Online Science Education Journal *http://dergipark.gov.tr/ofed*

2020; 5(1): 21 - 31.

The Effect of Student-Content Interaction on Students' Academic Achievement and Attitude towards Science[1]

İlyas Acet*, *Ministry of National Education, Kastamonu, Turkey*
Halil İbrahim Akyüz, *Kastamonu University, Kastamonu, Turkey*

*Corresponding Author: acetcan@gmail.com

To cite this article: Acet, I. & Akyüz, H. I. (2020). The effect of student-content interaction on students' academic achievement and attitude towards science. *Online Science Education Journal*, 5(1): 21-31

Article Info

Article History

Received:
28 January 2020

Accepted:
15 May 2020

Keywords

PowerPoint
Student interaction
Science
Academic achievement
Attitude

Abstract

The aim of the study was to compare the effects of teaching on academic achievement and science attitudes of students with interactive PowerPoint presentations and non-interactive PowerPoint presentations in terms of teaching the "Electricity Transmission" Unit of the 6th grade Science course. The research was designed as a semi-structured experimental design and consisted of 65 students from the 6th grade of a public secondary school. The participants were separated into two groups as control and the experiment groups. The transmission of electricity unit 20-question academic achievement test and 22-item science attitude scale were used for data collection. Achievement test and attitude scale were applied to the groups as pretest and posttest. In light of the data obtained in the study, it was concluded that the use of interactive PowerPoint presentations in teaching electricity transmission unit to secondary school 6th-grade students increased academic success but did not have the same effect on their attitudes towards science. Students can work on each grade level with interactive PowerPoint presentations according to their own level.

INTRODUCTION

The rapid advancements of teaching technologies have caused a change in the social structure and it has become inevitable for individuals to follow and adapt themselves to the technological inventions. The increase in the volume of the knowledge and the population of learners has raised various problems. Classes have become crowded and inadequate hardware. In addition, the number of teachers is insufficient and classes cannot use the advantages of developing technologies. It has become imperative to use the technology, especially the instructional technologies in order to solve such problems in teaching environments. The technology has been evolved as of 1926 when the idea of a machine was found to test the learning level of students. Pressey's teaching machines were developed later by Skinner and they have become an inseparable part of the classes with the effect of different learning theories (Burton, Moore, & Magliaro, 2003).

Although the use of technology has been increasing in educational environments, it is clear that individuals who have the required level of knowledge by the age cannot be raised without technology today. How these technologies could be used pedagogically in teaching environments has always been the subject of discussion. Thus, there has always been the need

for developing new methods and new educational software. The enrichment of teaching environments is enabled by such initiatives. The enrichment of educational environments also resulted in the formation of efficient educational environments. Technological developments in teaching environments established the need for the preparation of new programs and new educational materials. The computer technologies used in the classrooms have facilitated the preparation of enriched educational environments. Teaching materials are used to support multiple environments. Therefore, students can access different teaching contents, and uninterrupted learning has been realized because these contents attract the attention of more than one sense of the learners at a time. However, the physical availability of the technology in classrooms cannot be the solution for effective, efficient and engaging learning.

One of the technologies found in most of the learning environments is digital boards called either interactive boards or smart boards. Interactive boards were first designed and manufactured in the 1990s. It has been used in classroom environments since the 1990s. While it is a technology enabling the content of the computer to be projected on a flat surface with the projection and using the content interactively, it has replaced the chalkboards in class environments with its compact computer system design. These smartboards have an operating system including hardware such as processor and memory with a touch screen. The smartboard industry reached a market of $1 billion in 2008 in the world (interactive board, 2000). It is observed that many countries have invested significantly on interactive boards (Ekici & Yılmaz, 2013). The UK comes first among these countries. It has been noted that all primary schools have interactive boards. It has also been stated that not only primary education but almost most of secondary education uses interactive boards. The UK is not the only country investing in interactive boards. Two other important countries investing in interactive board applications are the US and Australia (Zengin, Kırılmazkaya, & Keçeci, 2012).

