Attitudes of Students and Teachers towards the Use of Interactive Whiteboards in Elementary and Secondary School Classrooms

Nuri Balta
Canik Basari University, Samsun/TURKEY
nuribalta@basari.edu.tr

Muharrem Duran
Bozok University, Yozgat/TURKEY
muharremduran@gmail.com

ABSTRACT
Recently much have been invested in the interactive whiteboard educational technology in Turkey. The government is still wishful to spread it to schools of all levels. This study tries to understand teachers' and students' attitudes toward interactive whiteboard technology along with differences in attitudes resulting from some demographic factors. Two parallel surveys consisting of 25 items were applied to 255 students and 23 teachers from three private schools. Students from sixth to twelfth grades and teachers from 15 different branches participated in this research study. The results indicate that interactive whiteboards are highly rated by both teachers and students. Students mostly prefer the usage of interactive whiteboards in math courses, and their attitudes differ across their genders and school levels. As students get elder, their positive attitudes toward interactive whiteboard technology decrease, and it has been found out that there is no difference between teachers' and students' attitudes. This study includes some implications for policy makers, educator and researchers.

Keywords: interactive whiteboard, student attitude, teacher attitude, ICT technology

INTRODUCTION
An interactive whiteboard is an instructional tool that is connected to a computer and a projector and enables the transfer of images from computer to the board. Thus, the instructor can control the related items directly on the screen with a pen or finger. The lecturer can perform various actions with interactive whiteboards such as dragging, clicking, pasting and copying items; taking handwrite notes, transforming them into texts and highlighting those texts; adding annotations, notes and drawings and saving them to be printed out and shared; showing picture animations and educational videos to the whole class; saving and recalling current and previous screens, revisiting, reviewing and amending when required; using contents available on a website.

Most of the studies in the written literature report extremely positive perceptions about the effects and the potential of interactive whiteboard technology (Elaziz, 2008). For instance, many studies report the positive effect of interactive whiteboards on students' success (Holmes, 2009; Lewin, Somekh & Steadman, 2008; Marzano, & Haystead, 2009; Thompson, & Flecknoe, 2003; Yang, Wang, & Kao, 2012; Yorgancı, & Terzioğlu, 2013). A study conducted by Yang, Wang, & Kao (2012) can be cited as an example for the effects of interactive whiteboards on students' success. They designed a quasi-experimental design with sixth-grade students to understand how interactive whiteboards influence students' learning. In their study, two different work groups were designed. One of these groups (n=59) studied in an environment using interactive whiteboards during the teaching process, while the other group (n=59) studied in an environment using conventional information technologies. They showed that students in the first group learned more productively than those in the second group. Besides such studies that show the positive effects of using whiteboards in teaching on students' success, there are some other studies that report the effect of interactive whiteboards as negligible (Glover, Miller, Averis, & Door, 2005; Higgins, Beauchamp, & Miller, 2007; Solvie, 2007).

Many teachers regard interactive whiteboards as valuable teaching tools (Warwick & Kershner, 2008). Interactive whiteboards enable teachers to design and organize activities and lessons using a broad variety of multimodal resources and to engage students' cognitive and innovative potentials into the learning process (Littleton, Twiner, & Gillen, 2010). In addition, interactive whiteboards can be used to deliver the instructions to the students effectively (DeSantis, 2012). As powerful technological devices, interactive whiteboards have the potential to "help teachers convert the ordinary classroom conditions into a student-centered collective environment" (Somyurek, Atasoy & Ozdemir, 2009). The use of interactive whiteboards in classrooms contributes to the learning process through increasing the teachers' proficiency level, facilitating student-centered instructional performances and changing many experienced teachers' attitudes toward technology

(Huber, 2010). Teachers can procure vast digital educational materials through instant access to the Internet and present them to students via interactive whiteboards.

Current research on the interactive whiteboards' use in educational settings reflects several advantages for students. For instance, they develop students' autonomy (Harlow, Cowie, & Heazlewood, 2010; Minor, Losike-Sedimo, Reglin & Royster, 2013) and it has been discussed that they increase student enthusiasm and motivation (Schmid, 2006; Torff & Tirotta 2010; Wood, R., & Ashfield, J. (2008), possess the capacity to ease teaching and learning (Smith et al., 2005; Glover et al 2005), enhance the degree of understanding (Holmes 2009; Wall, Higgins & Smith, 2005) and enable students to participate in the lessons being conducted and provide collaboration in the classroom (Gray et al., 2005; Minor, Losike-Sedimo, Reglin & Royster, 2013).

