Chapter 2
How Teachers and Students Depict Interactive Whiteboards and Tablet PCs in a 9th Grade Classroom?

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Abstract This paper describes a pilot project with the purpose of evaluating the effectiveness of tablet PCs and interactive/smart whiteboard for 9th grade students and their teachers. The pilot study was designed to explore students' and teachers' perceived effectiveness of using tablet PCs and interactive/smart whiteboards. The participants included a total of 136 teachers from various state funded schools and 732 9th grade students, who were provided with tablet PCs and interactive/smart whiteboards and were trained in their use. A survey was distributed to the participants at the end of the semester. This paper describes the pilot project and the survey results. We observed that (a) teachers think that interactive/smart whiteboard would have more impact whereas students consider tablet PCs would have more, and (b) students are more anxious about using tablet PCs and interactive whiteboards during instructional processes than teachers.

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2.1 Introduction

Integrating emerging ICT tools into school systems at the national level is always a challenge for governments at the decision-making level and for schools at the implementation level. Although the ministries of education have a keen interest in equipping schools with those technologies and empowering teachers with new competencies, there are various barriers and hurdles to successfully address those issues, leading mostly to another challenge which is another step in adjusting to change as the use of digital technologies in education rapidly changes and expands (Bates 2000; Duderstadt 1999).

Most of the time, students' effective learning experiences are (or should be) at the center of all these interventions in an education setting. The questions such as *what level of interaction is essential for effective learning? How technology can be used to facilitate effective interactions? And how can we achieve it?* are at the core of measuring the impact of such interventions. Addressing these questions, Moore (1989) outlined three types of interaction in terms of students' learning experiences: learner–content interaction, learner–instructor interaction, and learner–learner interaction.

According to Moore (1989), learner–content interaction refers to the process of "intellectually interacting with content" (p. 2) to make changes in learners' existing schema and understanding. Learner–instructor interaction addresses the issues such as increasing learners' motivation, attention, and stimulation for the subject matter in order to create a healthy and rich learning environment for the learners. Learner–learner interaction refers all types of interaction "between one learner and another learner, alone or in group settings." 18(p. 4). Hillman et al. (1994) goes further to add another type of interaction, learner–interface interaction, which refers to "a process of manipulating tools to accomplish a task" (p. 34).

In this study, students' learning experience with the tablet PC and interactive whiteboards is analyzed through these four types of interaction. In addition, similar approach was taken to elicit teachers' responses while implementing the use of tablet PCs and interactive/smart whiteboards. Finally, it was compared to what extend teachers' and students' perceptions show similarities and differences.

Earlier studies investigating the use of tablet PCs and interactive whiteboards indicate that both these technological tools have something to offer student learning at schools (some references will go here). The purpose of the pilot project described here was to observe and evaluate students' and teachers' applications of tablet PCs

and Interactive whiteboards as well as to understand how they perceive the contribution of those tools to teaching and learning process in a classroom setting. The pilot study would help us answer questions such as

- How do teachers perceive the effectiveness of tablet PCs and interactive/smart whiteboards with regard to some variables related to interaction?
- What challenges/pitfalls are there in using these technological tools in educational settings?

2.2 Study Site

This study has been carried out in schools which were part of a broader piloting process of FATIH project, carried out by the Ministry of National Education (MoNE). The pilot phase of FATIH project was launched with the delivery of tablet PCs and LCD Interactive Boards to 52 schools across Turkey. High schools around the country have been equipped with LCD Interactive Boards, and 8.500 tablet PCs have been distributed in 52 schools in 17 provinces within a pilot program. In the expanded pilot phase 49,000 tablet PCs have been distributed to both students and teachers in 81 provinces. By the Ministry of National Education (see http://fatihprojesi.meb.gov.tr/tr/english.php for more information about FATIH project).

