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Tablets in Education: Outcome Expectancy and Anxiety of Middle School Students*

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Abstract

It is planned that every student in all primary, middle, and high schools (public schools) under the administration of the Turkish Ministry of National Education receive a tablet through the FATİH Project. Research shows that many teachers hold reservations toward students using tablets for educational purposes. The purpose of this study is to determine middle school students' perceptions regarding the integration of tablets into the learning process. Participants totaled 939 students in eight middle schools located in different cities throughout Turkey. Data were gathered through means of a survey (questionnaire) which included demographics like grade level and gender as well as items on tablet related issues and on student opinions. Two factors – outcome expectancy and tablet anxiety – were identified through an exploratory factor analysis. A confirmatory factor analysis was conducted afterward in order to confirm and exemplify factors and their items. Two measurement models were tested, the latter returning a good model fit. The MANOVA test results showed that grade level affected the opinions on outcome expectancy, while gender affected tablet anxiety. It was found that 7th graders were the most optimistic of all grades in terms of outcome expectancy and that males were more withdrawn. It was also found that students with previous tablet experience were more optimistic regarding outcome expectancy.

Keywords

Tablet PC, Anxiety, Outcome Expectancy, Middle School, Gender.

As technology has continued to advance at such a rapid pace over recent decades, educational and instructional techniques have undergone constant change based on these advancements. Thus, the use of computers and technological devices in education has gradually become more and more widespread. Following this trend, throughout Turkey, 570,000 classrooms within kindergarten, primary, middle and high schools are planned to receive LCD panel interactive whiteboards and Internet infrastructure through the FATİH Project, administered by the Ministry of National Education. Moreover, all

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teachers and students are planned to receive tablet PCs with middle school students to receive tablets within the third year of the project, and with students from other grades to receive later (FATİH Projesi, 2013). The project's underlying assumption is that students will use the tablets as intended. Yet, as it is argued "successful investment in technology can lead to enhanced productivity, while failed systems can lead to undesirable consequences such as financial losses and dissatisfaction" (Venkatesh, 2000, p. 342). In this respect, therefore, investigating middle school students' acceptance of tablets becomes important since the outcomes of such studies can provide clues as to the quality of how tables will actually be used upon introduction to the education process. While a significant body of research exists on the use of technological innovations and systems, such as TAM (Davis, Bagozzi, & Warshaw, 1989) and models of PC utilization (Thompson, Higgins, & Howell, 1991, 1994), literature on middle school students' acceptance of tablets is scarce. This study is an attempt to identify to what extent students accept using tablets by examining factors influencing students' outcome expectancy and anxiety.

Computer based education (CBE), a concept superior even to tablets, supports learning by allowing students to synthesize information audio-visually (Çekbaş, Yakar, Yıldırım, & Savran, 2003; Morgil, Yavuz, Oskay, & Arda, 2005). CBE allows for the utilization of laptops, tablets, and smart phones/pdas along with many other alternatives. It is being debated that CBE supports comprehension rather than memorization which therefore enhances student achievement as compared to traditional instruction (Çekbaş et al., 2003). Moreover, just as it provides opportunities for instruction to be customized for individual diversities, so are students able to repeat lessons in CBE. Nevertheless, one of the disadvantages of CBE is that the software and technology used by it is still not flexible enough and is unable to fully respond to instant qualitative data and needs (Morgil et al., 2005). In the same vein, tablet PCs are not immune to such shortcomings.

The screen sizes of such tools have been the subject of many research studies, gauging their appropriateness for education. Just as it is commonly understood that laptop screens can pose a barrier between students and the instructor; so are smart phones/PDAs' screens too small to write on in an efficient manner. It can therefore be argued that tablets, due to their larger screen size, are more suitable to serve as instructional tools in the classroom (Cicchino & Mirliss, 2004). However, tablets can pose other challenges for education, especially problems of comprehending information when reading from the screen. Both positive and negative opinions can be found in the literature on tablet use. For instance, a study was conducted on reading from tablet screens on 100 pre-service Turkish language teachers in Turkey. The results showed that teachers have both optimistic and pessimistic insights about reading from a tablet screen. Teachers think that reading from the screen helps them easily reach resources/publications, effectively make use of time, retain learning, and increase motivation for reading. On the other hand, they think that it negatively affects human social development, reading habits, and health (Maden, 2012).

On a study designed to determine 80 primary school teachers' opinions about the FATİH Project, teachers were asked open-ended questions. Data were analyzed through qualitative and quantitative analysis techniques. One of the questions inquired about the favorable and unfavorable aspects of the FATİH Project for students. Teachers believe that although the project might improve students' interest in lessons, it might reduce the amount of time they allot for reading books. Most teachers stated that the project would enrich the education process and that such education, implemented through technology, would help kids catch up with the necessities of today's world. Moreover, the study revealed that 69% of teachers' project-related concerns were about the use of tablets (Çiftçi, Taşkaya, & Alemdar, 2013). In another study, conducted in the pilot schools of the FATİH Project, it was found that students utilized tablets less than interactive white boards. The reason for which was argued to be based on the various difficulties related to the practical use of tablets (Pamuk, Çakır, Ergun, Yılmaz, & Ayas, 2013).

