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Effectiveness of Tablet PCs in the Classroom: A Turkish Case

Ýlhan VARANK[1], Sabiha YENI[2], Zeynep GECÜ[3]

Abstract

Due to their innovative features, tablet PCs have rapidly taken their places in the classrooms as the potential instructional tools that may address some problems associated with traditional lecture-based pedagogy. The purpose of this case study is to investigate to what extend the use of tablet PC facilitates instructional processes in the classroom and to what extend it affects students' performance expectancy, effort expectancy, attitude and behavioral intention. A qualitative approach was used to analyze the data. A total of 32 traditional-aged sophomore students at a teacher training program from a north-western Turkish university participated in the study. It was found that the students' performance expectancies, effort expectancies and attitudes toward the use of tablet PCs in education were not high. However, though the students had unpleasant experiences with tablet PCs in the instruction they were not pessimistic about using tablet PCs outside of the classroom.

Keywords: tablet PC, classroom use, effectiveness, instructional use, learning outcomes, instruction, university.

Introduction

Due to their innovative features including sensitive touch screen, flat design and digital hand writing/drawing, tablet PCs have rapidly taken their places in the classrooms as the potential instructional tools that may address some problems associated with traditional lecture-based pedagogy (Anderson *et al.*, 2007; Pietzner, 2014). Consequently, several research studies have been conducted to in-

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vestigate the impacts of tablet PCs on students' perceptions and performances, instructors' experiences, and learning environments.

Derting and Cox (2008) claim positive impacts of tablet PCs on students' perceptions and performances. For instance, they found that tablet PCs positively affected students' learning in an introductory organic chemistry course by enriching the learning environment and also the students showed better reactions to the instruction and learning outcomes. Students were overwhelmingly in favor of introducing tablet PCs to the classrooms because of different instructional scenarios they could support, including presenting information with hand writing/drawing function, recording lectures, soliciting active participation from all students, conducting real-time assessments of student learning, and providing instant feedback and assistance to maximize learning performances (Xiang *et al.*, 2009)

Digital ink-based interactive classroom presentation systems, tablet PCs provide, improved the learning performances of students through increasing their focus and attentiveness in the classroom, providing immediate feedback to both students and instructors about students' misunderstandings, enabling instructors to adjust course materials in real–time according to students' answers and increasing student satisfaction (Koile & Singer, 2006). Similarly, electronic notes integrating podcast and slides with digital ink improved students' attitudes toward the combination of tablet-based instruction and audio podcasting (Lyles *et al.*, 2007).

Students believed that the feedback provided with tablet PCs might contain clear information as well as a human touch for online assignments. Moreover, faculty members reported the ease of using tablet PC technology increased the efficiency by providing more detailed digital feedback with digital ink (Gorgievski *et al.*, 2005). In addition, Anderson *et al.* (2007) contented that the classroom presentation systems supporting share of digital ink on slides between instructors and students made students enjoy seeing their work displayed and provided students time and chance to think more on questions and submit a response. If the digital ink feature is used to present mathematical concepts in lectures to foster interactive teaching and learning, educators move away from the traditional didactic teaching method currently prevalent in university education (Gupta, 2009). Students perceived that tablet PCs were the medium to provide written comments with digital ink resembling the paper/pen format the most natural medium for providing written comments (Pérez-Quiñones, &Turner, 2004). Students preferred replacing blackboard with tablet PCs to integrate live, handwritten material with slides and figures prepared in advance. By this way, the lectures can be easily captured to view at another time (Mock, 2004).

When given the chance, students may opt to use tablet PCs in the classroom. Those students voluntarily using tablet PCs in the classroom appeared to have positive dispositions towards the use of tablet PCs measured by technology

attitude and performance expectancy surveys (Moran *et al.*, 2010). Another study, examining students' perceptions about tablet PCs as an instructional tool in presenting and covering instructional materials in an undergraduate calculus course, revealed that the students perceived tablet PCs as tools creating an active learning environment supporting motivation and learning in a large group lecture format (Gorgievski *et al.*, 2005). Moreover, Derting and Cox (2008) emphasized that tablet PCs can enrich learning environment in which the product of lectures have been transformed positively in terms of student reaction and learning outcomes.