Information and communication technology (ICT) in education is widely used for effective learning throughout the world. As a type of ICT, interactive whiteboards have so many benefits. Due to this potential, many countries have invested considerably in the installation of interactive whiteboards and struggled to spread this technology to schools of all levels. In terms of installation of interactive whiteboards in schools, the United Kingdom (UK) has made the greatest attempt (Yang, Wang, & Kao, 2012). In many UK primary schools, other teaching tools have almost been completely replaced with interactive whiteboards (Warwick, Hennessy, & Mercer, 2011). In reference to BECTA (2007), the interactive whiteboards has a high prevalence in primary (100%) and secondary schools (98%) of UK.

In Turkey, more than $1 billion have been invested for the development of the elementary and secondary education programs (Somyurek, Atasoy & Ozdemir, 2009). This investment were made in accordance with FATİH Project (The Increasing Opportunities and Improvement of Technology Movement) which was initiated with National Science and Technology Policy 2003-2023 Strategy Document, in November 2010. The aim of this project was to provide equality of educational opportunities in Turkish schools and the most productive usage of information technologies. With this project, it was aimed to provide 570000 LCD Panels and internet network infrastructure in all classrooms of preschool, elementary and secondary education (FATİH, 2014).

Many countries, including USA, Canada, Mexico Taiwan, Japan, Singapore, Malaysia, China and Russia are also aware of the importance of using this technology in classroom teaching, and all these countries are eager to integrate interactive whiteboards in learning and teaching (Yang, Wang, & Kao, 2012). At the end of 2009, interactive whiteboards were installed in 31% of Australian classrooms, 40-42% of classrooms of Denmark and The Netherlands were equipped with interactive whiteboards as well (Lee, 2010).

Significance of the Problem

According to Heuser (2005), interactive whiteboards are used in "more than 1.6 million K-12 classrooms, by more than 40 million students globally." Since the FATİH project was initiated in Turkey, billions of dollars have been consumed in supplying schools with the interactive whiteboards, computers and Internet. Even though Turkey is one of the countries that invest a great deal in interactive whiteboard technology, there is comparatively fewer background or research literature available on interactive whiteboards than the other countries. Most of the studies conducted in Turkey related to interactive whiteboards are about participants' views (Bulut & Koçoğlu, 2012; Gürol, Donmuş, & Arslan, 2012; Kahyaoğlu, 2011) and about the problems that teachers and administrators encounter during the use and placement of the boards (Çiftçi, Taşkaya, & Alemdar, 2013; Keser, & Çetinkaya, 2013; (Somyurek, Atasoy & Ozdemir, 2009; Türel, 2012).

As the quantity of interactive whiteboards in Turkish classrooms is increasing, the productivity of these devices and attitudes toward them in promoting teaching and learning will continue to be questioned. Moreover, as teachers use interactive whiteboards, the attention will turn to pedagogical issues and the attitude towards these boards. Although many countries/schools have enthusiastically adopted interactive whiteboards, only few negative attitudes have been detected against these boards. Since the literature's lack of studies investigating students' and teachers' attitudes towards interactive whiteboards technology (Elaziz, 2008), this study may provide useful results for the literature especially showing how teachers and students perceive interactive whiteboard technology.

Before deciding whether to invest in a new technology or available technologies to screen the current system, policy makers and educators need to know views of education's shareholders such as teachers and students who are to use this technology in the first place. Further research that will include the other shareholders of education like parents/guardians, administrators and other facilitators are a need, especially in Turkey and would be valuable. Minor, Losike-Sedimo, Reglin and Royster (2013) also recommend a research on the attitudes of teachers and students related to technology integration and the interactive whiteboard technology.

METHOD

Research Setting

This study was conducted during the 2011-2012 educational year. The targeted schools were a private secondary school, a private science high school and a private Anatolia high school located in Keçiören district of Ankara. In the Turkish educational system, in terms of student achievement, science high schools rank the first among all other types of schools. The sample of the current study was composed of students and teachers from these schools. The subjected students were at the ages between 11 and 18 (6^{th}-12^{th} grades) studying at primary and secondary education. Teachers had years of teaching experience ranging from one year to 28 years; had branches been ranging from visual arts to physics. Owing to being private schools, the proficiency of these teachers in the use of interactive whiteboards is higher compared to the teachers of public schools. On the other hand, the use of interactive whiteboards has been compulsory in these schools since 2007, and the teachers had seminars on the use of interactive whiteboards four years ago.

