Uluslararası Eğitim, Bilim ve Teknoloji Dergisi
2016, Cilt 2, Sayı 3, 125-134

International Journal of Education, Science and Technology
2016, Volume 2, Issue 3, 125-134

RELATIONSHIP BETWEEN ATTITUDE OF STUDENTS AT THE LEVEL OF PRIMARY EDUCATION TOWARDS INTERACTIVE BOARD AND THEIR MOTIVATION FOR PROCESS OF LEARNING SCIENCE

Hakan SARAÇ*, Murat ÖZARSLAN**

ABSTRACT: The aim of this study is to determine the relationship between attitude of students at the level of primary education and their motivation for process of learning Science. Research was carried out with 632 elemantry and secondary school students, who are educated in a private school bound to National Education Ministry, in Spring term of 2015-2016 education period. Study is cross-sectional research from quantitative methods. As a data collection tool, "Interactive Board Attitude Scale" and "Permanent Science Learning Motivation Scale" were applied to students. While data obtained from applied scales were being analyzed, descriptive statistics, independent groups t-test, one way variance and correlation analyzes were utilized. As a result of the research, it is determined that students' attitude towards usage of interactive board is high; there is not any difference in students' motivation for process of learning Science in terms of their gender; students' motivation for permanent learning Science has changed statistically and significantly in the favour of 8th grade students; there is a positive low relationship between students' attitude towards usage of interactive board and their motivation level for permanent learning Science.

Keywords: Learning science, ınteractive board, elementary school, motivation, secondary school

1. INTRODUCTION

One of areas which have been used frequently recently in the scope of education-teaching technologies is interactive board technology. Interactive boards firstly produced in 1991 have started to be used in education at the beginning of 2000s. For the name of interactive boards, " smart board" and "electronic board" are used, too (Şad, 2012). In general, interactive boards consist of touch sensitive screen, computer and a projection device (Shenton and Pagett, 2008). At the present time, interactive boards have been used widely as digital learning learning environments (Littleton, 2010; Somyürek, Atasoy and Özdemir, 2009), and they have been presented to the schools within the scope of national education policies arranged by countries such as England, the USA, Taiwan, Australia and South Africa (Hall and Higgins, 2005; Holmes, 2009; Slay, Siebörger ve Hodgkinson-Williams, 2008; Lai, 2010; Torff and Tirotta, 2010). Also in our country, it was aimed to provide equal opportunities and more effective education in learning environments equipped with advanced technology, computer, interactive board, visual presenter, fast and powerful internet connection for each class and multifunctional printer for each school and tablets for each student within the scope of FATIH project (The Movement of Increasing opportunities and Improving Technology- FATIH) (FATIH project, 2012).

In recent years, researches examining students' attitudes have been focused on more often in academic studies about interactive board which is the most used one by teachers (Kurt, Kuzu, Dursun, Güllüpınar and Gültekin, 2013) in technologies provided thanks to FATIH Project in our country. Accordingly, Sünkür, Şanlı and Arabacı (2011) have concluded that

* Dr., MEB Fizik Öğretmeni, hknsrcmv@gmail.com
** MEB Biyoloji Öğretmeni, muratozarslan14@gmail.com

students have positive views about using interactive boards in the lessons. Zengin, Kırılmazkaya and Keçeci (2011) confirmed that students learnt better and had fun in courses in which interactive board was used for education; and interactive board affected students' attitude and success positively. İşman, Abanmy, Hussein, Saadany and Abdelrahman(2012) also concluded that the usage of interactive board increased students' motivation and success and facilitated their comprehension skills. Nevertheless, Olgun (2012) emphasized in her research about interactive board usage in Physics class that interactive boards can be perceived as a be beneficial tool in various classroom environments. Another similar study was conducted by Yıldızhan (2013) and consequently put forward that interactive boards and visual materials supported with sound and animations provide permanence. Akgün and Koru (2015) came to a conclusion that usage of boards had a positive and significant effect on students' attitude towards interactive boards. As a consequence of their studies in which students' attitude was examined in terms of different variables, Demircioğlu and Demircioğlu (2015) ascertained that students' attitude towards interactive boards is really high. Whereas students' attitude points did not display any difference in terms of their gender in the research, the points of their attitude differentiated in accordance with their level of class, families' income and also technology adequacy. As a result of the study in which students' views about interactive boards at secondary school were asked, Vural and Kırkbeş (2015) figured out that students had positive opinions when they first saw it, they wanted interactive boards to be used in the class and they also wanted to interactive boards to be used more often in numerical lessons such as Math and Physics.