Some common uses of tablet PCs by faculty members emerged such as converting instructional resources to electronic or digital ones and using handwriting on the screen during instruction (Lim, 2011), which might result in significantly reduced time needed for effectively teaching concepts and provide additional time to conduct more interactive instructional activities for active student engagement such as problem solving (Anderson *et al.*, 2007). It is expected that due to positive teaching experiences with instructional activities for active student engagements, some faculty members have remained enthusiastic about using tablet PCs in the classroom as a course delivery tool (Le Ber *et al.*, 2008; Lumkes, 2009). Research results suggested that in multiple tablet classroom students were benefiting from the archived notes and interpretation of the instructor to engage students through the use of tablet PCs. Additionally, tablet PCs allowed students to pay more attention and helped them understand the course materials better and helped instructors cover the materials more efficiently (Fister & McCarty, 2008).

It was discovered that students were in favor of introducing tablet PCs to lecture rooms and distance education. The use of wireless tablet PCs improved the interactivity between teachers and students, through illustration of concepts, feedback on assignments, presentation medium with hand-drawing functionality, lecture recording tools and tools to solicit active participation from all students. A statistically significant positive impact on student performance and on the student learning experience in the interactive classroom environment was found (Xiang *et al.*, 2009). Siozos *et al.* (2009) investigated the effects of a computer based assessment application called *My Test* in their study which was developed by using participatory methodology. My Test was developed for tablet PC platform which provided digital ink capabilities and enabled the transfer of traditional assessment practices to computer-based ones. As a result, the tablet PC platform rendered the My Test more useful for the students.

However, Corlett and Sharples (2004) contented that there was no evidence supporting the notion that using tablet PCs in the classroom itself radically changed or enhanced student learning in an environment where students were provided with a set of collaboration and knowledge-management tools on tablet PCs to support informal aspects of their learning. Thus, the purpose of this case study is to further investigate to what extend the use of tablet PC facilitates

instructional processes in the classroom and to what extend it affects students' expectancy, effort expectancy, attitude and behavioral intention.

Methodology

A qualitative case design is grounded for this study. Marshall and Rossman (2009) argued that a qualitative case study in social sciences enabling detailed investigation in authentic settings. This research method was chosen because it is appropriate for investigating "phenomenon that is inherently bounded with a finite amount of time for data collection or a limited number of people who could be interviewed or observed" (Merriam, 1998, p. 27). In addition, Yin (2009) underlined that case study can be used when variables and contexts cannot be separated and the context representing complex events and environments is authentic (Bogdan & Biklen, 2006). This study is conducted in a specific and authentic context of a regular college course offered in a Turkish university with limited number of the enrolled students during a regular course semester.

Participants

A total of 32 traditional-aged sophomore students at a teacher training program from a north-western Turkish university participated in the study. The students were from the Department of Computer Education and Instructional Technology and they enrolled in a four-credit mandatory educational technology course that titled Material Design and Use in Education.

Data Collection Instruments

A self-reporting survey instrument was used to collect the data. The instrument was composed of two sections. The first section included the following questions on the students' gender and experiences with the devices that have touch screens: (1) What is your gender? (2) Did you have an experience before with a device that has touch screen (such as mobile phone etc.)? (3) Did you write on a touch screen before? (4) Did you use tablet PC before?

The second section included the following eight expressions grouped under four categories the students were asked to respond to:

Category 1: Performance expectancy toward the use of tablet PC in education (1) The use of tablet PC positively/negatively affected my success in the classroom because…; (2) The use of tablet PC positively/negatively affected my productivity in the classroom because…

Category 2: Effort expectancy toward the use of tablet PC in education: (1) While using tablet PC I did/did not experience difficulties because...