Kamacı and Durukan (2012) conducted a study on research assistants inquiring their opinions on the educational use of tablets. Data were gathered through semi-structured interviews with research assistants having mostly positive feelings, such as that using tablets in education increases achievement, it expedites accessing information, it will put an end to carrying books, and it would increase student engagement. On the other hand, it was found that it might reduce the value of reading books and the culture that it entails. Kenar (2012) administered an experimental study gauging parents' opinions on tablet use. He found that parents of 4th and 5th grade students who were taught

with tablets had more positive attitudes toward technology and its use in education. Similarly, in another experimental study conducted on 5th grade students, it was found that those students who used tablets had more optimistic attitudes toward tablet use in education (Batur, Gülveren, & Balcı, 2013).

Ng and Nicholas (2009) researched both primary school and middle school teachers' and students' opinions about pocket PCs, collecting data through interviews and observations. The pocket PCs that had been distributed to the schools in Ng and Nicholas's study have comparable features to the tablets distributed to the pilot schools via the FATİH Project. The results showed that the primary and the middle school teachers held similar opinions. Some of the emerging themes include pocket PCs' being tools motivating students to participate in the lesson, they are more useful for less successful students rather than more successful students, they appeal to all the senses of students during the lesson, and they provide opportunities for individualized learning. Parallel to the teachers, students also raised positive feelings with the following themes emerging based on the student data: tablets easily allow editing what has been written or drawn on the screen, the screen size does not pose a problem, interaction and sharing is easy on tablets, and they have small dimensions and are light weight, all of which are advantageous (Ng & Nicholas, 2009). Chen, Balijepally, and Sutanto (2012), too, indicate that students have positive feelings toward the use of tablets in education.

Table 1
Positive and Negative Opinions Regarding the Use of Tablets

	Maden (2012)	Çiftçi, Taşkaya, and Alemdar (2013)	Kamacı and Durukan (2012)	Ng and Nicholas (2009)
Make reaching information easier	X	X	X	
Help use time effectively	X			
Provide lasting learning	X			
Increase motivation toward lesson	X	X		X
Make it easier to share information	X			X
Are fun and useful for listening	X	X		
Economical for features like durability, functionality, weight, and price	X			
Do not require carrying a bag		X	X	
Easy to learn				
Enhance achievement			X	X
Reduce value, reliability, and quality of information	X			
Negatively impact health	X	X		
Negatively impact human social development	X	X		
Negatively impact reading habits	X	X	X	

Table 1 synthesizes the optimistic and pessimistic attitudes toward the use of tablets in education. Out of all the items, "tablets make it easier to reach information resources/publications," "tablets increase motivation toward the lesson," and "tablets impact reading habits negatively" are attention-grabbing as being frequently referred items.

Theoretical Framework

Compeau and Higgings (1995) claim, based on the Social Cognitive Theory of Bandura (1977), that an individual's behavior is a function of the environment; and that reciprocally, the environment is a function of individual's behavior. That is, certain characteristics of the environment affect an individual's behavior, such as his/her personality. Behavior also influences the environment in which the individual exists. Among many dimensions affecting behavior, two cognitive factors are the major cognitive forces: outcome expectations and computer self-efficacy. Compeau and Higgings (1995) show that *outcome expectations* influence actual technology use directly, while self-efficacy affects actual use indirectly through *anxiety*. Examining factors that influence outcome expectations and tablet anxiety can provide useful insights toward the actual use and acceptance of tablets in education. Therefore, the current study has focused on understanding the impact of gender, grade, tablet experience, and tablet ownership on participants' outcome expectations and tablet anxiety. The following entails brief descriptions and related research on the discussed terms.

Outcome Expectancy

Compeau, Higgings, and Huff (1999) define outcome expectancy as "the perceived likely consequences of using computers" (p. 147). It is considered to have two dimensions; the first being performance outcome expectations, which refer to task-related prospects, and the second being personal outcome expectations, which refer to individual goals. This study focuses on the use of tablets as a learning tool, and is, as such, an example of the former. Many terms are associated with the concept of outcome expectancy. Venkatesh, Morris, Davis, and Davis (2003) call it performance expectancy, "defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (p. 447). It is also linked to the constructs of perceived usefulness (Davis, 1989; Davis et al., 1989), extrinsic motivation (Davis, Bagozzi, & Warshaw, 1992), and job-fit (Thompson et al., 1991).

Outcome expectancy has been empirically linked to how one makes use of an innovation in his or her everyday life. It has also been associated with the behavioral intention to use an innovation. Compeau and Higgings (1995), for example, show a positive link between outcome expectancy and actual use; the greater the expectancy, the greater the possibility to use the respective innovation. Venkatesh et al. (2003) show that as performance expectancy increases, so does the behavioral intention to use a given piece of technology increase, which indirectly enhances the likelihood of it's being used. The relationship between expectancy and behavioral intention is subject to interaction among several dimensions, including gender and age. Males, especially young subjects, tend to have higher intentions as their level of expectancy increases (Venkatesh et al., 2003). Studies also show linkages between the tablet experience and the increased likelihood of outcome expectancy (Callum, 2011; Park & Pobil, 2013). Outcome expectancy shows variations based on gender (Kusano et al., 2013), despite the claim that no significant linkages between the two exists (Shashaania & Khalilib, 2001). Females are likely to have lower levels of outcome expectancy than males (Ong & Lai, 2006).