Turkey has applied some projects to use developing technologies effectively in classrooms. Initially, the project called "The Movement to Increase Opportunities to Improve Technology" in education, known as FATİH, has been carried out. The project was announced to the public in November 2010, and the Ministry of National Education explained its purposes as a transition from computers to the availability of computers in every classroom. Thus, students would reach the information in a shorter time and much more easily. The interactive board is similar to the classical board physically. However, what makes it different compared to the classical board is that it provides interaction via its touch screen. Moreover, it has various advantages such as being able to update its content easily and quickly. This was expected to lead to a result of interactive boards replacing the regular normal textbooks. Some other properties of interactive boards are as follows: making presentations, giving academic lectures including advanced content interaction and increased audience engagement, sharing and storing of presentation file, and interaction with network computers and peripherals.

It could be noted that the interactive board is more advantageous compared to the computers in classrooms. The advantages of the interactive board over the computers are as follows: it can attract more attention, the teacher can record what he/she notes on the board and view them later, the teacher can share them with students. The disabled students can participate in the activities as seated and different learning activities can be performed. The aim of interactive whiteboards in classrooms is make learning effective, efficient, and engaging. It is clear that teachers can use the content on these interactive boards compatible with their curriculum and the content.

The Ministry of National Education has focused on e-content development for its investments. Education Information Network (EBA), which is an online platform for the e-content developed by the Ministry of National Education, has been offered to the service of teachers and students. It constitutes one of the important pillars of the FATİH project, the major education technology investment of the EBA Students have the opportunity to perform continuous learning with different activities through EBA. All these developments have once again revealed the importance of technology in the field of education. Due to the rapid increase of information and the population of learners, it is necessary to use technology and digital learning materials to teach more to a higher number of participants. It is believed that technology should be used efficiently to achieve effective learning in crowded classrooms. However, many technological learning tools cannot be used effectively because they do not allow teachers to organize and change the content according to their classroom settings. The major advantage of this study is that it allows the content to be prepared quickly by the researcher. In addition, the ability to make changes in the content can be shown as another advantage of the study. It is seen that the educational software which is a one-to-one educational software is difficult to apply in learning environments (classes of 30 people). It is believed that the problem can be solved by allowing teachers to organize the content according to their learning environment. Furthermore, thanks to the content making the student interact, the learners interact with the content to show that effective learning can be achieved. When the disadvantages of instructional software are examined, one of the major drawbacks is seen as the license fee. Mouse Mischief used completely free of charge by Microsoft Windows was used in the study. PowerPoint presentations are undoubtedly one of the most used technological programs in education. However, it is noteworthy that teachers do not pay attention to the techniques of preparing them and could not leave the traditional method where the teacher is at the center. The aim of the study was to present the importance of content preparation for teachers according to their class level free of charge, to use technology effectively, and to be at the center of learning together with the students actively participating. For the 6th grade students, the aim was to address the science lesson including abstract concepts and experiences and to increase the attitudes towards the lesson with the increase of academic success. The students were enabled to adapt the lesson by understanding the relationship between the subjects and the concepts of daily life. Another significance of the present study is to make the course more enjoyable by using interactive presentations for students having difficulty in learning the subjects of the science lesson. It is important for students to enjoy the course in terms of their academic success and attitudes. In this study, it is thought that students' use of technology more actively in the lesson will contribute to them in terms of being science literate. When the literature review was conducted, no study was found investigating the effect of 6th-grade students ‘interactive PowerPoint presentation on learners' academic achievement and attitudes towards science lessons. For this reason, this research is expected to guide future studies on students' academic achievement and attitudes towards the lesson.

METHOD

Research method, data collection tools, application process are presented in this section.