The study site included eight high schools from different geographical regions in Turkey: two schools in Ankara, five schools in Kastamonu, and one school in Karaman province. A total of 136 teachers, teaching the 9th graders at those schools, participated in the study. 50 % of the participating teachers were male ($n = 68$) and 47.1 % of them were females, whereas 2.9 % ($n = 4$) did not mention their genders. 5.1 % of the teachers were between 20 and 29 age intervals ($n = 7$); 56.6 % of them were between 30 and 39 age intervals ($n = 77$); 30.1 % of them were between 40 and 49 age intervals ($n = 41$); 5.9.1 % of them were between 50 and 59 age intervals ($n = 41$); and, 2.2 % were missing values ($n = 3$). Teachers' graduated schools included College of Education 44.9 % ($n = 61$), College of Science and Letters 50 % ($n = 68$), College of Theology 2.2 % ($n = 3$), Conservatory 0.7 % ($n = 1$), and undefined 2.2 % ($n = 3$). Demographics related to teachers' distribution across their teaching subject areas are presented in Table 2.1.

Teachers who have their own PCs were 94.1 % ($n = 128$), those who did not have were 4.4 % ($n = 6$), with 1.5 % ($n = 2$) no response; those who indicated that they used tablet PCs before were 3.5 % ($n = 32$), those who did not use were 73.5 % ($n = 100$), with 2.9 % ($n = 4$) no response; when teachers' computer use in years were analyzed, it was observed that 12.5 % of them had 16 or more years of experience ($n = 17$); 27.2 % of them had between 11 and 15 years ($n = 37$); 41.2 % of them had between 6 and 10 years ($n = 56$); 14.7 % of them had between 1 and 5 ($n = 20$), and 0.7 % of them ($n = 1$) never used a computer before. 3.7 % of the

Table 2.1 Teachers' distribution across subject areas

Subject areas	*n*	%
German	3	3.7
Physical education	1	0.7
Biology	8	5.9
Geography	7	5.1
Literature	1	0.7
Philosophy	2	1.5
Physics	3	2.2
Religious studies	2	1.4
English	5	3.7
Chemistry	4	2.9
Mathematics	12	8.8
Music	1	0.7
Teaching as a profession	2	1.5
Guidance and psych. counseling	2	1.5
Art	2	1.5
History	8	5.9
Turkish lang. and literature	17	12.5
Undefined	54	39.7
Total	136	100.0

teachers did not respond this item (n = 5). Teachers who had previous interactive/smart whiteboard experience were 33.8 % (n = 46), whereas those who never used them before were 65.4 % (n = 89), with 0.7 % no response (n = 1).

In addition to the teachers, a total of 732 9th grade students in those selected schools participated in the study. The distribution of students across schools is presented in the following figure (see Fig. 2.1).

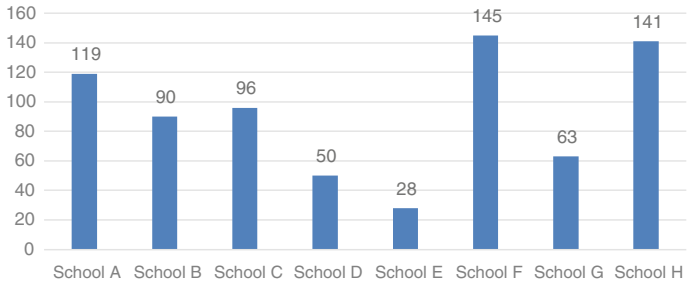

Fig. 2.1 Student participation across schools

2.3 Implementation Process

Piloting in the selected schools had been started at the beginning of Spring 2012 and took about 4 months, until the end of the school year. In order to better describe the piloting process, a detailed descriptive information regarding the implementation process will be summarized for each school.

School A is located in Kastamonu province with relatively low school achievement scores. 1/3 of students leave high school and move into vocational school after 9th grade due to either their low achievement, or repeating. At the time of the piloting, the school had a computer lab and interactive white board in the 9th graders' classroom. Tablet PCs were distributed to students by getting written consent from their parents. School B had classes with 30 or less students in each class. The school has a boarding option, where students were registered to the school from nearby cities and/or villages. Similarly, school C also had a boarding option for students. School administration embraced the vision for technology use at their schools. School D also provided boarding option, where students were coming from nearby cities. Before the implementation process, teachers brought their own computers and projection devices into their classes since there were not enough computers to use at the school. School E, which is the last school in Kastamonu region, was the most successful one in the province according to the nationwide exam statistics results. 60 % of the school students were boarding students and there was a housing option for 25 teachers, who stayed and provided extended study hours for boarding students after school hours. This school had a lab for each content area teaching, sports arena, and a rich library. Each class had laptops and projection devices which were provided by the school administrators. School F, located in Karaman, was a religious high school where boys and girls attended the school in two different buildings. The university entrance ratio was low for the school. Almost 60 % of the students were boarding students at the school. School G, which was rated in the top 10 Anatolian high school nationwide, was located in Ankara with considerably better physical conditions compared to the other schools. All classes were equipped with interactive whiteboards. The materials and orientation process is narrated below.