Category 3: Attitude toward the use of tablet PC in education: (1) I did/did not like to use tablet PC in the classroom because…; (2) The use of tablet PC did/did not make the lesson enjoyable because…; (3) The use of tablet PC did/did not make me feel anxious, stressed and concerned because…

Category 4: Behavioral intention of the use of tablet PC: (1) I would/would not like to use tablet PC outside of the classroom because…; (2) I would/would not like to prefer tablet PC in my other courses because…

The expressions and the categories under which those expressions were grouped were gathered from literature (Moran *et al.*, 2010).

Procedure

The study took place in a regular classroom environment on the regularly scheduled class time. The study was conducted after the eighth week of the fifteen-week fall semester in 2012 and took only four weeks. Initially, until the eighth week, the Material Design and Use in Education course was conducted regularly. Then, the study was carried out for four weeks. The major difference between the regular courses and the courses in which the study was carried out after the eighth week was that in the later one the students were asked to use tablet PC provided while performing individual activities and in-class group applications. After now, the first one will be called regular course and the second one will be called tablet PC-integrated course.

The regular course, having a student-centered instructional approach, had two-hour two sessions in two different days of a week. The course was designed around two student-centered applications first of which was called individual activities which were submitted to instructor via Moodle before coming to the class. The individual activities were graded for the purpose of enforcing students to prepare before coming to the class. The second student-centered application was called in-class group applications. In the regular course, the students were not required to come to the class for the first two-hour session. This two-hour time was given to the students to complete the individual activities before coming to the second two-hour session. Then, the students submitted the individual activities to the instructor for grading. The purpose of the individual activities was to cognitively prepare the students at the knowledge level for the later in-class group applications for higher order learning. The general format of the individual activities was that the students were first asked to read related sections from their textbook and then prepare an assignment to send the instructor.

In the second two-hour session, the purpose of which for the students was higher-order learning, the students, coming to the class prepared after completing the individual activities, were asked to solve a real life problem as a group using the skills and knowledge they gained from the individual activities. For example, one of the topics of the course is the rules and the elements of instructional material design. Before coming to the class, the students were asked to read the related chapter from the textbook. Then, using word processing software, they were asked to create an evaluation form to evaluate an instructional material regarding to what extend the instructional material design elements were used appropriately and the instructional material design rules were followed, based on the knowledge they gained from the textbook. Then, students sent the evaluation forms to the instructor over Moodle for grading.

In the class, the students were asked to create instructional materials as groups to teach a certain skill and knowledge to a certain age group students with paper and pencil. Then, using the evaluation form they had created before coming to the class, they were asked to evaluate each other's instructional materials. During the four weeks of the study in which tablet PC integrated courses were conducted, the students were asked to come to the class to complete the individual activities in the classroom, as opposed to the regular course in which the students completed the individual activities out of the class. After completing the individual activities using utility software programs (such as word processing, drawing programs etc.) on the tablet PC, the students were asked to send them, i.e. instructional material evaluation forms, from their tablet PC over Moodle to the instructor for grading

The second two-hour session was conducted similar to the one in the regular course, except that the students were asked to complete the in-class group applications using utility software programs on tablet PC. However, the students did not send the product of the in-class group applications to the instructor because it was not graded. During the study, each student was provided with a tablet PC in the classroom. The tablet PCs were collected at the end of the classes. Also, the students were asked to create a user account on a Moodle site hosted on the university servers.

Data Collection

In the last day of the study, the survey was given to the students to collect data, in which they were asked to respond to the 8 open-ended expressions. There was no time limitation to respond. On average, they completed the survey in 30 minutes. The purpose of the research and the directions for the survey was introduced verbally by the researcher before the survey was given to the students.