The survey was applied to 64 science high school, 67 Anatolian high school and 124 middle school students and 23 teachers (11 high schools and 12 primary schools). The 58% of surveyed students were female and 42% were male. English teachers (6) prevailed among the participant teachers. Before the application of the survey, participants were given information about the purpose and content of the survey. The survey was applied to teachers during the breaks, and to students in the last 20 minutes of the class hours. Moreover, elementary and high-school students were administered on different days.

Purpose and Research Questions

This paper focuses on the interactive whiteboards and analyses on students' and teachers' responses to attitude survey. The purpose of this study was to determine the attitudes of both teachers and students against the use of interactive whiteboards and to determine the differences between their attitudes across their genders, ages and schools. It also compares the attitudes between groups of teachers in different subject areas.
The research questions of this study are listed as follows:

1. What are the attitudes of students towards interactive whiteboards?
    a. Do attitudes differ across courses?
    b. Do attitudes differ for elementary and high schools?
    c. Do attitudes differ across gender?
    d. Do attitudes differ across students' possession of a personal computer?
    e. Is there any relationship between attitudes and the ages of the students?
2. Do attitudes differ for students and teachers?

Instruments

Two different data collection instruments were developed by the researcher to collect data in order to give responses to the research questions. Reliability was established on the instruments using the Cronbach's alpha internal consistency reliability estimates. Data collected from students and teachers were merged and only one reliability coefficient was calculated. The overall reliability estimated for the instruments was measured as .92. Therefore, the instruments are considered to be highly reliable.

The primary validity evidence appropriate to the instrument was content validity. To enhance content validity of the instrument, three experts; two experts from a university and one experienced teacher from a private high school carefully reviewed all items of the instrument. The experts were asked to review the instruments for unclear directions, vague items and words, and the appropriateness of the scale. The experts mostly offered changes about the parallelism of the items on both instruments. Additionally, two unnecessary items were excluded, and two akin items were reduced to one item concerning experts' opinions.

Finally, there were 25 items on the survey along with some extra demographic items. Two typical items on the surveys were: "interactive whiteboard is a great technology" and "course is enjoyable when interactive whiteboard is used." In the five-point Likert-type scale used in this study, 5 corresponded to 'strongly agree, 4 'agree, 3 'neutral, 2 'disagree' and 1 'strongly disagree'. Hence, a score below 3 on this scale denoted a negative attitude, a score close to 3 a neutral attitude and a score above 3 a positive attitude.

Data collection and analysis

Data presented in this paper come from the survey administered to students and teachers in three private schools possessing and actively using interactive whiteboards. Before the application of the survey participants were given information about the purpose and content. Survey was administered to teachers during the breaks, applied to students during the last minutes of the class hours. The survey consisted of 25 short items and took approximately 20 minutes to complete.

In this paper, the descriptive statistics calculated were the means and percentages. The inferential statistical models used were the t-test for independent samples, correlation for relationship and linear regression for prediction. The research questions were tested at an alpha level of .05.

FINDINGS

Do attitudes differ across courses?

In the course of the use of interactive whiteboards, students were asked: "Which lesson do you like most?" Students pointed out 15 different lessons ranging from German language to Biology lessons which they enjoy the usage of the interactive whiteboards in. The percentage of the branches that the students like the interactive whiteboards to be used in is given in Table 1.

Table 1: The percentages of attitudes across branches

Lesson	%	Lesson	%	Lesson	%
German L.	2.8	Visual arts	.4	Geometry	5.9
Physical education	2.0	English	11.0	Physics	3.1
Biology	4.7	Chemistry	1.2	Turkish L.	4.3
Geography	4.7	Maths.	33.5	Science and technology	5.9
Literature	.4	Social sciences	8.3	History	11.8

Table 1 shows that students mostly like the use of interactive whiteboards in math lessons (33.5) and at least in literature (.4) and visual arts (.4). There is a significant supremacy of math course, the nearest course (History) legs 21.7 percentages behind the math.

Do attitudes differ for elementary and high schools?

A total of 131 high school and 124 elementary school students responded the survey questions. There were 25 items on the survey, and it was scored between 5-1 indicating the positive and negative attitudes. The maximum possible score for each participant was 125. The mean of the high-school students was calculated as 83.5 with a standard deviation of 20.8 and the mean of elementary school students was calculated as 104.3 with a standard deviation of 15.6. Both the mean and the spread of the high-school students' scores are lower than those of elementary school. The related statistical analysis, the independent sample t test results are shown in Table 2.