2.4 Materials and Orientation Process

During the piloting process, various digital platforms and materials were prepared either by the Ministry of Nation Education or SEBIT, an organization developing digital platforms and educational materials for K-12 education. The following table shows the materials utilized in the process.

During the piloting process, teachers were provided an in-service training about basics of PC use, effective uses of interactive boards, tablet PCs, and their educational uses. Within the basics of PC use module, teachers were trained on

operating systems functions and MS Office and its functional uses. These training sessions were provided face-to-face by the Ministry of National Education for 30 h.

Tablet PCs and interactive/smart boards included users' guides, which included information about their technical specifications, their functions, as well as how-to visuals. In addition, another in-service training was provided for teachers which lasted 15 h during one week of training.

The third training program included educational use of interactive/smart boards and tablet PCs. This program included both theoretical and practical sessions. The theoretical part included the educational benefits and their functional use in classrooms. In the practice session, the program included lesson plans and the use of embedded software in tablet PCs. These software were browsers, classroom management system, word processing, spreadsheet, presentation, e-book reader, market application, and calendar application. Teachers were provided sample lesson plans with good practice samples and scenarios related to their content areas. These sessions were designed in a show-and-tell and discussion format, face-to-face, and lasted 15 h.

These sessions were completed in an intertwined manner in each meeting with teachers and time was extended when needed. In addition, an online help desk was made available for teachers synchronously. Teachers were expected to train their students accordingly during their class time.

2.4.1 Data Collection Tools

The data were collected through three different survey tools. The demographic survey tool was designed to gather teachers' personal characteristics, such as gender, age, how many years they have been using a computer, their subject matter, graduation information, whether they used a tablet PC and interactive/smart board before in their teachings, and whether they had a personal computer at home. The second (the effectiveness of using tablet PC and interactive/whiteboards in classroom settings: Teacher form) one was adapted from Askar, Koksal, & Yavuz (1992) to determine how teachers perceive the effectiveness of those emerging technologies when used in a classroom setting. This tool had the same variables to measure both for tablet PC and the interactive/smart board. They were mainly asked to compare their experiences in using the tablet PCs and interactive whiteboard to the environments where they did not use them nor these technologies were available. The third tool (the effectiveness of using tablet PC and interactive/whiteboards in classroom settings: Student form) was identical to the second except that they were addressed to students.

In those survey tools given both to teachers and students were 25 variables included. Those variables included interest in the subject matter, understanding the course, attention span to the course, amount of readings, help from teacher, fear, embarrassment, noise, self-evaluation, leisureliness, teacher–student interaction, student–student interaction, receiving awards, curiosity, trust, speed of learning, amount of vocabulary, willingness to study, success, liking the school, liking the

course, amount of writing, participation to discussions, number of questions posed, and anxiety. Both students and teachers were asked to rate their perceived effectiveness with one of the three observations: increases, does not change, or decrease. For example, the first variable would be read by the participants as "In settings where tablet PCs are used, teacher–student interaction increases/does not change/decreases-," and the student checks the appropriate checkbox.

2.4.2 Data Analysis

Data were analyzed through descriptive statistics and significant tests. In order to determine whether students' and teachers' responses change, chi-square test was run, followed by Tamhane post hoc tests.

2.5 Students' and Teachers' Perceived Effectiveness of Using Interactive/Smart Whiteboards and Tablet PCs

The analyses of students' and teachers' perceived effectiveness of using interactive/smart whiteboards and tablet PCs were presented in Tables 2.2 and 2.3, respectively. As presented in Table 2.2, most of the students hold the belief that their interest in the subject matter, understanding the course, attention span to the course, help from teacher, self-evaluation, leisureliness, teacher–student interaction, student–student interaction, curiosity, trust, speed of learning, amount of vocabulary learnt, willingness to study, success, liking the school, liking the course, participation to discussions, and number of questions posed would decrease (ranges between 30 and 70 %); whereas, the amount of writing and noise levels would increase when the interactive/smart whiteboard were used in their classes. On the other hand, the amount of readings, fear, anxiety, and receiving rewards would not change.