In additon to positive sides of interactive board using, some other negative consequences were also asserted by results of some researches. For instance, students stated some technical problems that interactive boards run so slow, their touch screen is very sensitive and smart boards can not be used when the electricity is gone. (Vural and Kırkbeş,2015). On the one hand, some disadvantages like interactive boards are unable to be integrated sufficiently into lesson plans, they make learners passive and cause teachers to be dependent on computer so much were also indicated. (Shenton and Pagett, 2008; Türel,2012). On the other hand, Erduran and Tataroğlu(2009) marked that issues such as inadequacy of materials and sources to be used with interactive boards and waste of time for preparing materials and inability to have sufficient skills for preparing materials led some negative effects on teachers.

In contemporary societies, Science has been always valued and regarded as important (Karasar, 2004). Science is a network of teories connected with each other through logic which stand for our latest thoughts about what natural world resembles. (Medawar,2003). Studies about perspectives to Science generally focus on attitudes towards Physical Sciences (Papanastasiou and Zembylas, 2002; George, 2003).

In the field of literature, elementary and secondary school students' motivation for Maths and Physical Science in terms of the variables such as gender, class level, favourite lesson, education of parents. Akpınar, Batdı and Dönder, 2013; İnel Ekici, Kaya and Mutlu, 2014; Martin, 2004; Tseng, Tuan and Chin, 2009; Uzun and Keleş, 2010; Dede and Yaman, 2007; Yenice, Saydam and Telli, 2012). Azizoğlu and Çetin (2009) determined in their study fulfilled with secondary schools that gender did not effect students' motivation level significantly; however, it did have an effect on their attitude. In the study carried out with secondary students, Britney and Pajares (2001) determined that motivation of female students are higher than male ones. Female students' self-efficacy for learning Science, self-regulation and motivation for being succesful in Science are also higher than male ones.In the studies, it is deducted that

motivation is restricted with Physical Science in the schools and it does not go further than school; even if motivation for learning Science is vital, it takes little consideration in the field of literature (Shernoff and Hoogstra, 2001; Vedder-Weiss and Fortus, 2011).

In other studies carried out abroad related to this subject, it is also confirmed that students' motivation for learning Science is generally low in classes which teacher-centred teaching is applied in (Pascarella, Walberg, Junker and Heartel, 1881) and students' motivation decreases as they step to the 8th grade from 5th grade in traditional schools (Fortus and Vedder-Weiss, 2014; Osborne, Simon and Collins, 2003).

When indicated resarches are examined, it is seen that there is not any focus on studies dealing with the relationship between students' attitudes towards interactive bards at the primary level and their motivation for learning Science. Thats why in this study, it is aimed to determine the relationship between students' attitude towards interactive boards and their motivation for the process of learning Science. Therefore, the research problem of this study is like this: "Is there any relationship between students' attitudes towards interactive boards at the primary level and their motivation for learning Science? " In order to reach this goal, the following sub-problems were tried to be answered :

1) How is students' attitude towards interactive board using ?

2) What is the point of students' motivation for learning Science?

3) Is there a statistically significant difference among students' motivation points for learning Science with regard to their gender?

4) Is there a significant difference among students' motivation points for learning Science in terms of their class level?

5) Is there a meaning relationship between points of students' attitude towards interactive boards and their motivation for learning Science?

2. METHOD

From quantitative research methods, cross-sectional design was applied in this research. Any research can be completed in shorter time with cross-sectional design by working with samples belonging to different age groups or learning levels but in the same life period (Çepni,2012).