Tablet Anxiety

People experience anxiety when they believe that they are not competent to perform a certain behavior (Stumpf, Brief, & Hartman, 1987), which is the very notion linking it to the concept of self-efficacy (Compeau et al., 1999). Venkatesh (2000) calls it emotion when referring to anxiety about computers. Deriving from the Simonson, Maurer, Montag-Torardi, and Whitaker's (1987) definition of computer anxiety, tablet anxiety is "an individual's apprehension, or even fear, when she/he is faced with the possibility of using" tablets (Venkatesh, 2000, p. 349). "The behavioral manifestations of computer anxiety include avoidance of computers and minimization of any necessary interaction with computers" (Bozionelos, 2004, p. 726).

Anxiety has a negative effect on computer use (Bozionelos, 2004). Less anxious individuals perform computer tasks at a higher level performance (Bozionelos, 2004; Brosnan, 1998). Anxiety with technology impacts the intention to use technology indirectly through the perceived ease of use. People with higher anxiety perceive that technology is not easy to use, leading individuals to experience less desire to use computers (Venkatesh, 2000). Similarly, the amount of effort a person expects to exert on technology is a mediator between anxiety and intention to use the technology; and this relationship is mediated by gender, age, and experience. Males, young people, and more experienced people tend to have stronger intentions (Venkatesh et al., 2003). Yushau (2006) claims that ownership of and experience with computers are two important and interrelated factors in relieving computer anxiety. Computer anxiety is less in those individuals who own computers (Korobili, Togia, & Malliari, 2010; Tekinarslan, 2008). Although some positive relationships have been reported between experience and anxiety (Mahar, Henderson, & Deane, 1997), more evidence suggests that higher experience with computers reduces computer anxiety (Anthony, Clarke, & Anderson, 2000; Bozionelos, 2001, 2004; Broos, 2005; Chua, Chen & Wong, 1999; Todman & Monaghan, 1994; Wilfong, 2006). An interaction effect has also been reported indicating that although males' level of anxiety decreases as they become more experienced with computers, that females do not display the same tendency (Broos, 2005). Specifically, females appear to be more anxious in computer related tasks (Broos, 2005; Chua et al., 1999; Cooper, 2006; Durndell & Haag, 2002; Shu, Tu, & Wang, 2011; Singh, Bhadauria, Jain, & Gurung, 2013), despite the fact that some research suggests there to be no significant relationship between gender and anxiety (Tekinarslan, 2008; Todman & Monaghan, 1994). Research on the relationship between age and anxiety is less definitive (Powell, 2013). While Onifade and Keinde (2013) claim that the relationship is not significant, Powell (2013)

indicates that research is split between studies finding age to be positively related to anxiety and other studies finding non-significant relationships.

Most studies on technology acceptance focus on the utilization of computers, technological systems, or some other innovation. At the dawn of a large-scale technological investment like the FATİH project, it is important to understand to what extent students accept tablets in the education process since the findings of which may provide clues for the forthcoming actual use of such tablets. The fact that a significant portion of teachers have concerns about students' use of tablets (Çiftçi et al., 2013) is also a matter needing to be addressed. Therefore, the purpose of the current study is to determine middle school students' perceptions about integrating tablets into learning. In this context, the following research questions were examined:

1. What is the students' outcome expectancy regarding the use of tablets for instructional purposes?
2. Do students display anxiety about using tablets?
3. Do outcome expectancy and tablet anxiety have any differences based on core student demographics of grade level and gender? And do tablet experience and ownership have any effect in the same manner?

Method

Research Design

The survey research design was administered in this study. The main purpose of the survey design is to explain, in detail, the relationships in the settings. Most of the time, relationships among variables that are not formed as a result of any intervention, but which rather exist or develop naturally by themselves are those which are investigated (Çepni, 2005). In the current study, whether gender, grade level, tablet experience, and/or tablet ownership has any effect on the dependent variables was investigated. The independent variables of the study were not manipulated in any manner.

Participants

Middle school students in public schools – four in Bursa, one in each of Afyonkarahisar, Kayseri, Aydın, and Trabzon – were participants of the study. The participants were determined by convenience sampling based on personal contact. The target population of the study was middle school students in the Turkish public schools, although it is acknowledged that the results of the study would be generalizable to a limited portion of the population due to the convenience sampling used for the study. In order to meet the validity and reliability guidelines, the sample was chosen based on a 1:5 proportion. More than 1,200 students were targeted to participate voluntarily in the study so as to obtain at least 200 to 250 students as respondents. A total of 980 students responded to the survey. Cases that had missing values were excluded as explained in the Data Analysis section. There were 19 students who did not mark their gender, and 3 students who did not mark their grade level. The distribution of students based on gender and grade is seen in Table 2. As seen from the table, there are at least 73 students who are to be treated as different groups, providing a sufficient number for analyses to begin. Male to female ratio also appears to be balanced. It is important, here, to remember that the survey research studies, by definition, do not require participant numbers to be equal across the groups.