Data analysis

Content analysis was used to analyze the data. In the analysis, the students' answers were coded to find the common reasons regarding why the students responded to the expression as they did. This process was also described by Miles and Huberman (1994) as "data reduction", "data display" and "conclusion drawing and verification" (p.10).

Results

As indicated in Table 1, a total of 22 students, 12 of which were female and 10 were male, had experience with the tools that had touch screen. Similarly, 10 female and 11 male students had experience of writing on a touch screen. However, only four male students used tablet PC before.

Table 1. *Summary table of gender, experiences of a touch screen device and tablet PC*

Gender	**N**	**Experience of touch screen**	**Writing on touch screen**	**Use of tablet PC**
Female	12	12	10	0
Male	20	10	11	4
Total	32	22	21	4

After the content analysis, 9 reasons were identified as the possible causes of participants' positive and/or negatives responses to the expressions in the study. The reasons and their definitions were given in table 2.

Table 2. *Reasons directing participants' responses and their definitions*

Reasons*	**Definitions**
Attitude towards tablet PC *(Attitude)*	Participants' positive and/or negative feelings towards the use and the effectiveness of tablet PCs
Time management of course related activities/assignments performed with tablet PC *(Time management)*	Managing the time needed to complete individual activities and in-class groups assignments in which the participants had to use tablet PC
Appropriateness of course in which tablet PC may be used *(Appropriateness of course)*	Courses in which tablet PC may/may not be appropriate to be used
Effectiveness of tablet PC *(Effectiveness)*	Tablet PC's facilitativeness of the instructional process
Familiarity with tablet PC *(Familiarity)*	Participants' familiarity to using and/or managing tablet PC
Inefficiency of tablet PC *(Inefficiency)*	tablet PC's hinderness/defacilitativeness of the instructional process
Inexperience in the use of tablet PC *(Inexperience)*	Participants' unfamiliarity to using and/or managing tablet PC

Reasons*	Definitions
Instructional approach used with tablet PC *(Instructional approach)*	Instructional process in which the individual activities and the in-class group applications were performed on tablet pc
Technical problems experienced with tablet PC *(Technical problems)*	Hardware and software problems the participants experienced during the study

**The expressions in the parentheses are abbreviations of the reasons that will be used in the rest of the article*

Table 3 illustrates the number of responses the participants gave to each expression. As can be seen in the table, the numbers of the participants giving negative responses are higher than the ones giving positive responses. Also, some participants did not respond to some of the expressions.

Table 3. *Number of responding participants by categories and expressions*

Categories	Expressions	Number of Respondents
Performance Expectancy	The use of tablet PC positively affected my success in the classroom because	8
	The use of tablet PC negatively affected my success in the classroom because	24
	The use of tablet PC positively affected my productivity in the classroom because	7
	The use of tablet PC negatively affected my productivity in the classroom because	25
Effort Expectancy	While using tablet PC, I did not experience difficulties because	3
	While using tablet PC, I experienced difficulties because	29
Attitude	I liked to use tablet PC in the classroom because	14
	I did not like to use tablet PC in the classroom because	18
	The use of tablet PC made the lesson enjoyable because	13
	The use of tablet PC did not make the lesson enjoyable because	17
	The use of tablet PC made me feel anxious, stressed and concerned because	24
	The use of tablet PC did not make me feel anxious, stressed and concerned because	6
Behavioral Intention	I would not like to use tablet PC outside of the classroom because	9
	I would like to use tablet PC outside of the classroom because	23
	I would like to prefer tablet PC in my other lessons because	12
	I would not like to prefer tablet PC in my other lessons because	18

Table 4, 5, 6 and 7 summarize the students' responses to specific expression under every single category and show the common reasons corresponding to the students' responses. As shown in table 4, a total of 24 participants out of 32 responded negatively to the first expression of performance expectancy (*the use of tablet PC positively/negatively affected my success in the classroom because*). Eight participants believed the use of tablet PC positively affected their success. The following reasons were derived from the participants' responses as the

possible causes affecting positively/negatively their success: Instructional approach, inexperience and time management.