2.1. Study Groups

Research was conducted in private elementary and secondary school located in Marmara Region / Turkey in the education year 2015-2016. The scales in the research were asked to be filled in voluntarily and it was stated in the instructions that students might not deliver scales if they would not like. Totally 632 students including 329 male and 303 female ones attended the study. Data related to gender and class levels of students participating in the study are in Table 1:

Table 1: Data Related to Gender and Class Levels of Students Participating in the Study

Participants	School Level	Class Level	Male	Female	Total
Students	Elementary	3th Grade	54	52	106
		4th Grade	59	53	112
	Secondary	5th Grade	56	55	111
		6th Grade	51	59	110

	7th Grade	55	47	102
	8th Grade	54	37	91
	Total	329	303	632

2.2. Data Collection Tools

In the scope of research, scales of interactive board attitude and permanant Science learning were applied to students at one sitting.

2.2.1. Interactive Board Attitute Scale

5 point likert scale named as “Interactive Board Attitude Scal” including 25 items were used so as to gather data about interactive board from students. Scale for the concept “Interactive Board” was improved by Çelik and Atak (2012).After validity and reliability study, the scale included 3 factors " Facilities of Interactive Board, Difficulties of Interactive Boards and Teachers' Usage of Interactive Boards"as a result of factor analysis of the scale. In this study, Cronbach Alpha reliability co-efficient was found as .832.

2.2.2. Permanent Science Learning Motivation Scale

“Continuing Motivation for Science Learning” scale improved by Fortus and Vedder-Weiss (2014) was transcribed to Turkish by Erdoğan and Çakır(2015). The scale's Cronbach Alpha co-efficient was 0.87 and test re-test reliability co-efficient was 0.84 in the study. Scale had 19 items prepared as “Not correct at all” , “Not so correct”, “Partially correct”, “correct” and “Completely correct” in 5 likert type. In this study, Cronbach Alpha co -efficient reliability of the scale was also calculated as .871.

2.3. Data Analysis

Data collected from students voluntarily was firstly tested with Kolmogorov-Smirnow analysis for the normal distribution compliance test and it was confirmed that data displayed normal distribution ($p>.05$). And then, attitude scales of students' interactive board and permanent Science learning motivation were examined for the averages at the general and factor level and independent groups t-test with regard to gender and one way variance according to class level (ANOVA) analyzes were done. Furthermore, correlation test was used in order to measure the relationship between interactive board and permanent Science learning motivation applied to the students.

3. FINDINGS AND CONCLUSION

In the table 2, findings about students' attitude points for interactive board usage and their motivation points for permanent Science learning are presented.

Table 2: Descriptive Statistic Results of Points of Students' attitude towards Interactive Board and Their Motivation for Permanent Science Learning

Attitude	N	$\bar{X}$	Ss
Attitude towards interactive board usage	632	3.63	.51
Motivation for Permanent Science Learning	632	2.86	.92

According to table 2, it is seen that students' attitudes towards interactive board usage is high.($\bar{X}$=3.63; Ss= .51). Moreover, it is determined that students' motivation level for permanent Science learning is at the medium level. ($\bar{X}$=2.86; Ss= .92)

Findings related to difference in students' motivation for permanent Science learning in terms of their gender are displayed in the Table 3.

Table 3: T-test Results of Students' Motivation Points for Permanent Science Learning in Terms of Their Gender

Attitude	Cinsiyet	N	$\bar{X}$	Ss	t	p*
Motivation for Permanent Science Learning	Male	329	2.92	.97	1.817	.07
	Female	303	2.79	.85		

*p>.05

According to the Table 3, it is determined that there is not a statistically significant difference in students' motivation for permanent Science learning in terms of their gender.(t (632) = 1.817; p>.05). This conclusion reveals that gender does not have a significant effect on students' motivation for permanent Science learning.

Findings related to difference in students' motivation for permanent Science learning with regard to their class grade are showed in the Table 4.