Majority of teachers (ranges between 50 and 80 %) on the other hand, hold the belief that when the interactive/smart white whiteboard were used in the classrooms, students' interest in the subject matter, understanding the course, attention span to the course, noise, self-evaluation, leisureliness, teacher–student interaction, student–student interaction, curiosity, trust, speed of learning, amount of vocabulary, willingness to study, success, liking the school, liking the course, participation to discussions, and number of questions posed would decrease; whereas, seeking help from teachers, fear, receiving rewards, and anxiety would not change. Yet, their embarrassments and amount of reading and writing would increase. The percentages of the teachers in favor of the effectiveness of the interactive whiteboard ranges between 10 and 40 % (Table 2.4).

Table 2.2 Materials embedded in Tablet PCs

Component	Purpose
Educational Information Network (EIN) market	Portal where MoNE presents all its approved digital content and services
EIN internet browser	EIN Internet browser is provided for safe internet surfing and accessing the materials in the market
EIN bookcase	Books which were distributed by the MoNE free of charge in pdf format
Classroom management application	An application to be used by teachers to manage their courses by using their tablet PCs. With this application, teachers are able to start and end a class; integrate interactive whiteboards with their tablet PCs, can take attendance; rule certain restrictions such as locking students' tablet PCs, or their internet access; can take snapshots from interactive whiteboards or from any student's or their own tablet tos hare later; can view students' tablet views individually; and finally, can control interactive whiteboard remotely
Clickers	An application with which teachers could design their own interactive quizzes and polls, evaluate the results, and share what they like accordingly
Messaging	Teachers could send a message to their students
V-Book	An application to access subject and concepts with tablet PCs. Each V-Book included examples, interactive exercises, experiments, simulations, sample questions with answers, and diagnostic multiple choice questions for students to evaluate their learning process
	Students were given option to add web pages and bookmarks to their v-books. Search capability was also present in v-books
Z-Book	Z-book is an application to deliver textbooks prepared and distributed by the MoNE. In these z-books, content is enriched by simulations, interactive activities, videos, and interactive questions. Bokmarking, highlighting, note-taking were made available with z-books
Vitamin	Vitamin is a K-12 interactive e-content platform, including tutorials, library, study plans, and exams. Teachers can access the library to select and use appropriate content for their classes
	It is possible for teachers to design their lesson plans, share their plans, send questions and/or exams to their students, and monitor their students' progress. Students can access interactive activities, simulations, experiments, interactive activities, videos, and interactive questions
Support center	Upport center was an embedded application in tablet PCs, where many how-to materials were presented in video format
Vitamin teacher portal	A professional development portal for teachers. This portal hosts various asynchronous educational videos and live seminars

(continued)

Table 2.2 (continued)

Component	Purpose
Other applications	In addition to those applications mentioned above, tablet PCs included the following applications: • Kingsoft Office • Notes Mobile (MyScript) • RealCalc • Grapher • Sketch n Draw • Snapbucket • EBookDroid • Jorte Calendar • Mobo Player • Tangram

When the distributions of students' and teachers' responses were compared, teachers and students tend to differ in their perceptions of number of questions posed, the amount of writing, liking the school, success, willingness to study, speed of learning, trust, receiving awards, help from teacher, amount of readings, attention span to the course, interest in the subject matter, and understanding the course.

When students' responses to using tablet PCs were examined (see Table 2.3), it has been observed that most of the students hold the belief that their fear, embarrassment, noise level in the classroom, and the amount of writing would increase; whereas, no change would be observed in receiving awards. Yet, apart from those mentioned above, there will be a decrease in the rest of the statements (ranges between 34 and 78 %).