Similarly, the majority of the participants (25 out of 32) responded negatively to the second expression of performance expectancy (*the use of tablet PC positively/negatively affected my productivity in the classroom because*). The others (7 participants) said the use of tablet PC positively affected their productivity. The derived reasons were the same as above: Instructional approach, effectiveness, time management and inexperience.

Table 4. *Participants' specific responses to expressions regarding performance expectancy*

The use of tablet PC positively affected my success in the classroom because (8 participants)	
Reasons	Specific student responses
Instructional approach	*"*I was engaged in and enjoyed the class", "We got out of direct instruction", "I found opportunities to learn and apply what I learned"
The use of tablet PC negatively affected my success in the classroom because (24 participants)	
Reasons	Specific student responses
Instructional approach	"I did not understand the content of the course in the class", "My assignments became detailed but my classroom participation was not enough", "I came to the class unprepared because I was not allowed to do individual activities at home"
Inexperience	"Since I had no experiences with tablet PCs before, I spent lots of time to learn how to use it", "I was not able to use the tablet PC fast enough", "I was not familiar with the software applications on the tablet PC"
Time management	"Because of the time limitation, I focused on just finishing the assignments, and I was not sure about quality of the content", "I did not have enough time to complete the assignments", "We were expected to do much in limited time in the classroom"
The use of tablet PC positively affected my productivity in the classroom because (7 participants)	
Reasons	Specific student responses
Instructional approach	"I performed the activities in the classroom regularly and continuously", "I spent effort to complete the activities in the class", "the activities performed as a group had a better quality"
Effectiveness	"The tablet PCs helped me complete my in class activates on time", "the tablet PC helped me reach information and materials on the internet needed to complete the in-class assignments "
The use of tablet PC negatively affected my productivity in the classroom because (25 participants)	
Reasons	Specific student responses
Instructional approach	"I had difficulties to complete the in-class activities", "I lost the sense of adaptation to the course", "The noise in the classroom during the activities affected my creativity negatively"
Time management	"No time was left to participate in the class", "I was not able to spend enough time to complete the in-class activities", "I was stressed competing against time"
Inexperience	"My insufficiency to use tablet PC affected the activities negatively", "Instead of participating in the class, I struggled to use the tablet PC", "I was not able to complete my activities and participate in the class because I had to struggle with the tablet PC"

Majority of the students, 29 out of 32, indicated that they encountered difficulties while using the tablet PC in the classroom, responding to the expression *while using tablet PC I did/did not experience difficulties because*. The derived reasons of the difficulties the tablet PC users encountered were technical problems and inexperience. Three participants did not encounter any difficulties because of the familiarity.

Table 5. *Participants' specific responses to expressions regarding effort expectancy*

While using tablet PC, I did not experience difficulties because (3 participants)	
Reasons	Specific student responses
Familiarity	"I am used to touch screen and android OS", "I used touch screen mobile phones before"
While using tablet PC, I experienced difficulties because (29 participants)	
Reasons	Specific student responses
Technical problems	"Touch screens of the tablet PCs were very sensitive. Sometimes, we had to rewrite same things again and I had difficulties to send our products from the tablet PC to regular computers", "The internet connection was problem and it was difficult to use touch screen", "The internet connection was problematic and the tablet PCs were not functioning appropriately"
Inexperience	"Initially we did not get used to the tablet PC", "I did not use tablet PC before", "The tablet PC had the technology and operating system I did not use before", "I just started to use tablet PC in this course"

A total of 18 students said *I did not like to use tablet PC in the classroom* and the reasons found were: Time management, instructional approach and inefficiency. Because of instructional approach used during the study, participants liked to use tablet PC in the classroom. Thirty students responded to the expression *the use of tablet PC did/did not make the lesson enjoyable because* and 13 of them believed it made the lesson enjoyable due to instructional approach. The rest, 17 students, believed it did not make the lesson enjoyable due to inefficiency, inexperience, instructional approach and time management.