Table 4. ANOVA Results of Students' Attitude Points for Interactive Board Usage with regard to Their Class Grade

Attitude	Class	N	$\bar{X}$	sd	F	p*	Significant Difference
Motivation for Science Permanent Learning	3th grade	106	2.78	5-626	3.350	.005	3-8
	4th grade	112	2.80				4-8
	5th grade	111	2.92				-
	6th grade	110	2.82				6-8
	7th grade	102	2.71				7-8
	8th grade	91	3.19				
	Total	632	2.86				

*p< .05

According to Table 4, it is determined that points of students' motivation for learning Science displayed statistically significant difference with regard to their class level.($F_{(5-626)}$ =3.350, p≤.05). In accordance with this conclusion, Games-Howell test was used in order to find source of the difference. The reason why this analysis was applied was that variance of the data did not demonstrate homogeneity after Levene test.(p=.017, p<.05). After Games- Howell test, 8th grade students' motivation points for permanent Science learning showed statistically

significant difference in favour of 8th class ($\bar{X}$=3.19) compared to 3th grade($\bar{X}$=2,78), 4th grade ($\bar{X}$=2,80), 6th grade($\bar{X}$=2,82) and 7th grade ($\bar{X}$=2,71).

For the purpose of finding out whether there is a significant difference between students' motivation for learning Science and students' attitudes towards interactive board usage and sub-dimensions of attiude scale, findings were analyzed with pearson product-moment correlation technique and presented in the Table 5.

Table 5. Correlation Results Demonstrating the Relationship between Students' Interactive Board Using with its Sub-dimensions and Their Motivation for Learning Science

Variables	**$\bar{X}$**	**Ss**	**1**	**2**	**3**	**4**	**5**
Interactive Board Using Average	3.63	.51	1	.865**	.878**	.659**	.175**
Facilities of Interactive Board using Sub-dimension Average	3.63	.49		1	.594**	.466**	.139**
Difficulties of Interactive Board Sub-dimension Average	3.51	.70			1	.398**	.153**
Teachers' usage of Interactive Board Sub-dimension Average	3.88	.75				1	.141**
Motivation Average for Science Learning Process	2.86	.92					1

**p< .01

According to Table 5, it is determined that there is a positive significant relationship between students' attitude towards interactive board and their motivation level for permanent Science learning process.(r= .175, p<.01). Moreover, it is confirmed that there is a positive significant relationship at the low level between sub-dimensions of attitude scale for interactive board usage and permanent Science learning.(r= .139; r= .153; r= .141, p<.01).

4. DISCUSSION AND SUGGESTIONS

In the study, it is ascertained that students' attitudes towards interactive board usage is high. This conclusion bears a resemblance to research results in which students have positive attitudes and opinions about the usage of interactive board (İşman vd., 2012; Sünkür vd., 2011; Vural and Kırkbeş, 2015; Zengin vd., 2011). The reasons for these conlusions might be the fact that the study was conducted in a private school where all of the lessons were frequently taught with the help of interactive board. Because, it is stated that the frequent usage of interactive board in the lessons had a positive effect on students' attitudes towards educational Technologies (Akgün and Koru, 2015; Olgun, 2012; Yıldızhan, 2013). The other reason is also taught to stem from the fact that financial income of students' families enables students to reach technology easily and with this way students often use technology in their lives actively. Because, in the field of literature it is known that there is a positive relationship between financial income of

students' families and their attitudes towards interactive board usage in the lessons (Demircioğlu and Demircioğlu, 2015).

In the study, it is specified that there is not statistically significant difference between students'motivation points for learning Science process with regard to their gender. This conclusion reveals the fact that students' gender does not have statistically significant effect on their motivation for learning Science. However, it is stated in the literature that female students have lower motivation for learning Science than male ones (Fortus and Vedder-Weiss, 2014). Besides, it is indicated that gender do not cause significant difference in points of motivations in the variance of students' motivation points for learning Science with regard to their gender (Azizoğlu and Çetin, 2009) or female students have higher motivations than male ones (Britner and Pajares, 2001). Consequently, different conclusions related to students' motivation for learning Science are included in the body of literature. Nevertheless, when it is considered that studies about motivation generally focus on Physical Science motivation and there is not sufficient study related to motivation for learning Science process (Shernoff and Hoogstra, 2001; Vedder- Weiss and Fortus, 2011; Erdoğan and Çakır, 2015), more studies can be conducted about the effect of students' gender on their motivation for learning Science process.