Research Method

The study used semi-experimental research design. Semi-experimental design, one of the quantitative research methods, is a commonly used research method, especially in studies

on education, when there is no random selection and it is possible to control all the variables (Cohen, Manion & Marrison, 2000). In semi-experimental designs with unsynchronized control groups, the method of selecting the control group is conducted by neutral assignment. Moreover, the fact that the groups are similar as much as possible is considered. There is no special attention given for the selection of the groups (Karasar, 2003). The experimental model of the research is given in Table 1.

Table 1. Pretest – posttest quasi-experimental method with control group model design

Groups	Pretest	Application	Posttest
Student interactive PowerPoint presentation	Achievement test Attitude towards science lesson scale	Four weeks x four hour	Achievement test Attitude towards science lesson scale
PowerPoint presentation	Achievement test Attitude towards science lesson scale	Four weeks x four hour	Achievement test Attitude towards science lesson scale

The study group consisted of a total of 65 students studying in the 6th grade in a secondary school in Seydiler district of Kastamonu province in the 2015-2016 academic year. Two groups were identified in order to make the two groups similar as much as possible. One of these classes (6-B) was selected as the experimental group (N = 34), and the other (6-A) was identified as the control group (N = 31) to receive the lesson according to the 2005 Science Program with the Student Interactive PowerPoint presentation. The number of students in each class is given in Table 2.

Table 2. Experiment and control groups information

Groups	Class	Female	Male	n
Experiment	6-B	17	17	34
Control	6-A	16	15	31
Total		33	32	65

Data Collection Tools

A 20-items academic achievement test, and the 22-items Science Attitude Scale were used for data collection.

Achievement test

The achievement test (Annex-1) developed by Gürbüz (2012) was used as test questions. In the first stage, the academic achievement test consisting of 30 items has been reorganized as 27 questions by correcting three items required to be fixed in line with the expert opinions and three questions stated to be inappropriate. Before conducting the reliability studies of the test, forms for expert opinion were created according to the relevant student acquisition, and scientific process skills of each question, and a pilot application was carried out. A classification table was prepared according to the scientific process dimension and knowledge accumulation of each item and answer in the test. Experts checked the validity of the developed test, and the reliability of the test was found to be $\alpha = 0.79$.

Attitude towards science lesson scale

As another tool of data collection, the attitude scale developed by Şaşmaz Ören and Tezcan (2009) was used to measure students' attitudes towards science lessons. The reliability coefficient of this scale, measuring the attitude towards science lessons was Alpha = 0.93. For the scale validity consisting of 22 items, the opinions of five experts were received. One of the experts was specialized in science education, one in evaluation and assessment, two in

language education, and the other in educational sciences. The scale is a five-point Likert-type scale. Some of the items in the scale are positive (13 items), and some are negative (9 items). For each item, answers can reflect the students' opinions as "I totally agree", "I agree", "I am indecisive", "I disagree", and "I totally disagree". The scale was applied to all of the students in both groups as pretest and posttest.

Application process and lesson processing

In the control group and experimental group, lessons were taught using PowerPoint presentations. The PowerPoint presentation about "Electricity Transmission" unit was displayed on the smartboard and explained following the curricula. The implementation period for both groups was planned as 20 lessons and four weeks. In the control group, the lessons were taught through non-interactive PowerPoint presentations whereas the lessons are taught by making the student interact in the experimental group. The student interactive PowerPoint presentation prepared by Mouse Mischief after taking an expert opinion was developed and implemented as follows:

The Mouse Mischief program and the Unifying program were installed on interactive boards used in the classes within the scope of the FATİH project. Thanks to the Unifying program, it was possible to connect up to 10 wireless microphones to a wireless mouse receiver. Thus, it became a mouse for each group to interact with the board. Students interacted with the presentation using the mouse.

Each group interacted with the presentation on the smartboard and carried out activities using their mouse. Some examples of student interactive presentations were given below. They carried out activities such as drawing, marking items, and answering the questions with the mouse cursor. A timer was placed, and the activities of each group can be followed. Some examples of student interactive PowerPoint presentations and classroom application were presented in Figure 1.