Similarly 30 students responded to the expression *the use of tablet PC did/did not make me feel anxious, stressed and concerned because*. Only, 6 students did not feel anxious, stressed and concerned. However, their responses could not be categorized under a reason. On the other hand, the rest of 24 students felt anxious, stressed and concerned. The derived reasons were inefficiency, inexperience, instructional approach, time management and technical problems.

Table 6. Participants' specific responses to expressions regarding attitude

I liked to use tablet PC in the classroom because (14 participants)	
Reasons	Specific student responses
Instructional approach	"Doing something by myself was better than instructors' direct teaching", "I learned to complete student-centered and creative activities within limited time"
I did not like to use tablet PC in the classroom because (18 participants)	
Reasons	Specific student responses
Time management	"Before we had more time to complete the individual activities and completed them whenever we wanted", "I completed the assignments in very limited time"
Instructional approach	"I think no one prepared for the class while using the tablet PCs", "I believe question-answer type instructional method is more productive"
Inefficiency	"We tried to produce things with the tablet PCs that had limited capacity", "Computers were better than tablets"
The use of tablet PC made the lesson enjoyable because (13 participants)	
Reasons	Specific student responses
Instructional approach	"The course was not boring anymore", "It was better than listening to boring lectures. It was more enjoyable to do something with visual materials", "We had a different learning experience in the course. There was no direct instruction"
The use of tablet PC did not make the lesson enjoyable because (17 participants)	
Reasons	Specific student responses
Inefficiency	"There were problems with the physical use of tablet PC", "The word processing software on the tablet PC was not sufficient. Graphic tools did not have basic features"
Inexperience	"We were not able to use the tablets PCs", "How could people, who did not know how and what to do, enjoy the course while struggling between start and finish lines", "Because we only struggled with the tablet PCs we were stressed"
Instructional approach	"I forget everything after the course which bothered me", "I could not say we enjoyed the lesson for now because the course for us was all about coming to class, completing the activities and leaving"
Time management	"Rather than enjoyment, there was a hurry because we were anxious to complete the activities on time", "We were anxious to finish in class activities in the classroom"
The use of tablet PC did not make me feel anxious, stressed and concerned because (6 participants)	
Reasons	Specific student responses
No classification	"We learned new things. We used a new technologic tool. There was no reason to be anxious", "Because I used tablet PC before, I was comfortable", "I did not care anything"
The use of tablet PC made me feel anxious, stressed and concerned because (24 participants)	
Reasons	Specific student responses
Inefficiency	"While using the tablet PC on screen keyboard, I had difficulties to complete in class assignments"
Inexperience	"Because it was the first time for me to use tablet PC I had difficulties"
Instructional approach	"I got out of the class without learning much", "I only focused on completing the in class assignments regardless of the quality"

A total of 23, out of 32, students would like to use tablet PC outside of the classroom due to its effectiveness and their attitude toward it. Only 9 students would not like to use tablet PC outside of the classroom because they believed it was an inefficient tool. Thirty students responded to the last expression of behavioral intention (*I would/would not like to prefer tablet PC in my other lessons because*). The number of students who responded positively (12) is close to the number of students who responded negatively (18) to this expression. Positive responses were due to the following derived reasons: Instructional approach, familiarity and appropriateness of course. On the other hand, negative responses were due to attitude, appropriateness of course, inefficiency and instructional approach.