In the study, it is ascertained that students' motivation points for permanent Science learning process in accordance with students' class level differentiated significantly and statistically in favour of 8th grade students. This result put forwards the fact motivation points of 8th grade students are statictically significant high except for 5th grades. Besides, it is remarkable that students' motivation did not differentiate statistically apart from 8th grade students. Because, it is generally stated in the literature that students' motivation for permanent Science learning decreases by contrast with the increase of their class grade (Fortus and Vedder-Weiss, 2014; Vedder-Weiss and Fortus, 2011; Osborne, Simon and Collins, 2003). However, it is found out that students' motivation for permanent Science learning did not display any change in term of their class grade in democratic learning environments which was decided and put into practise by both teachers and principals together, and also supported in compliance with students' interests and requirements, and in which students had a chance of choosing time and subject of their learning,; their self-assesment skills and their own learning strategies were promoted; cooperation, coomunication and dialogues were included (Fortus and Vedder-Weiss, 2014). The results of this study bear a resemblance in general with conclusions of the studies in literature in which students' motivations did not change in accordance with their class grade in democratic learning environments (Fortus and Vedder-Weiss, 2014; Vedder-Weiss and Fortus, 2011). The result of this study is thought to have its source in the fact that study was conducted in a private school and democratic learning environment.

In the study, it is determined that there is a low significant relationship in the positive way between students' attitudes towards interactive board usage and their motivation level for permanent Science learning. This reveals that students' attitude towards interactive boards had a low effect on their motivation for permanent Science learning. In this respect, it is thought that the effect of interactive board usageon their motivation for learning Science is really low. Herein, implementations related to the usage of interactive boards might not make satisfactory contributions to learning Science process which is really important in our day.

These suggestions can be made in accordance with the findings obtained from this research;

- More studies about the effect of educational technologies such as interactive board usage

on the motivation of permanent Science learning process can be carried out.

- Studies related to the effect of variables such as individual features (learning types, age, gender, etc.) and environmental factors on the motivation for permanent Science learning can be conducted.
- In order to enhance students' motivation for permanent Science learning, not only students are encouraged to learn Science in the schools but also different activities outside of the school can be arranged. (project studies, research centres, planned tours to laboratories etc., scientific exhibitions etc.)
- Both intramural curriculum activities and extrascholastic activities can be developed during the period of formal education.
- Learning environments and schools should be made more democratic and students should have a voice in the administration and implementations and also they should be provided to decide on their learning. With this way, new generations who have more freedom and think scientifically can be raised.
- Materials that can be used with interactive boards and enhance students' motivations for permanent Science learning can be prepared and used.

REFERENCES

Akgün, M., & Koru, G. (2015). Akıllı Tahta Kullanımına Yönelik Öğrenci Tutumu Ve Öğretmen Görüşlerinin İncelenmesi (Ankara İli Örneği). *Qualitative Studies*, (1), 1-12.

Akpınar, B., Batdı, V., & Dönder, A. 2013. İlköğretim öğrencilerinin fen bilgisi öğrenimine yönelik motivasyon düzeylerinin cinsiyet ve sınıf değişkenine göre incelenmesi. Cumhuriyet International Journal of Education, 2(1): 15-26.

Azizoğlu, N. & Çetin, G. (2009). 6 ve 7. sınıf ö ğrencilerinin öğrenme stilleri, fen dersine yönelik tutumları ve motivasyonları arasındaki ilişki. *Kastamonu Eğitim Dergisi*, 17(1), 171-182.

Britner, S.L., & Pajares, F. 2001. Self-efficacy beliefs, motivation, race and gender in middle school science. Journal of Women and Minorities in Science and Engineering, 7: 271-285.