Figure 1. Lesson teaching in the experimental group

RESULTS

The academic achievement and attitude scale were tested at .05 significance level using independent sample t-test analysis using the SPSS 20 program. It was decided to use the independent sample t-test after investigating that the data showed normal distribution. One of the indicators showing the data is normally distributed is skewness and kurtosis (kurtosis). When these values are between -1.5 and +1.5, it could be noted that our data show a normal distribution (Tabachnick & Fidell, 2013). In Table 3, the results of the analysis where the data are normally distributed are given in Table 3.

Table 3. Normal distribution of the data

Scales	**Pretest**		**Posttest**	
	Skewness	**Kurtosis**	**Skewness**	**Kurtosis**
Attitude Scale	-0,737	-0,227	-0.825	0,640
Achievement Test	-0,394	-0,474	-0,422	-0,889

The results of the attitude scale and academic achievement scale applied to the control and experimental groups before and after the application were analyzed with the 'independent groups t-test' analysis, and the results of the pretest, posttest mean scores, standard deviations (S.D.) and a p-value of both groups were given in Tables. In order to examine whether there is a statistically significant difference between two groups, level of significance alpha was set at the 0.05 level to achieve statistical significance for all analyses.

The comparison of the experimental group and the control group students' academic success was carried out before and after the application:

While examining the academic success of the groups before application, the results of the implementation of the same test as a pretest are given in Table 4. There was no difference between the pretest results of the groups. In this case, it can be said that the groups had similar characteristics.

Table 4. Comparison of the pretest of achievement test scores

Groups	N	$\overline{x}$	SD	t	p
Experiment	34	11,00	3,339	0,875	0,385
Control	31	10,29	3,185		

While examining the academic success of the groups after application, the results of the implementation of the same test as a pretest are given in Table 5.

Table 5. Comparison of the posttest of achievement test scores

Group	N	$\overline{x}$	SD	t	p
Experiment	34	16,35	2,922	4,885	0,000
Control	31	12,71	3,090		

The 34 participants in the experimental group (M = 16,35 SD = 2.92) compared to the 31 participants in the control group (M = 12,71, SD = 3,090) demonstrated significantly better posttest of achievement test scores, t(63) = 4.88 , p = .00. It was found that there was a statistically significant difference between the achievement test scores of the two groups. Accordingly, it could be noted that the instruction with the student interactive PowerPoint presentations used in the experimental group increased the success compared to that of the student non-interactive PowerPoint presentations applied to the control group.

The comparison of the experimental group and the control group students' attitudes towards science was carried out before and after the application. The results of the application of the same test as a pretest are given in Table 6.

Table 6. Comparison of the pretest of attitude toward science course

Group	N	$\overline{x}$	SD	t	p
Experiment	34	38,88	16,272	0,074	0,941
Control	31	38,61	12,646		

When the data in Table 6 are examined, it is seen that there is no significant difference among the groups. This result shows that there is no significant difference in the attitudes of the experimental and control groups towards the pre-applied science lesson.

Table 7. Comparison of the posttest of attitude toward science course

Group	N	$\overline{x}$	SD	t	p
Experiment	34	38,88	11,092	-0,738	0,463
Control	31	40,03	17,143		

Experiment group (M = 38,88 SD = 11,092) compared to the control group (M = 40,03, SD = 17,143) demonstrated no significantly difference in the posttest of attitude toward science course scores, t(63) = -0,738 , p = ,463. Accordingly, it could be noted that the lessons supported by the student interactive PowerPoint presentation in the experimental group did not cause any change in the attitudes towards the science lesson according to the Science Education Program applied to the control group.