Majority of teachers on the other hand, hold the belief that when tablet PCs were used in the classrooms, students' fear, and the amount of writing and readings would increase; whereas, no change would be observed in students' participation to discussions, anxiety, receiving awards, embarrassments, and the seek for help from teachers. Yet, apart from those mentioned above, teachers are of the opinion that there will be a decrease in the rest of the statements (ranges between 36 and 78 %).

When the distributions of students' and teachers' responses were compared, teachers and students tend to differ in their perceptions of the amount of writing and reading, liking the school, willingness to study, amount of vocabulary learnt, noise level in the classroom, and the help from teachers. Overall, teachers think that interactive/smart whiteboard would have more impact whereas students consider tablet PCs would have more. According to teachers, interactive/smart whiteboard would have more negative impacts whereas students think that tablet PCs would have more negative impacts.

Comparison analyses indicate that students are more anxious about using tablet PCs and interactive whiteboards during instructional processes than teachers. When designing instructional materials and delivery tools, socio-cognitive factors, such as

Table 2.3 Descriptive and X^2 statistics results related to students' and teachers' perceived impacts on education with interactive/smart whiteboard

In a setting where interactive/smart whiteboard are used	Student						Teacher						Overall		
	Increases		Does not change		Decreases		Increases		Does not change		Decreases		X^2	p	Difference
	f	%	f	%	f	%	f	%	f	%	f	%			
1. Interest in the subject matter	79	11.1	110	15.4	525	73.5	0	0	13	14.9	74	85.1	11.015	0.004	**
2. Understanding the course	83	11.6	183	25.6	449	62.8	1	1.2	19	22.1	66	76.7	10.683	0.005	**
3. Attention span to the course	186	26.1	178	25	349	48.9	8	9.4	23	27.1	54	63.5	12.016	0.002	**
4. Amount of readings	176	24.8	279	39.2	256	36.0	34	41.5	30	36.6	18	22.0	12.088	0.002	**
5. Help from teacher	157	22.1	274	38.6	279	39.3	24	28.6	38	45.2	22	26.2	5.622	0.060	*
6. Fear	304	42.7	337	47.3	71	10.0	38	44.7	43	50.6	4	4.7	2.478	0.290	
7. Embarrassment	307	43.4	328	46.3	73	10.3	41	48.2	39	45.9	5	5.9	1.927	0.382	
8. Noise level in the classrom	302	42.2	187	26.2	226	31.6	28	32.6	28	32.6	30	34.9	3.177	0.204	
9. Self-evaluation	65	9.2	257	36.4	384	54.4	6	7.1	32	38.1	46	54.8	0.417	0.812	
10. Leisureliness	46	6.5	158	22.3	506	71.3	3	3.5	17	19.8	66	76.7	1.650	0.438	
11. Teacher-student interaction	184	25.8	193	27.0	337	47.2	16	18.2	23	26.1	49	55.7	3.004	0.223	
12. Student-student interaction	168	23.7	203	28.6	339	47.7	16	18.2	29	33.0	43	48.9	1.553	0.460	
13. Receiving awards	87	12.3	406	57.3	215	30.4	5	6.0	40	48.2	38	45.8	9.130	0.010	**
14. Curiosity	42	5.9	109	15.2	565	78.9	1	1.1	13	14.8	74	84.1	3.553	0.169	
15. Trust	57	8.0	292	40.9	365	51.1	2	2.4	27	32.1	55	65.5	7.574	0.023	**

(continued)

Table 2.3 (continued)

In a setting where interactive/smart whiteboard are used	Student						Teacher						Overall		
	Increases		Does not change		Decreases		Increases		Does not change		Decreases		X^2	p	Difference
	f	%	f	%	f	%	f	%	f	%	f	%			
16. Speed of learning	79	11.0	149	20.8	488	68.2	3	3.5	23	26.7	60	69.8	5.565	0.062	*
17. Amount of vocabulary	71	9.9	228	31.8	417	58.2	10	11.8	30	35.3	45	52.9	0.907	0.635	
18. Will to study	67	9.4	182	25.5	464	65.1	5	5.9	35	41.2	45	52.9	9.634	0.008	**
19. Success	64	9.0	235	33.1	412	57.9	1	1.2	31	36.9	52	61.9	6.141	0.046	**
20. Liking the school	28	3.9	199	27.9	485	68.1	1	1.1	33	37.9	53	60.9	4.911	0.086	*
21. Liking the course	35	4.9	212	29.9	463	65.2	2	2.3	28	31.8	58	65.9	1.298	0.523	
22. Amount of writing	460	65.1	149	21.1	98	13.9	64	76.2	15	17.9	5	6.0	5.385	0.068	*
23. Participation to discussions	98	13.7	293	41.0	323	45.2	16	18.8	26	30.6	43	50.6	3.935	0.140	
24. Number of questions posed	126	17.7	287	40.3	300	42.1	15	17.6	24	28.2	46	54.1	5.354	0.069	*
25. Anxiety	281	39.4	326	45.7	107	15.0	36	42.4	42	49.4	7	8.2	2.830	0.243	