Table 2: t test results for attitudes of high and elementary schools

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	8.03	.005	-9.01	253	.000	-20.79
Equal variances not assumed			-9.08	240.67	.000	-20.79

As seen on Table 2 the difference, attributed to attitude, between elementary and high-school students, is highly significant ($p<0.000$). According to this result elementary school students have more positive attitude towards interactive whiteboards when compared to high-school students.

Do attitudes differ across gender?

Of the surveyed students, 58% were female and 42% were male. While the mean of the scores of the males was 100.4, that of females was 88.8 showing male students having more positive attitudes toward the interactive whiteboards. The results of the independent t-test conducted for the difference between male and female students' attitudes is indicted in Table 3.

Table 3: t test results for attitudes of male and female students

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	5.47	.020	4.51	253	.000	11.67
Equal variances not assumed			4.66	247.10	.000	11.67

Table 3 shows that attitude toward interactive whiteboards differs for male and female groups and in fact, the difference between groups is highly significant (p<0.000).

Do attitudes differ across students' possession of a personal computer?
Of the 255 participant students, 168 had a personal computer, and 87 didn't have one. The means of the students having and not having a personal computer are 93.7 and 93.5 respectively. Having had a computer may affect students' attitudes against the interactive whiteboards. To shed light on this possibility t-test was conducted. Table 4 indicates independent t test results.

Table 4: t test results for attitudes of students having and not having a personal computer

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	2.55	.111	.066	253	.95	.18
Equal variances not assumed			.067	183.46	.95	.18

Table 4 shows the mean difference for student's possession of a computer is only .18. This is quite low to result in a significant difference. The conduction of t test resulted in no statistical significant difference (p > .05)

Is there any relationship between attitudes and the ages of the students?
Students at different grades at the ages ranging from 11 to 18 participated in this study. Correlating the attitude with the ages of students considered to be valuable. The relationship between attitudes and the ages of the students is indicated in Table 5.

Table 5: Regression results for attitude and the age

Model Summary		ANOVA					Coefficients		
R	R Square	Model	df	Mean Square	F	p	Model	B	p
-.55	.304	Regression	1	34439.07	110,44	.000	(Constant)	170.19	.000
		Residual	253	311.83			Age	-5.50	.000
		Total	254						

The Pearson correlation results indicated that there is a moderate correlation of -.55 among the age and attitude showing that as students get elder, they gain more negative attitudes against interactive whiteboards. Linear regression is the next step up after correlation. Linear regression is used to understand whether students' attitude can be predicted based on their age. The R^2 value in Table 5 indicates how much of the "attitude" can be explained by the independent variable; "age". In this case, 30.4% can be explained as a high figure. The ANOVA result indicates the statistical significance of the regression model that was applied. Table 5 shows that p = .000, which is less than .05, and indicates that, overall, the age can statistically significantly predict the attitude of students. By referring to Table 5, we can present the regression equation as:
Attitude = 170.19 -5.50*Age.

Do attitudes differ for students and teachers?
For this study, 22 teachers at aforementioned schools were surveyed. Nine were male and 13 were female teachers. The teachers were from 14 different branches and six of them were English language teachers. The mean attitude score for teachers were calculated as 98.1 indicating a mean score slightly above that of students (93.6). Since the surveys applied to students and teachers were parallel; it is safe to compare the gathered scores. For instance, a pair of parallel questions was as follows: Student: "I understand the content easier when interactive whiteboard is used" and teacher: "I teach the content easier when interactive whiteboard is used." Moreover, ten items were completely same. For instance, one of those was: "I have positive feelings towards interactive whiteboards."

There were 255 students and 22 teachers completing the survey. The comparison of the attitudes was performed via independent t-test and, the results are shown in Table 6.

Table 6: t test results for attitudes of students and teachers

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	p	t	df	p	Mean Difference
Equal variances assumed	.189	.664	-.96	275	.337	-4.49
Equal variances not assumed			-1.04	25.61	.306	-4.49

Table 6 indicates that teachers and students almost have similar attitudes towards the interactive whiteboards. The independent t test resulted in no significant difference ($p>.05$).