DISCUSSION AND CONCLUSION

The study was conducted to examine how students 'interactive PowerPoint presentations in the 6th-grade "Electricity Transmission" unit were affected by students' academic achievement and attitudes towards the lesson compared to student non-interactive PowerPoint presentations. The study was carried out in a public school in Kastamonu province where Class 6-B was selected as the experimental group and the lessons were taught with interactive PowerPoint presentations. Class 6-A was selected as the control group, and the lessons were taught with non-interactive PowerPoint presentations. The t-test was used to test the hypotheses of the research. When the posttest scores of the two groups did not differ significantly, no significant difference was found between students' attitudes towards science lessons. On the other hand, a significant difference was found in favor of the experimental group for their academic achievements. Lessons were conducted by the researcher in both groups. Prior to the study, the pre-test applied to assess the preliminary information of both groups was used as the posttest after the application was completed. At the end of the study, it was seen that both groups improved their performance throughout acquisition. However, the academic success of the experimental group was higher than that of the control group. These results have revealed that the use of interactive PowerPoint presentations contribute to learning in science classes. According to these results, it is seen that the use of student interactive PowerPoint presentations in science teaching positively affects students' academic success.

As a conclusion, it was observed that interactive PowerPoint presentations had no impact on students' attitudes, and learning took place in both groups. The academic achievement average of the experimental group was found to be higher than that of the control group. However, it was observed that there was no significant effect on their attitudes towards the lesson.

In a study carried out by Çepni, Ayvacı, and Bacanak (2004), it has been noted that computer technology can be used as a tool in order to facilitate students' learning as well as providing meaningful and permanent learning.

In a study conducted by Hallet and Faria (2006), the effects of multimedia and PowerPoint presentations on learning were investigated. Multimedia environments include sound, video, animation, graphics, and tests. The study has revealed that the information learned in multiple learning environments is easier to remember than traditional lessons with PowerPoint slides (Hallett & Faria, 2006).

When we examine various studies on PowerPoint presentations, it can be seen that the studies have presented that these presentations are predominant with positive results. However, some studies have shown that PowerPoint presentations also have some negative aspects (Apperson, Laws, and Scepansky, 2006). As a result of all these studies, it has been revealed that computers have become a part of education. In some studies, it has been stated that it

should be seen as an aid for computer-based education systems (Geban, & Demircioğlu, 2003; Seferoğlu, 1996).

In some studies, students' attitudes towards lecture presentations were investigated, and positive results were obtained regarding the effectiveness of PowerPoint presentations. In a study, comparing the effect of teaching via PowerPoint presentation in higher education, it has been stated that PowerPoint presentations cannot replace the blackboards, and they will be auxiliary tools improving learning. Moreover, it has been highlighted that the use of PowerPoint does not result in very high academic success of students. it is more useful in teaching specific subjects, rather than using it throughout the entire lesson. Furthermore, it facilitates to remember what is learnt through animated models, animations, and key concepts (Szabo & Hastings, 2000).

In another study conducted on PowerPoint presentations, it was observed that the PowerPoint presentations provided a significant increase in students' level of knowledge (Baştürk, 2008). In a study on teaching English courses in Higher Education Program, the effect of teaching with traditional teaching methods and computer-aided PowerPoint presentation on students' access was investigated. In the research, using pretest and posttest, experiment and control groups were compared. According to this research, a significant difference was found in favor of the experimental group, where PowerPoint-supported teaching was conducted (Akdağ, 2008). Accordingly, it could be noted that the computer-aided teaching method positively affects students' academic success (Güven & Sülün, 2012).

In some other studies, it has been revealed that the presentations made by students improve their teaching and organizational skills (Susskind, 2005). In a study on the use of computers explaining the subject of photosynthesis in the field of biology, it was found that Computer Assisted Instruction (CAI) materials were effective for the understanding and application levels of students' learning. It was seen that CAI materials were effective in terms of increasing students 'achievements. However, the same effect could not be seen in terms of improving students' attitudes. This has been related to the difficult development of attitudes in a short time (Çepni, Taş, & Köse, 2006). The effect of overhead slides on learning with PowerPoint has been investigated in certain learning areas (nursing education, educational sciences, social psychology, commerce) with specific course hours and term studies. In these studies, different results were obtained regarding the students' performances. In the presentations made as PowerPoint, it was stated that there was an increase in students 'self-confidence and positive attitudes, and the increase in students' success was based on the support given to them by means of other methods and techniques (Savoy, Proctor & Salvendy, 2009).