Student $n = 714$
Teacher $n = 85$
*0.10
**0.05

Table 2.4 Descriptive and X^2 statistics results related to students' and teachers' perceived impacts on education with Tablet PCs

In a setting where tablet PCs are used	Student						Teacher						Overall		
	Increases		Does not change		Decreases		Increases		Does not change		Decreases		X^2	p	Difference
	f	%	f	%	f	%	f	%	f	%	f	%			
1. Interest in the subject matter	71	10.0	87	12.2	554	77.8	8	10.8	10	13.5	56	75.7	0.177	0.915	
2. Understanding the course	78	11.0	172	24.2	462	64.9	8	11.1	20	27.8	44	61.1	0.496	0.780	
3. Attention span to the course	164	23.0	171	24.0	377	52.9	13	18.1	18	25.0	41	56.9	0.940	0.625	
4. Amount of readings	152	21.4	270	38.0	288	40.6	37	50.7	24	32.9	12	16.4	34.02	0.000	**
5. Help from teacher	150	21.2	267	37.8	290	41.0	22	30.1	33	45.2	18	24.7	7.826	0.020	**
6. Fear	325	45.9	296	41.8	87	12.3	34	47.2	33	45.8	5	6.9	1.858	0.395	
7. Embarrassment	319	44.9	308	43.4	83	11.7	33	45.8	36	50.0	3	4.2	4.028	0.133	
8. Noise level in the classroom	291	41.1	204	28.8	213	30.1	23	31.9	18	25.0	31	43.1	5.210	0.074	*
9. Self-evaluation	66	9.4	278	39.4	361	51.2	10	14.1	30	42.3	31	43.7	2.325	0.313	
10. Leisureliness	50	7.1	160	22.6	497	70.3	4	5.5	18	24.7	51	69.9	0.363	0.834	
11. Teacher-student interaction	155	21.9	185	26.1	368	52.0	14	18.9	24	32.4	36	48.6	1.414	0.493	
12. Student-student interaction	139	19.6	197	27.8	372	52.5	14	19.2	23	31.5	36	49.3	0.457	0.796	
13. Receiving awards	84	11.8	381	53.7	244	34.4	6	8.5	35	49.3	30	42.3	2.013	0.365	
14. Curiosity	42	5.9	131	18.5	536	75.6	4	5.4	12	16.2	58	78.4	0.286	0.867	

(continued)

Table 2.4 (continued)

In a setting where tablet PCs are used	Student						Teacher						Overall		
	Increases		Does not change		Decreases		Increases		Does not change		Decreases		X^2	p	Difference
	f	%	f	%	f	%	f	%	f	%	f	%			
15. Trust	56	7.9	253	35.7	400	56.4	5	7.0	23	32.4	43	60.6	0.453	0.797	
16. Speed of learning	74	10.4	144	20.3	493	69.3	8	11.1	20	27.8	44	61.1	2.444	0.295	
17. Amount of vocabulary	62	8.7	234	32.9	415	58.4	17	23.3	16	21.9	40	54.8	16.59	0.000	**
18. Will to study	68	9.6	165	23.3	476	67.1	7	9.9	28	39.4	36	50.7	9.475	0.009	**
19. Success	70	9.9	222	31.4	416	58.8	9	12.7	24	33.8	38	53.5	0.921	0.631	
20. Liking the school	29	4.1	194	27.3	487	68.6	1	1.4	33	45.8	38	52.8	11.38	0.003	**
21. Liking the course	39	5.5	214	30.4	450	64.0	5	6.8	29	39.2	40	54.1	2.864	0.239	
22. Amount of writing	412	58.4	157	22.2	137	19.4	56	75.7	13	17.6	5	6.8	9.905	0.007	**
23. Participation to discussions	104	14.7	308	43.6	294	41.6	11	15.3	35	48.6	26	36.1	0.868	0.648	
24. Number of questions posed	129	18.2	266	37.5	315	44.4	16	22.2	24	33.3	32	44.4	0.880	0.644	
25. Anxiety	267	37.6	314	44.2	130	18.3	30	42.3	33	46.5	8	11.3	2.255	0.324	