Table 2
Demographic Profile

	Female		Male		Total	
	N	N%	N	N%	N	N%
5th grade	115	27.8%	174	34.6%	289	31.5%
6th grade	127	30.7%	158	31.4%	285	31.1%
7th grade	99	23.9%	95	18.9%	194	21.2%
8th grade	73	17.6%	76	15.1%	149	16.2%
Total	414	100.0%	503	100.0%	917	100.0%

Instruments and Data Collection

The data were collected through a survey. The study was about student opinions and it was planned to reach a large number of participants. Since it was not fiscally feasible for the researchers to travel to the specified provinces, one of the best ways to obtain data about the opinions of large samples while not being present is the survey method. Surveys allow for standardized measures. "Standardized measurement that is consistent across all respondents ensures that comparable information is obtained about everyone who is described. Without such measurement, meaningful statistics cannot be produced" (Fowler, 2009, p. 3). Therefore, the survey method was preferred as the data collection method.

The survey contained two sections; the first section included items on student demographics, such as grade level and gender and also included items on

tablet-related issues, such as possessing a tablet and ever using a tablet before. The second section included 25 Likert type items concerning expectations of students on the instructional use of tablets, the general use of tablets, and students' level of anxiety about tablet use. During the development of the survey items, opinions of four students from the target audience, two subject matter experts, and one Turkish language teacher were acquired. Afterward, a pilot study also was conducted on 12 students from the target audience, and after the conclusive expert review, the survey was brought to its final form. In the survey, items like "The touchable nature of the screen grants ease of use" and "It is difficult to take notes in tablets" were presented with a 5-point scale in which 1 meant "strongly disagree" and 5 meant "strongly agree." The survey was prepared both as a printed and in an online form, with both versions being administered. The process of the survey development, then, can be listed in the following order.

1. The survey items were prepared by taking into account the views of students who had the same characteristics as the sample.
2. The survey items included both positive and negative statements, which two subject matter experts reviewed.
3. Edits were made on the survey items based on the comments made by the subject matter experts. Edits involved inclusions such as the definition of tablet being added to the beginning of the survey form. Edits also involved changes such as presenting the label "strongly disagree" instead of simply 1, and presenting the label "strongly agree" instead of simply 5.
4. A Turkish language teacher reviewed the survey form and suggested using terms such as "long lasting" instead of "difficult to forget;" and "It would not negatively affect my desire" instead of "It would not affect my desire."
5. Two months before the actual survey was implemented, the survey was piloted on 12 students who had the same characteristics as the sample.
6. Some terms were replaced by more user-friendly words, such as "tablet computer" being preferred instead of "tablet PC."

The survey was administered during spring 2013 via two mediums: an online and a paper-based form. There were 601 online and 379 paper-based respondents. It took about 20 minutes for a participant to complete the survey. As described in the Data Analysis section, the survey items were subject to both an exploratory factor analysis and a confirmatory factor analysis. The final exploratory factor analysis returned a two-factor structure, explaining 51.21% of the total variance. The coefficient alpha reliability of all items in the survey was .87. The two factors named "Outcome Expectancy" and "Tablet Anxiety" had coefficient alpha reliability values of .90 and .70, respectively, based on the confirmatory factor analysis.

The factor scores were obtained by mean scoring the related items so that the factor scores might fall between a minimum of 1 and a maximum of 5. For "Outcome Expectancy," a score 1 indicated that the student believed that using tablets would not help him or her to attain learning gains, whereas 5 meant that the student believed that the tablets would help him or her to attain learning gains. For "Tablet Anxiety," a score 1 meant that the student had no anxieties about using a tablet, whereas 5 meant that the student was extremely anxious about using a tablet. The details of the factor loadings and scoring have been provided in the Results section.

Data Analysis

Most statistical analyses require data to be normally distributed. The skewness values ranged from -2.08 to .94; and the kurtosis levels ranged from -1.57 to 2.82. The values were at an acceptable level to perform structural analyses according to Kline (2005). An exploratory factor analysis was run in order to determine under how many factors the items should be categorized. Two models were formed and tested through a confirmatory factor analysis based on the factors emerging from the exploratory factor analysis, after which two separate MANOVAs were run in order to identify the effect of various independent variables on factor mean scores. Finally, after the MANOVAs were run, in order to analyze the relationship between the interacting variables, ANOVAs and post-hoc analyses were performed. While the confirmatory factor analysis was conducted using AMOS, all other analyses were conducted using SPSS. There were 980 cases obtained through the survey. In order to obtain robust results in AMOS, those cases having missing values in the second section of the survey – itself consisting of the 25 survey items and forming the bases for the confirmatory factor analysis – were excluded from the statistical analyses. Therefore, the analyses began with 939 cases. No intervention was done on the missing values of the first section of the survey. The details of all these analyses were explained in the Results section as appropriate.