Table 7. *Participants' specific responses to expressions regarding behavioral intention*

I would like to use tablet PC outside of the classroom because (23 participants)	
Reasons	Specific student responses
Effectiveness	"Because of the numerous applications on the tablet PC and its portability, I think it will be helpful for me", "It is both small and has numerous features", "I like to use it out of the school because it is portable and has basic applications and internet connection"
Attitude	"I would like to use it out of the school because it is future's technology", "I would like to use it to become familiar to it"
I would not like to use tablet PC outside of the classroom because (9 participants)	
Reasons	Specific student responses
Inefficiency	"Tablet PCs were not very useful tools. They did not respond to my needs", "Desktop PCs are easier to use and have more advanced features", "Touch screen is troublesome"
I would like to prefer tablet PC in my other lessons because (12 participants)	
Instructional approach	"If it is used appropriately in the classroom I believe it will be enjoyable", "I would like to use it in other courses because it increases activeness of students", "If tablet pc is used only whenever needed it may increase the quality of courses. With audio visual materials, courses may be more understandable"
Familiarity	"Because we were just introduced with tablet PCs we lost a lot of time. In future, because this problem will be disappeared I would like to it", " I believe after learning how to use tablet PC, we will have numerous benefits of it"
Appropriateness of course	"Depending on the content, tablet PCs can be used in some courses", "It can be used in the courses that have verbal or qualitative content", " Based on needs of courses, it can be used in some of them"

I would not like to prefer tablet PC in my other lessons because (18 participants)	
Reasons	Specific student responses
Attitude	"I do not think it will be useful in all the courses", "Although the tablet PCs made the course enjoyable I do not believe it had positive contribution", "I did not see any benefits of it in the classroom. Note book-pen or laptop is more useful"
Appropriateness of course	"My preferences to use it may change from course to course", "I prefer verbal dialog in qualitative lessons, one way communication is better in quantitative lessons", "It cannot be used in some lessons such as math and physics", "It is not appropriate to use it in all courses. Without time problem I would like to write faster"
Inefficiency	"I do not believe tablet PC is productive and useful", "Its use for instruction is not productive", "I do not prefer it in other courses because it does not create an active learning environment"
Instructional approach	"I would not like to experience time problem and jeopardize my learning in other courses", "Courses that have verbal communication between students and instructors are more informative and enjoying, instead of performing activities with tablet PC"

Conclusions

The students' performance expectancies, effort expectancies, and attitudes toward the use of tablet PC in education were not high because the majority of the students responded negatively to the expressions in the related three categories. If the reasons (time management, inefficiency, inexperience, instructional approach and technical problems) derived from the negative responses to the expressions are reviewed this result may be attributed to the students' first time experiences in the use of tablet PCs in instruction. Neither an initial training on the use of tablet PC nor additional time to become familiar with it was provided for the students before the study. This may have caused insufficient time for students to complete the individual and group works during the instruction, insufficient use of tablet PC and disability to overcome technical problems. Also, due to aforementioned reasons, the students might have been hesitant about using tablet PC in other courses, as found in the analysis.

On the contrary, although not using tablet PCs before, the majority of the participating students had some experiences with touch screens. However, the nature of this experience was not known. Most probably, the students might have had experiences with touch screens on mobile phones as found in the analysis that might have had different features from regular tablet PCs, such as screen capacity (sizes, quality etc.), tasks performed, and operating systems. This experience

might have not been enough to improve students' performance expectancies, effort expectancies, and attitudes toward the use of tablet PC in education.

Interestingly, though the students had unpleasant experiences with tablet PCs in instruction they were not pessimistic about using tablet PCs outside of the classroom. This finding may be attributed to its some features facilitating regular life including its small dimensions, mobility, easy internet connectivity, processing power to run software applications. Also, students considered tablet PC as future's technology that must be learned.

The results of this study showed that tablet PC integration in the classroom should not be isolated instructional implementations with an isolated tool out of the classroom routine. The students did not get accustomed to tablet PC and felt ownership of it when tablet PCs were given at the beginning of the class and collected back at the end. Consequently, the students were not able to use the tablet PC with its full capacity and class turned to learning the use of it, instead of integrating it into the instruction. Technology integration in education should be performed with tools, including tablet PC and computers, with which students are familiar or that belong to students.

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