Student $n = 712$
Teacher $n = 74$
*0.10
**0.05

curiosity, student interaction, trust, and participation to the discussion should be emphasized and integrated into teaching process along with the content materials.

The study results also indicated that both teachers and students equally agree on four items that would decrease the overall impact. Yet, teachers emphasized that fear would stay still. In the survey tools, there were 25 items, upon which both teachers and students indicated either a positive or negative impacts on education. This finding clearly shows that those emerging technologies carry a lot of expectations for both students and teachers. Teachers would be advised to develop activities for students to address cognitive issues, such as attention, memory, and learning independent from content matters.

2.6 Conclusion and Discussion

The impact of tablet PCs and interactive/smart whiteboards in teaching and learning has been investigated in various school levels, including elementary (i.e., Kravcik et al. 2004; Jang et al. 2012), secondary (i.e., Alvarez et al. 2013), high schools (i.e., Betcher and Lee 2009), and universities (i.e., Eurell et al. 2005). When the results are reviewed for tablet PCs, it can be concluded that tablet PCs can help enhance students' note-taking ability (Eurell et al. 2005); improved their ability to organize class materials, and allowed them to integrate handwritten notes and course materials (e.g., Enriquez 2010); provided students individualized feedback and that such feedback was related to student engagement behavior (Xu 2010; McVey 2008); enhanced the learning environment for many mathematics students and that the technology engaged students with different learning styles (Fister and McCarthy 2008); enhanced classroom dynamics, teaching effectiveness, and student learning in science and engineering courses (Rogers and Cox 2008).

According to Lee (2010), the interactive/smart whiteboard revolutionized the classroom system. Yet, Lee (2010) observed at schools during school visits that teachers initially maintained their existing pedagogical style with the interactive whiteboards. Moreover, Lee (2010) also emphasized that teachers had employed the full spectrum of approaches from the strongly teacher-centric to strongly student-centric as well as beginning to explore new ways of using the technology as they practice it more. Citing Lee and Winzenried's study, Lee (2010) went further to add that variables articulated for successful implementation of instructional technologies are held true for integrating interactive/smart whiteboards: teacher acceptance, classroom availability, ongoing in-house support and development, quality infrastructure, funding, and most importantly quality leadership.

Another study by Somyurek et al. (2009) identified the problems hindering the effective and efficient use of smart boards in Turkish primary and secondary schools, as compared to previous ICT integration efforts by MoNE. Based on the data collected from both teachers and students, the researchers reported that the factors hindering the use of IWBs in education are correlated with factors occurring in previous ICT integration projects. In other words, the lessons learned from

previous ICT projects were not applied to the smart board integration project. Furthermore, such large-scale projects draw public interest, as well. Therefore, the researchers point out the fact that before negative opinions spread "in the public mind, and before ICT in education loses its novelty to educational actors, necessary measures must be taken by institutions technical support, maintenance, and administrative cooperation" (p. 373).

Research about the effectiveness of interactive whiteboards usually addressed teachers' acceptance and schools' willingness to use the whiteboard. Teacher and student acceptance and use of the whiteboard were explored based on various models such as Technological Pedagogical Content Knowledge model (e.g., Jang and Tsai 2012) and/or various versions of Technology Acceptance Model (e.g., Türel 2011). The attractiveness of the whiteboard to the students, the enhanced student attendance, and how they help improve student behavior (Lee and Winzenried 2006) and the significant improvements in teacher efficiency (Becta 2007, p. 48) are also explored in detail. According to Lee (2010), enhancing the quality of teacher and student usage is the next major challenge. The results of this case study, therefore, is a contribution to the existing effectiveness research in exploring the perceived effectiveness of using two emerging technologies during a piloting period at various high schools. Based on the results of this case study, the following suggestions could be made;