Results

Table 3
Rotated Component Matrices for Exploratory Factor Analyses

	Components of the First Factor Analysis [a]			Components of the Second Factor Analysis [b]	
	1	2	3	1	2
Item14	.839			.834	
Item15	.832			.831	
Item18	.819			.817	
Item23	.817			.815	
Item19	.805			.802	
Item21	.802			.801	
Item6	.781			.780	
Item2	.779			.779	
Item3	.771			.772	
Item12	.766			.770	
Item9	.766			.766	
Item1	.705			.720	
Item5	.689			.706	
Item25	.679			.668	
Item10	.594			.611	
Item22	.492			.498	
Item20		.748			.738
Item13		.726			.712
Item11		.628			.642
Item7		.616	.302		.633
Item4		.574			.591
Item17		.572			.560
Item24		.508			.510
Item16		.384			.383
Item8	.308		.738	Item excluded	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Only the factor loadings .3 or more were shown.
[a] Rotation converged in 5 iterations.
[b] Rotation converged in 3 iterations.

An exploratory factor analysis was performed in order to determine how the collected data should be organized under various factors. Three factors emerged in the first run of the factor analysis (see Table 3). However, only one of the items of the last factor had a high factor load. This item and the other acceptable item of the last factor were both loading on the other factors. When the analysis was repeated after excluding this item, the factors were grouped under two factors. The first group was composed of items regarding both the general expectations that students had concerning tablets as well as what expectations they had regarding tablets' effects on the learning process. This group was called "Outcome Expectancy." The second group consisted of the anxieties regarding tablet use, and was called "Tablet Anxiety."

In order to settle the factors and their items, a confirmatory factor analysis was performed after the exploratory factor analysis. A model (Model 1) was tested with the items and the related factors. Although some of the analysis' results returned significant values, it was found that Model 1 did not have a good model fit (χ^2 = 967.932; *df* = 251; $p <$ .05; RMSA = .055, CFI = .937, TLI = .930). Factor loadings ranged from .58 to .82 for "Outcome Expectancy," and from .25 to .69 for "Tablet Anxiety" with a covariance of -.20 between the factors.

The model was reviewed for possible problems along with the modification index. The researchers decided to exclude the items that were insufficiently loading on the "Tablet Anxiety" factor and which had a high correlation with the other factor. In particular, it was seen that Item13 and Item16 were loading not only on their own factor, but also on the other factor. These also had high correlations with many other items. Since Item16, Item17, and Item24 had low factor loadings, these items were excluded from the analysis. An example of the remaining "Tablet Anxiety" items is "I avoid using tablets because of their possibility of crashing." In order to conform to the theoretical framework of the study, the researchers decided that those items which better expressed students' expectations regarding the gains that tablets' might bring to the learning process itself were kept in the analysis and that the other, more general items such as "It is advantageous for tablets to be mobile and light," were excluded. An example of the remaining "Outcome Expectancy" items is "Using tablet enables learning content faster." After these revisions were made, the new model (Model 2) was tested, with results showing that the model had a good model fit (χ^2 = 32.792; *df* = 26; $p > .05$; RMSA = .028, CFI = .992, TLI = .989). (See Figure 1).

The expected model fit values and the values obtained from the confirmatory factor analysis were given side by side in Table 4. The model fit was tested against the expected values.

Table 4
Model Fit Values

		Observed Values	
Model Fit Index	Expected Values	Model 1	Model 2
χ^2 (Chi-square)	Insignificant [a]	967.932 ($p < .05$)	32.792 ($p > .05$)
TLI	≥.95 [c]	.930	.989
CFI	≥.90 [b]	.937	.992
RMSEA	≤.06 [c]	.055	.028

[a] McDonald and Ho (2002), [b] Usluel, Aşkar, and Baş (2008), [c] Hu and Bentler (1999)

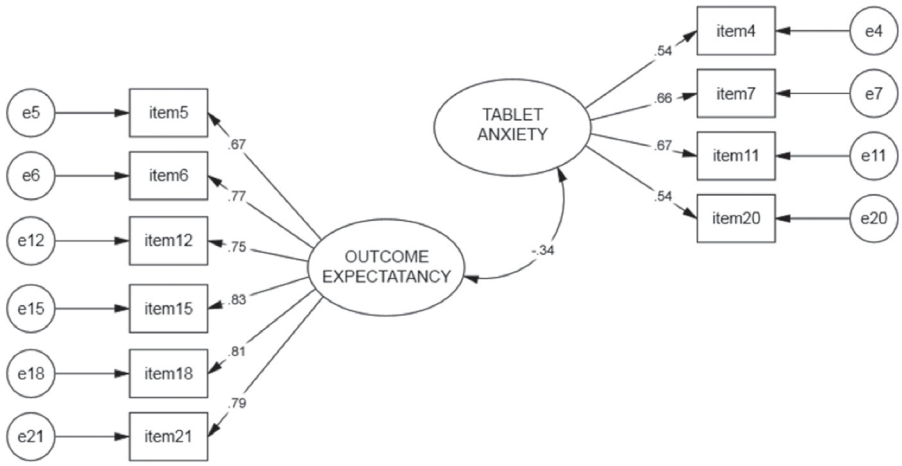

Figure 1: Improved Factor Structure (Model 2) – Standardized Coefficients

After the items forming the factors were reviewed, mean factor scores were calculated for "Outcome Expectancy" and "Tablet Anxiety." Table 5 shows the student distributions and factor mean score distributions according to the independent variables and based on the newly formed factor structure. The data comes from 414 female and 503 male students, making a total of 917 students. It was mentioned under the Data Analysis section that a total of 939 cases had been included in the factor analyses. The reason that the numbers do not match is that the students who had missing values in the first section of the survey were not excluded from the analyses. Some students did not mark their gender and grade level in the survey form. SPSS automatically excludes cases with missing values from the analyses.