Kaya and Aydın (2011) stated that the students understood the lesson better, they did not get bored in the lesson and their interest in the lesson increased with the use of smart boards in the social studies lesson.

Emre, Kaya, Özdemir, and Kaya, (2011) have not found a significant difference in favor of smartboard for academic success in their studies where they investigated the effects of the use of Smart Board on the success of science and technology teacher candidates studying on the structure of the cell membrane and their attitudes towards information technologies. As a result of a computer-aided study on the granular structure unit of the class it was observed that there was a significant difference between the posttest scores of the experimental group using

the computer-assisted teaching method and the posttest scores of the control group using the traditional teaching methods. This differentiation was in favor of the experimental group. Another study showed that there was a negative correlation between students' use of PowerPoint presentations and their exam scores (Sugahara & Boland, 2006). This was not in consistency with the results of the present study. The reason could be the difference in the effectiveness of the PowerPoint presentations used in the classroom.

Similar results were obtained in terms of academic success compared to the above studies. However, different results were found in students' attitudes towards the course. It can be stated that the application in the experimental group was limited to four weeks, and this period was insufficient for students to develop an attitude towards the lesson. Further studies can be conducted on the long-term.

It should be taken into consideration that the ability of researchers to conduct such studies to use the properties of interactive boards is important for the results of the research. The implementation period of the research covers four hours of lectures per week for four weeks. Research can be done with the study carried out in a longer interval. This research, which is applied in the 6th grades of secondary school, can also be applied to other classes.

REFERENCES

Akdağ, M. (2008). Geleneksel Öğretim ile PowerPoint Sunum Destekli Öğretimin Öğrenci Erişisine Etkisi The Effects of Traditional Instruction and PowerPoint Presentation – Supported Instruction on Student ' s Achievement. *Eğitim ve Bilim - Education and Science*, *33*, 26–34.

Apperson, J. M., Laws, E. L., & Scepansky, J. A. (2006). The Impact of Presentation Graphics On Students' Experience In The Classroom. Computers & Education, 47, 116–126. https://doi.org/10.1016/j.compedu.2004.09.003

Baştürk, R. (2008). Assessment & Evaluation İn Higher Education Applying The Many I Facet Rasch Model To Evaluate PowerPoint Presentation Performance İn Higher Education. *Assessment & Evaluation in Higher Education*, *33(4)*(January), 431–444. https://doi.org/10.1080/02602930701562775 Erişim Tarihi: 30.05.2016

Burton, J. K., Moore, David, M., & Magliaro, S. G. (20). Behaviorism and Instructional Technology. In David H. Jonassen (Eds). Handbook of Research on Educational Communications and Technology (Second Edition). London: Lawrence Erlbaum Associates

Cohen, L., Manion, L. and Morrison, K. (2000) Research Methods in Education. 5th Edition, London: Routledge.

Çepni, S., Ayvacı, H. S. & Bacanak, A. (2004). Fen Eğitimine Yeni Bir Bakış, Fen Teknoloji-Toplum. Trabzon:Top-Kar Matbaacılık.

Çepni, S., Taş, E., & Köse, S. (2006). The Effects of Computer-Assisted Material On Students' Cognitive Levels , Misconceptions And Attitudes Towards Science. *Computers & Education 46*, 192–205. https://doi.org/10.1016/j.compedu.2004.07.008

Demircioğlu, H. & Geban, Ö. (1996). Fen Bilgisi Öğretiminde Bilgisayar Destekli Öğretim ve Geleneksel Problem Çzöme Etkinliklerinin Ders Başarısı Bakımından Karşılaştırılması, Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 12, 183-185.