Lessons Learnt:

- More effort is needed to improve interactions to change students' perceptions regarding fear, noise level in the classroom, and anxiety.
- Socio-cognitive variables, such as curiosity, student interactions, trust, and contribution to discussions, are to be integrated into curricula when designing instruction with Tablet PCs and interactive/smart whiteboard.
- Independent from course materials, teachers need to be trained in designing activities related to attention, memory and learning by using Tablet PCs and interactive/smart whiteboard.
- Teachers need more time to internalize tablet use in their classes before their students. Providing tablet PCs to teachers and students at the same time seemed to create synchronization problems.
- Applications embedded in tablet PCs need to be revisited based on teachers' expectations and needs.
- Teachers and other stakeholders should be well-informed much earlier in time before scaling up.
- Schools' infrastructures are crucial and support should be provided just-in-time and on-site for teachers.

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References

Alvarez, C., Salavati, S., Nussbaum, M., & Milrad, M. (2013). Collboard: Fostering new media literacies in the classroom through collaborative problem solving supported by digital pens and interactive whiteboards. *Computers & Education, 63*, 368–379.

Askar, P., Köksal, M. & Yavuz, H. (1992). Students perceptions of computer assisted instruction environment and their attitudes towards computer assisted learning. *Educational Research*, *34*(2),133–139.

Bates, A.W.T. (2000). *Managing Technological Change: Strategies for college and university leaders*. San Francisco: Jossey-Bass.

Becta. (2007). Harnessing technology review 2007: Progress and impact of technology in education: Summary report. Retrieved from http://publications.becta.org.uk/display.cfm?resID=33980

Betcher, C., & Lee, M. (2009). *The interactive whiteboard revolution*. Melbourne, Australia: ACER Press.

Enriquez, A. G. (2010). Enhancing student performance using tablet computers. *College Teaching, 58*(3), 77–84.

Eurell, J. A., Diamond, N. A., Buie, B., Grant, D., & Pijanowski, G. J. (2005). Tablet computers in the veterinary curriculum. *Journal of Veterinary Medical Education, 32*(1), 113–116.

Fister, R. K., & McCarthy, M. L. (2008). Mathematics instruction and the tablet PC. *International Journal of Mathematical Education in Science and Technology, 39*(3), 285–292.

Hillman, D. C. A., Willis, D. J., & Gunawardena, C. N. (1994). Learner interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *American Journal of Distance Education, 8*(2), 30–42.

Jang, S., & Tsai, M. (2012). Exploring the TPACK of Taiwanese elementary mathematics and science teachers with respect to use of interactive whiteboards. *Computers & Education, 59*(2), 327–338.

Kravcik, M., Kaibel, A., Specht, M., & Terrenghi, L. (2004). Mobile collector for field trips. *Educational Technology & Society, 7*(2), 25–33.

Lee, M. (2010). Interactive whiteboards and schooling: The context. *Technology, Pedagogy and Education, 19*(2), 133–141.

Lee, M., & Winzenried, A. (2006). Interactive whiteboards: Achieving total teacher usage. *Australian Educational Leader, 28*(3), 22–25.

McVey, M. (2008). Writing in an online environment: Student views of "inked" feedback. *International Journal of Teaching and Learning in Higher Education, 20*(1), 39–50.

Moore, M. G. (1989). Three types of interaction. *American Journal of Distance Education, 3*(2), 1–7.

Rogers, J. W., & Cox, J. R. (2008). Integrating a single tablet PC in chemistry, engineering, and courses. *Journal of College Science Teaching, 37*(3), 34–39.

Somyurek, S., Atasory, B., & Ozdemir, S. (2009). Board's IQ: What makes a board smart? *Computers & Education, 53*, 368–374.

Türel, Y. K. (2011). An interactive whiteboard student survey: Development, validity and reliability. *Computers & Education, 57*, 2441–2450.

Xu, Y. (2010). Examining the effects of digital feedback on student engagement and achievement. *Journal of Educational Computing Research, 43*(3), 275–291.

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