The descriptive values in Table 5 show that female students are more optimistic about "Outcome Expectancy" in comparison to the male students. Moreover, both 5th and 7th graders who own tablets, and 6th and 8th graders who do not own tablets exhibit higher, more positive levels of "Outcome Expectancy" as compared to other students. It is seen from the table that while 8th grade students exhibit higher levels of "Tablet Anxiety" than the others students, the 7th graders have the least.

Two MANOVA tests were run using the mean factor scores. While the factor mean scores were entered into the analyses as the dependent variables, grade level and gender were entered as the independent variables. Moreover, in the first MANOVA test, the status of "tablet experience" (whether the student had ever used a tablet or not) was the additional independent variable. Similarly, in the second MANOVA test, "tablet ownership" (whether students, or their family, owned a tablet themselves or not) was included as the additional independent variable. The results are seen in Table 6. The reason for running two separate MANOVA tests is that there is almost no possibility for a student to have a tablet PC at home without having ever used it. In such a case therefore, because there would not be a student falling into the "has a tablet," and "did not use a tablet," it would not be meaningful to investigate this condition while performing the statistical analyses.

In the first MANOVA test, grade level (*Wilks' Lambda*=.99; $F(6; 1800)=2.31$; $p < .05$) and gender (*Wilks' Lambda*=.99; $F(2; 900)=4.69$; $p < .05$) returned significant results. Owning a tablet PC did not have any impact on the dependent variables. Univariate analyses showed that grade level impacted the "Outcome Expectancy" variable $F(3; 901)=3.82$; $p < .05$. They also showed that gender impacted the "Tablet Anxiety" variable $F(1; 901)=8.34$; $p < .05$. The post-hoc tests indicated two sub groups for the grade level – the first group included 5th, 6th, and 7th grades; the second group included 5th, 6th, and 8th grades. The mean score values of under the "Outcome Expectancy" factor turned out to be significantly different for 7th (M = 4.44) and 8th grade (M = 4.12) students (see Table 5). Based on these results, it is possible to say that 7th grade students are the most optimistic in regard to tablets' usage for learning purposes. Regarding the "Tablet Anxiety" factor, it was seen that the mean score for females (M = 2.31) was significantly less than the mean score for males (M = 2.45) (see Table 5). Thus, females have less anxiety about using tablets than do males.

Table 5
Mean Scores Regarding "Outcome Expectancy" and "Tablet Anxiety"

		Have Tablet at Home?						*Ever Used Tablet?*								
		Yes			*No*			*Yes*			*No*			*Total*		
		N	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*
OUTCOME EXPECTANCY																
5th grade	Female	27	4.36	.82	88	4.38	.86	83	4.42	.76	32	4.28	1.05	115	4.38	.85
	Male	41	4.43	.88	133	4.28	.90	115	4.43	.87	59	4.09	.91	174	4.32	.89
	Total	68	4.41	.85	221	4.32	.88	198	4.43	.82	91	4.16	.96	289	4.34	.87
6th grade	Female	26	4.03	1.35	101	4.25	1.11	80	4.27	1.10	47	4.09	1.26	127	4.20	1.16
	Male	22	4.10	1.20	136	4.21	1.10	84	4.44	.89	73	3.92	1.27	158	4.19	1.11
	Total	48	4.06	1.27	237	4.23	1.10	164	4.36	1.00	120	3.99	1.26	285	4.20	1.13
7th grade	Female	14	4.63	.54	85	4.49	.93	55	4.60	.90	44	4.39	.85	99	4.51	.88
	Male	14	4.57	.79	81	4.33	1.09	63	4.56	.89	32	3.99	1.26	95	4.37	1.05
	Total	28	4.60	.66	166	4.41	1.01	118	4.58	.89	76	4.23	1.05	194	4.44	.97
8th grade	Female	14	4.54	.54	59	4.19	1.08	38	4.46	.76	35	4.04	1.20	73	4.26	1.01
	Male	14	3.61	1.58	62	4.07	1.18	44	4.23	1.16	32	3.64	1.34	76	3.98	1.27
	Total	28	4.07	1.25	121	4.13	1.13	82	4.34	.99	67	3.85	1.27	149	4.12	1.15
Total	Female	81	4.33	.97	333	4.33	1.00	256	4.42	.91	158	4.20	1.10	414	4.33	.99
	Male	91	4.25	1.11	412	4.24	1.05	306	4.43	.93	196	3.94	1.18	503	4.24	1.06
	Total	172	4.29	1.04	745	4.28	1.03	562	4.43	.92	354	4.06	1.15	917	4.28	1.03
TABLET ANXIETY																
5th grade	Female	27	2.35	.91	88	2.31	.92	83	2.34	.92	32	2.26	.91	115	2.32	.91
	Male	41	2.65	1.12	133	2.39	1.10	115	2.43	1.17	59	2.5	.97	174	2.45	1.11
	Total	68	2.53	1.05	221	2.36	1.03	198	2.39	1.07	91	2.41	.95	289	2.40	1.03
6th grade	Female	26	2.08	1.05	101	2.63	1.11	80	2.41	1.10	47	2.7	1.13	127	2.51	1.12
	Male	22	2.55	1.21	136	2.37	1.11	84	2.3	1.21	73	2.5	1.03	158	2.40	1.12
	Total	48	2.29	1.14	237	2.48	1.12	164	2.35	1.15	120	2.58	1.07	285	2.45	1.12
7th grade	Female	14	2.14	.72	85	2.12	1.09	55	2.01	.97	44	2.27	1.12	99	2.13	1.04
	Male	14	2.41	1.52	81	2.27	1.10	63	2.26	1.16	32	2.34	1.17	95	2.29	1.16
	Total	28	2.28	1.18	166	2.19	1.09	118	2.15	1.08	76	2.3	1.13	194	2.21	1.10
8th grade	Female	14	2.32	.99	59	2.17	.90	38	2.09	.88	35	2.32	.94	73	2.20	.91
	Male	14	3	1.35	62	2.73	1.08	44	2.76	1.20	32	2.81	1.05	76	2.78	1.13
	Total	28	2.66	1.21	121	2.46	1.03	82	2.45	1.11	67	2.56	1.01	149	2.49	1.07
Total	Female	81	2.22	.93	333	2.33	1.04	256	2.25	.99	158	2.41	1.05	414	2.31	1.02
	Male	91	2.64	1.24	412	2.41	1.10	306	2.41	1.19	196	2.52	1.04	503	2.45	1.13
	Total	172	2.44	1.12	745	2.38	1.08	562	2.34	1.11	354	2.47	1.05	917	2.39	1.08