Çelik, S., & Hasan, A. T. A. K. (2012). Etkileşimli tahta tutum ölçeğinin geçerlik ve güvenirlik çalışması. *Anadolu Journal of Educational Sciences International*, *2*(2), 43-60.

Çepni, S. (2012). *Araştırma ve proje çalışmalarına giriş*. Trabzon: Üçyol Kültür Merkezi.

Dede, Y., & Yaman, S. 2007. Öğrencilerin fen ve teknoloji ve matematik dersine yönelik motivasyon düzeylerinin bazı değişkenler açısından incelenmesi. Kuram ve Uygulamada Eğitim Yönetimi Dergisi, 52: 615-638.

Demircioğlu, G., & Demircioğlu, H. (2015). Öğrencilerin kimya derslerinde akıllı tahta kullanımına yönelik tutumlarının farklı değişkenler açısından incelenmesi. *Journal of Research in Education and Teaching*, 4 (2), 387-395, ISSN: 2146-9199.

Erdoğan, D., & Çakır, M. (2015). Daimi Bilim Öğrenme Motivasyonu Ölçeği'nin Türkçe'ye Uyarlanması: Geçerlik ve Güvenirlik Çalışması. *Trakya Üniversitesi Eğitim Fakültesi Dergisi*, *5*(2).125-136.

Erduran A., & Tataroğlu, B. (2009). Eğitimde Akıllı Tahta Kullanımına İlişkin Fen Ve Matematik Öğretmen Görüşlerinin Karşılaştırılması. *9th International Educational Technology Conference (IETC2009)*, s. 14-21.

FATİH Projesi (2012). [Online] Retrieved Semtember, 10, 2016 fromhttp://fatihprojesi.meb.gov.tr/

Fortus, D., & Vedder-Weiss, D. (2014). Measuring students' continuing motivation for science learning. *Journal of Research in Science Teaching*, 51 (4), 497-522.

George, R. (2003). Growth in students‟attitudes about the utility of science over the middle and high school years: evidence from the longitudinal study of American youth, *Journal of Science Education and Technology*, 12(4), 439-448.

Hall, I., & Higgins, S. (2005). Primary school students' perception of interactive whiteboard. Journal of Computer Assisted Learning, 21, 102-117.

İnel Ekici, D., Kaya, K., & Mutlu, O. 2014. Ortaokul öğrencilerinin fen öğrenmeye yönelik motivasyonlarının farklı değişkenlere göre incelenmesi. Mersin Üniversitesi Eğitim Fakültesi Dergisi, 10(1): 13-26.

İşman, A., Abanmy, F. A. A., Hussein, H. B., Saadany, A., & Abdelrahman, M. (2012). Saudi secondary school teacher sattitudes' towards using interactive whiteboard in classrooms. *The Turkish Online Journal of Educational Technology-TOJET,*11(3), 286-296.

Karasar N., (2004). *Bilimsel Araştırma Yöntemleri*. Ankara: Nobel Yayınları.

Kurt, A. A., Kuzu, A., Dursun, Ö. Ö., Güllüpınar, F., & Gültekin, M. (2013). Fatih Projesinin Pilot Uygulama Sürecinin Değerlendirilmesi: Öğretmen Görüşleri. *Journal of Instructional Technolologies & Teacher Education Vol.1 No2,* 1-23

Lai, H. J. (2010). Secondary school teachers' perceptions of interactive whiteboard training workshops: A case study fromTaiwan. *Australasian Journal of Educational Technology,* 26, 511-522.

Littleton, K. (2010). Research into teaching with whole-class interactive technologies: Emergent the mes. *Technology, Pedagogy and Education*, 19, 2, 285-292.

Martin, A.J. 2004. School motivation of boys and girls: differences of degree, differences of kind, or both. Australian Journal of Psychology, 56(3): 133-146.

Medawar, B.P. (2003).*Genç Bilim adamına Öğütler*. Ankara: Tübitak Popüler Bilim Kitapları.

Osborne, J., Simon, S.,& Collins, S. (2003). Attitudes towards science: A reviewof the literature and its implications. *International Journal of Science Education*, 25(9), 1049–1079.

