updating the attitudes toward computer usage scale using American undergraduate students. *Computers in Human Behavior*, 25, 535–543.
- Myers, J. M., & Halpin, R. (2002). Teachers' attitudes and use of multimedia technology in the classroom: Constructivist-based professional development training for school districts. *Journal of Computing in Teacher Education*, 18(4), 133–140.
- Nelson, L. J., & Cooper, J. (1997). Gender differences in children's reactions to success and computers. *Computers in Human Behavior*, 13(2), 247–267.
- Ng, W., & Nicholas, H. (2009). Introducing pocket PCs in schools: Attitudes and beliefs in the first year. *Computers and Education*, 52, 470–480.
- Ngai, E. W. T., Poon, J. K. L., & Chan, Y. H. C. (2007). Empirical examination of the adoption on WebCT using TAM. *Computers and Education*, 48, 250–267.
- OECD (2001). *The wellbeing of nations: The role of human and social capital*. Paris: OECD.
- Olivier, W. (2005). Teaching mathematics: Tablet PC technology adds a new dimension. In *Proceedings of the 8th International Conference on The Mathematics Education into the 21st Century Project: Reform, revolution and paradigm shifts in mathematics education* (pp. 176–181). Malaysia.
- Ordidge, I. (1997). IT's for girls-or is it? *Education and Training*, 1, 30–35.
- Osin, L. (1998). Computers in education in developing countries: Why and how? *Education and Technology Series*, 3(1), 1–14.
- Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers and Education*, 37, 163–178.
- Robertson, I., Calder, J., Fung, P., & O'Shea, T. (1995). Computer attitudes in an English secondary school. *Computers and Education*, 24(2), 73–81.
- Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press.
- Sáinz, M., & López-Sáez, M. (2010). Gender differences in computer attitudes and the choice of technology-related occupations in a sample of secondary students in Spain. *Computers and Education*, 54, 578–587.
- Schumacher, P., & Morahan-Martin, J. (2001). Gender, internet and computer attitudes and experiences. *Computers in Human Behavior*, 17, 95–110.
- Selwyn, N. (1998). The effect of using a home computer on student's educational use of IT. *Computers and Education*, 31, 211–227.
- Shapka, J. D., & Ferrari, M. (2003). Computer-related attitudes and actions of teacher candidates. *Computers in Human Behavior*, 19, 319–334.
- Shashaani, L. (1994). Socioeconomic status parents' sex-role stereotypes, and the gender gap in computing. *Journal of Research on Computing in Education*, 26(4), 433–451.
- Somyürek, S., Atasoy, B., & Özdemir, S. (2009). Board's IQ: What makes a board smart? *Computers and Education*, 53(2), 368–374.
- Statista (2013). *Tablet PC sales*. <<http://www.statista.com>> Retrieved 20.07.13.
- Teo, T. (2006). Attitudes toward computers: A study of post-secondary students in Singapore. *Interactive Learning Environments*, 14(1), 17–24.
- Teo, T. (2008). Assessing the computer attitudes of students: An Asian perspective. *Computers in Human Behavior*, 24, 1634–1642.
- Teo, T. (2009). Modelling technology acceptance in education: A study of preservice teachers. *Computers and Education*, 52, 302–312.
- Teo, T., Chai, C. S., Hung, D., & Lee, C. B. (2008). Beliefs about teaching and uses of technology among pre-service teachers. *Asia-Pacific Journal of Teacher Education*, 36(2), 163–174.
- Teo, T., Chai, C. S., & Lee, C. B. (2008). Understanding pre-service teachers' computer attitudes: Applying and extending the technology acceptance model (TAM). *Journal of Computer-Assisted Learning*, 24(2), 128–143.
- Teo, T., & Noyes, J. (2008). Development and validation of a computer attitude measure for young students (CAMYS). *Computers in Human Behavior*, 24, 2659–2667.
- Thompson, P. (2013). The digital natives as learners: Technology use patterns and approaches to learning. *Computers and Education*, 65, 12–33.
- Van Eck, E., & Volman, M. (2001). Gender equity and information technology in education: The second decade. *Review of Educational Research*, 71(4), 613–634.
- World Bank (1995). *Priorities and strategies for education: A World Bank review*. Washington, DC: World Bank.