Table 6
MANOVA results for "Outcome Expectancy" and "Tablet Anxiety"

Effect	*Wilks' Lambda*	*F*	*df*	Error *df*	*p*
MANOVA 1					
Intercept	.06	6995.67	2	900	.00
Grade Level	.99	2.31	6	1800	.03
Gender	.99	4.69	2	900	.01
Tablet Ownership	1.00	.25	2	900	.78
Grade Level * Gender	.99	1.12	6	1800	.35
Grade Level * Tablet Ownership	.99	1.03	6	1800	.40
Gender * Tablet Ownership	1.00	1.16	2	900	.32
Grade Level * Gender * Tablet Ownership	.99	1.12	6	1800	.35
MANOVA 2					
Intercept	.04	11183.11	2	899	.00
Grade Level	.99	2.24	6	1798	.04
Gender	.99	4.31	2	899	.01
Tablet Experience	.97	13.38	2	899	.00
Grade Level * Gender	.99	2.03	6	1798	.05
Grade Level * Tablet Experience	1.00	.51	6	1798	.80
Gender * Tablet Experience	.99	2.22	2	899	.11
Grade Level * Gender * Tablet Experience	1.00	.22	6	1798	.97

In the second MANOVA test, in addition to the variables of grade level (*Wilks' Lambda*=.99; $F(6; 1798)=2.24$; $p < .05$) and gender (*Wilks' Lambda*=.99; $F(2; 899)=4.31$; $p < .05$), the variable of "tablet experience" (*Wilks' Lambda*=.97; $F(2; 899)=13.38$; $p < .05$) also returned significant results. Additionally, an interaction effect was observed between grade level and gender (*Wilks' Lambda*=.99; $F(6; 1798)=2.03$; $p < .05$). Univariate analyses confirmed the effect of grade level on "Outcome Expectancy" $F(3; 900)=2.93$; $p<.05$ and the effect of gender on "Tablet Anxiety" $F(1; 900)=6.07$; $p<.05$, similar to the way observed in the first MANOVA test. They also showed a significant relationship between gender and "Outcome Expectancy" $F(1; 900)=4.54$; $p<.05$. It was found that the interaction effect between grade level and gender was valid only for "Tablet Anxiety" $F(3; 900)=3.71$; $p<.05$. Post-hoc tests were also conducted, revealing that for the "Outcome Expectancy" factor, students' grade levels were broken down into the same categories as in the first MANOVA test. The second MANOVA test also revealed that females (M = 4.33) have significantly greater "Outcome Expectancy" than do males (M = 4.24) (see Table 5). The impact of gender on "Tablet Anxiety" was the same as in the first MANOVA test.

In order to investigate the impact of the interaction between grade level and gender on "Tablet Anxiety," a new independent variable composed of eight options was formed which also consisted of combinations of each variables' options (i.e. "male and 7th grade," "female and 8th grade," etc.). Then an ANOVA test was run where the "Tablet Anxiety" was the dependent variable and the newly formed variable was the independent variable $F(8; 930)=2.75$; $p < .05$. The post-hoc tests divulged that females in 7th grade (M = 2.13) and 8th grade (M = 2.20) exhibited lower levels of anxiety about tablets than did males in 8th grade (M = 2.78) (see Table 5). Finally, the results for "tablet experience" were explored. The univariate analyses unearthed that "Outcome Expectancy" is affected based on whether the student had previously used a tablet or not. As seen from Table 5, students who had previously used a tablet (M = 4.43) had more positive "Outcome Expectancy" as compared to those students who had never used a tablet before (M = 4.06).