Ekici, S., & Yılmaz, B. (2013). FATIH Projesi üzerine bir değerlendirme. *Türk Kütüphaneciliği*, 27(2), 317-339.

Emre, İ., Kaya, Z., Özdemir, T. Y., & Kaya, O. N. (2011, May). Akıllı tahta kullanımının fen ve teknoloji öğretmen adaylarının hücre zarının yapısı konusundaki başarılarına ve bilgi teknolojilerine karşı tutumlarına karşı etkileri. In 6th International Advanced Technologies Symposium (IATS'11) (pp. 16-18).

Gürbüz, F. (2012). 7E Öğrenme Modelinin 6. Sınıf Fen ve Teknoloji Dersi "Yaşamımızdaki Elektrik" Ünitesinde Öğrencilerin Akademik Başarılarına ve Kalıcılığa Etkisi. (Yayınlanmamış Doktora Tezi). Atatürk Üniversitesi, Eğitim Bilimleri Enstitüsü, Erzurum.

Güven, G., & Sülün, Y. (2012). Bilgisayar Destekli Öğretimin 8. Sınıf Fen ve Teknoloji Dersindeki Akademik Başarıya ve Öğrencilerin Derse Karşı Tutumlarına Etkisi. *Türk Fen Eğitimi Dergisi,* 9(1), 69-76

Hallett, T. L., & Faria, G. (2006). Teaching With Multimedia : Do Bells And Whistles Help Students Learn ? *Journal of Technology in Human Services*, 24(2-3), 167–179. https://doi.org/10.1300/J017v24n02.

Interactive Boards (2020). In Wikipedia. Retrieved Apple 17, 2020, from https://tr.wikipedia.org/wiki/Etkile%C5%9Fimli_tahta. Erişim Tarihi: 07.05.2020

Karasar, N. (2003). Bilimsel Araştırma Yöntemi. (12. Baskı). Ankara: Nobel Yayıncılık.

Kaya, H. ve Aydın, F. (2011). "Sosyal Bilgiler Dersindeki Coğrafya Konularının Öğretiminde Akıllı Tahta Uygulamalarına İlişkin Öğrenci Görüşleri". *Zeitschriftfür die Welt der Türken*, 3, 179-189.

Savoy, A., Proctor, R. W., & Salvendy, G. (2009). Information retention from PowerPoint and traditional lectures. *Computers & Education*, 52(4), 858–867. https://doi.org/10.1016/j.compedu.2008.12.005

Sugahara, S., & Boland, G. (2006). The effectiveness of PowerPoint presentations in the accounting classroom. *Accounting Education*, 15(4), 391-403.

Susskind, J. E. (2005). PowerPoint's power in the classroom: enhancing students' self-efficacy and attitudes. *Computers & Education*, 45, 203–215. https://doi.org/10.1016/j.compedu.2004.07.005

Szabo, A., & Hastings, N. (2000). Using IT İn The Undergraduate Classroom : Should We Replace The Blackboard With PowerPoint? *Computers & Education*, 35, 175–187. https://doi.org/10.1016/S0360-1315(00)00030-0

Seferoğlu, S. S. (2006). Öğretim Teknolojileri ve Materyal Geliştirme (3. Baskı).Ankara: Pegem.

Şaşmaz Ören, F., & Tezcan, R. (2009). The Efectiveness of Learning Cycle Approach on Learners' Attitude towards Scirncr i Seventh Grade Science Classesof Elemantary School. *Elementary Education Online,* 8(1), 103-118.

Tabachnick, B. G., & Fidell, L.S. (2013). Using Multivariate Statistics (sixth ed). Boston: Perason Publishing.

Zengin, F., Kırılmazkaya, G., & Keçeci, G. (2012). Akıllı Tahta Kullanımının Fen Bilimleri Dersindeki Başarı ve Tutuma Etkisi. NWSA-Education Scienses, 7, 526–537.

[1] This study was made from the first author's master thesis under the supervision of the second author.