DISCUSSION

In this study, the answers given to seven important questions and sub-questions attributed to the attitudes of students and teachers towards the interactive whiteboards were examined. As a result of this research study, several valuable results were obtained. First of all, interactive whiteboards were highly rated by both teachers and students. This is consistent with recent research that has broadly established that students and teachers report favourable feedbacks about interactive boards (Hall & Higgins, 2005; Kennewell & Morgan, 2003; Mathews-Aydinli, & Elaziz, 2010; Moss et al., 2007; Öz, 2014; Schmid, 2006; Wall, Higgins, & Smith, 2005). Teachers' positive attitudes are consistent with the findings of several other researchers (Elaziz, 2010; Lai, 2010; Xu & Moloney, 2011). Likewise, students' favorable attitudes are consistent with findings of Elaziz (2010), Lisenbee (2009), and Morgan (2008). Moreover, in terms of attitudes, the results of this study are consistent with the studies conducted by Erdem, (2012) and by Ateş (2010) in private schools. Furthermore, there are studies conducted in public schools indicating positive effects of interactive white boards on students' attitudes (Yorganci & Terzioğlu, 2013; Zengin, Kırılmazkaya & Keçeci, 2011).

Secondly, this study indicated that students' attitudes differ across the gender, the mean of the scores of the males was significantly higher than that of female students showing male students having more positive attitudes toward the interactive whiteboards. This result is contrary to the finding of Morgan (2008) who showed that males displayed fewer at-task behaviours during observations when the interactive whiteboards was not in use than did females. Similarly, the study conducted by Öz (2014) showed that there was no difference in terms of gender. Likewise, similar results were reports by Yuan and Lee (2012) who showed that there was no gender difference on perceptions toward Magic Boards. Thus, the findings of this study contradict with the up to date research on the effect of interactive whiteboards on the independent variable gender. This implies that more researches are needed to have appropriate decisions for whether gender difference affects the attitude towards interactive whiteboards.

Four of the findings of this study are remarkable. First, the correlational analysis between age and attitude showed that as students get elder their positive attitudes decrease. The prediction of attitude from age can be deduced form the equation; Attitude = 170.19 -5.50*Age. Second, in dependent sample t-test results indicated that there was no differences between the attitudes of teachers and students. Third, students mostly prefer the usage of interactive whiteboards in math courses. Fourth, students' attitudes differ across school levels. However, no results in the literature were detected to compare these four findings.

CONCLUSION

To conclude, the attitudes of teachers and students toward the uses of interactive whiteboards exhibit a very favorable description overall. Despite everything, the private school teachers' and students' positive attitudes toward the use of the interactive whiteboards in classrooms may influence MoNE policymakers in two ways: First, positive attitudes of private school participants indicate that these schools have eliminated the factors such as the lack of interactive whiteboard related in-service training, lack of digital educational material, lack of assistance and maintenance, and administrative affairs (Somyurek, Atasoy & Ozdemir, 2009) that negatively affect the attitudes of teachers and students. Policy makers may observe the teachers' and students' practices with the whiteboards in private schools and transfer the gained experiences to public schools. Second, by referencing to the private schools they confidently may continue to make investments on new technology integration to public schools.

Moreover, positive feelings of students towards the boards may encourage teachers from all over the world to use these devices and to engage students with interactive white boards in their courses. Since this study has provided evidence about teachers' and students' attitudes toward interactive whiteboards, it would be interesting to compare this research's findings with those of other countries.

Although the outcomes obtained through this study have a potential to be used as a resource by future researchers, it still has several limitations. The proportion of private schools to public schools in Turkey is only about 1%, and this study is limited with only a small portion of these private schools which is located in Ankara. On the other hand, the sample of teachers in the study had a professional development program on the usage of interactive whiteboards which is an important factor that may have affected teachers' and students' attitudes.

As a country in search of compensating its gap in terms of meeting ICT needs of the 21st century, the results of this study are expected to shed light for policy makers and educators in Turkey. The future investments in education should be made using the resources effectively, taking views of the shareholders of education, especially teachers and students into account. Thus, time would not be wasted, and better educational outcomes would be achieved. Since only a few studies conducted in Turkey were found attributed to the attitudes of the school teachers and students towards interactive whiteboards, the results of this study are substantial. Especially, in terms of comparability this study will be valuable for future research and educational investments.

RECOMMENDATIONS AND FUTURE RESEARCH

- Students' attitudes towards interactive whiteboards may be effected by the way in which their interactivity is used and developed in classroom practice. Research is needed to explore the ways teachers use these tools and its effect on students' attitudes and learnings.
- Experimental studies on the effect of the interactive whiteboards usage on students' achievement can be conducted.
- Patterns of the usage of interactive whiteboards in higher educational institutes and their effect on university students can be investigated.
- Collaboration should be provided by the government so that teachers can share practical issues with using the interactive whiteboards.
- Research is needed to understand the match between interactive whiteboards technology and pedagogy.
- More classroom observations are needed to investigate to what extent educators actually make use of the capabilities of these interactive boards.

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