Conclusion and Discussion

Overall, the results indicate that students were quite positive about tablets in education. The mean scores for "Outcome Expectancy" fall between "somewhat agree" and "strongly agree" according to the Likert scale for both males (M = 4.24) and females (M = 4.33), with results being closer to "somewhat agree." The mean scores for "Tablet Anxiety" fall between "somewhat disagree" and "undecided" according to the Likert scale for both males (M = 2.45) and females (M = 2.31). Students' levels of anxiety about using tablets are rather low. In order to provide a sense of this, when the values are compared to each other, it is seen that "Outcome Expectancy" values are proportionately greater than "Tablet Anxiety" values. In other words, students' positive attitudes are confirmed by the scarcity of anxiety exhibited. These results, contradicting those in the literature (Çiftçi et al., 2013; Pamuk et al., 2013), show that students have rather positive notions about using tablets in the educational process. Nevertheless, the significant differences existing among students' thoughts require further contemplation.

The most important of such differences is that those students who had previously used a tablet had greater mean scores for "Outcome Expectancy" and therefore consider tablets appropriate for learning, at least more so than those who had not. The influence of tablet experience, therefore, agrees with the literature (Callum, 2011; Park & Pobil, 2013). Based on this finding, it would be reasonable to infer that before suddenly and heavily employing tablets for instructional activities, students should be provided tablets for regular, everyday purposes. In other words, students should become accustomed to using tablets before actually being required to do anything involving tablets. Kenar (2012) and Batur et al. (2013) also report improvements in student attitudes after having been provided opportunities to use tablets in experimental settings.

Experience with tablets, on the other hand, did not have any impact on the "Tablet Anxiety" scores, despite the fact that most literature reports a negative relationship (see for example Wilfong, 2006). One speculation is that having no experience with tablets would not mean the students are completely isolated from tablets. Almost all smart phones on the market today have the same features as the tablets. It could be speculated that at least some of the students who reported no tablet experience would possibly have had experience with a smart phone, either because they or their parents own one. This might have reduced the degree of influence that students' experience with tablets had on the dependent variables. This logic also makes sense for tablet ownership results as tablet ownership did not affect any of the dependent variables, either. For a large portion of the students therefore, owning a tablet PC might no longer be an issue.

Both MANOVA tests indicate that female students appear to have significantly less "Tablet Anxiety" than do male students. The difference between genders increases especially among 8th graders due to the interaction effect. The results disagree with the vast majority of previous research which claim that females display higher levels of anxiety (Broos, 2005; Cooper, 2006; Chua et al., 1999; Durndella & Haag, 2002; Shu & Wang, 2011; Singh et al., 2013). Chen et al. (2012) reports that males usually have more experience using tablets than do females and that males' knowledge on tablets is superior to that of females. In the current study however, the percentage of females who had previously used a tablet was slightly greater than the percentage of males who had previously used one, as per the survey's simple descriptive statistics (see Table 5). After accounting for tablet experience, the second MANOVA test showed that females have significantly greater "Outcome Expectancy," too. The fact that experience promotes "Outcome Expectancy" (Callum, 2011; Park & Pobil, 2013) and that females have more experience, allows researchers to speculate that females' low level of "Tablet Anxiety" could be due to their superior experience with the tablets, as well.

The results for the grade variable showed similar patterns across the MANOVA tests. Grade affected "Outcome Expectancy," with 8th grade students being the least supportive toward the instructional use of tablets, and the 7th graders being the most supportive. Venkatesh et al. (2003), for example, reported that younger people tend to have a greater intention to use technology as compared to older people. However, the results were not directly proportional to grade level in the current study. Specifically, 5th and 6th graders' "Outcome Expectancy" levels were not significantly different from 7th and 8th graders'. Also, grade level did not affect "Tablet Anxiety," other than via the interaction effect that was explained above with 7th and 8th graders representing the two peaks. Such fluctuating results are perhaps due to the fact that students at this age are transitioning into maturity. More inquiry is necessary in order to better explain the nature of the relationship between grade and dependent variables.

Based on the data collected, middle school students support the use of tablet PCs in instructional activities. Although they have abstentions, they do not have overly distressing concerns about using tablets. When they do however, males appear to need more support in transitioning to learning with tablets than do females, as their concerns are greater. Furthermore, although 7th grade students are the most optimistic of all students, grade level – or in other words, student age – is open to further exploration because it points to various interactions and fluctuations. Future research, possibly being experimental in nature and bringing more independent variables into the model, can be helpful to identify possible connections. Efforts can also be directed toward improving instruments to measure "Tablet Anxiety" since it had a relatively lower reliability score and low factor loadings compared to the other factor. Compeau and Higgings (1995) also report low scores on anxiety and connect this to the multi-dimensionality of the construct. They found in their study that the anxiety construct had sub-dimensions such as a desire to learn more about computers and beliefs about learning to use computers. Accounting for the different dimensions of anxiety might improve the variance and relationships it explains.

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