Olgun, H. (2012). *Fizik Dersinde Ortaöğretim Öğrencilerinin Akıllı Tahta Kullanımı ile İlgili Algılarının Araştırılması.* Yüksek Lisans Tezi, Marmara Üniversitesi, Eğitim Bilimleri Enstitüsü, İstanbul.

Papanastasiou, E. C., & Zembylas, M. (2002). The effect of attitudes on science achievement: a study conducted among high school pupils in Cyprus, *International Review of Education*, 48(6), 469-484.

Pascarella, E.T.,Walberg, H. J., Junker,L. K., & Heartel, G. D. (1981). Continuing motivation in science for early and late adolescents. *American Educational Research Journal*, 18(4), 439–452.

Shenton, A., & Pagett, L. (2008). From 'Bored' toscreen: theuse of the interactive white-board for literacy in six primary classrooms in England. *Literacy*, 41(3), 129-136.

Shernoff, D. J., & Hoogstra, L. (2001). Continuing motivation beyond the high school classroom. *New Directions for Child and Adolescent Development,* 93, 73-88. doi: 10.1002/cd.26

Slay, H., Siebörger, I., & Hodgkinson-William, C. (2008). Interactive whiteboards: Real beauty or just-lipstick?. *Computers & Education, 51*(3), 1321-1341.

Somyürek, S., Atasoy, B., & Özdemir, S. (2009). Board's IQ: Whatmakes a board smart? *Computers & Education*, 53(2), 368-374.

Sünkür, M., Şanlı, Ö., & Arabacı, İ. B. (2011). *Akıllı tahta uygulamaları konusunda ilköğretim II. kademe öğrencilerinin görüşleri (Malatya İli Örneği).* 5th International Computer

Şad, S. N. (2012). An Attitude Scale for Smart Board Use in Education: Validity and Reliability Studies. *Computers & Education*, 58(3), 900-907.

Torff, B., & Tirotta, R. (2010). Interactive whiteboards produce small gains in elementary students' self-reported motivation in mathematics. *Computers & Education*, 54, 379-383.

Tseng, C.H., Tuan, H.L., & Chin, C.C. (2009). Investigating the influence of motivational factors on conceptual change in a digital learning context using the dual-situated learning model. International Journal of Science Education, 32(14): 1853-1875.

Türel, Y.K. (2012). Teachers' negative attitudes towards interactive whiteboard use: Needs and problems. *Elemantary Education Online,11(2),* 323-439.

Uzun, N., & Keleş, Ö. (2010). Fen öğrenmeye yönelik motivasyonun bazı demografik özelliklere göre değerlendirilmesi. *Gazi Eğitim Fakültesi Dergisi*, 30(2),561-584.

Vedder-Weiss, D., & Fortus, D. (2011). Adolescents' declining motivation to learn science: Inevitable or not?. *Journal of Research in Science Teaching*, 48 (2), 199-216. doi: 10.1002/tea.20398

Vural, Ö.F., & Kırkbeş, H. (2015). Orta öğretimdeki öğrencilerin akıllı tahta hakkındaki görüşlerinin incelenmesi. *Akademik Sosyal Araştırmalar Dergisi*, 3(18), 214-230.

Yenice, N., Saydam, G., & Telli, S. 2012. İlköğretim öğrencilerinin fen öğrenmeye yönelik motivasyonlarını etkileyen faktörlerin belirlenmesi. Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi, 13(2): 231-247.

Yıldızhan, Y. H. (2013). Temel eğitimde akıllı tahtanın matematik başarısına etkisi. *Middle Eastern & African Journal of Educational Research, 5,* 110-121.

Zengin, F.K., Kırılmazkaya, G., & Keçeci, G. (2011). Akıllı tahta kullanımının ilköğretim öğrencilerinin fen ve teknoloji dersindeki başarı ve tutuma etkisi. *5. Uluslararası Bilgisayar ve Öğretim teknolojileri Sempozyumu.* 22-24 Eylül, Fırat Üniversitesi Elazığ.