

The Effect of the Smart Board Usage in Science and Technology Lessons*

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Abstract

Statement of Problem: In this study, in teaching the unit "electricity in our lives" in the 7th grade science and technology class, the effect of using smart boards to the students' retention of the information is examined and compared to the 2005 Science and Technology curriculum.

Purpose of the study: The aim of the current study is to investigate the effect of smart board use on science education.

Method: For this research, two 7th grade classes were selected, one a control group and the other the experimental group, at a Secondary School in Kastamonu Province.

An achievement test of 25 questions was used as a means of collecting data related to the unit. For four weeks, the control group students studied the unit according to the 2005 Science and Technology curriculum, while the experimental group studied the unit with supporting smart board activities. The achievement test, prepared to measure the equivalence of the groups in terms of knowledge, was applied as the pre-test. The same test was also applied as the post-test to measure the achievement of both groups. Finally, in order to measure how much the students recalled the learned information, the same test was applied a third time as a retention success test four weeks later. The resulting data was analysed with the SPSS 20 statistical software package, and the t-test was used in the evaluation of the data.

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Findings: A significant difference in favour of the experimental group was determined between the achievement of the experimental group, in which the lessons were studied using the smart board, and the control group. Furthermore, according to the results of the permanence test applied four weeks after the application, the students' recall rate was higher among the students of the experimental group than of those in the control group.

Results: The use of smart boards in teaching 7th grade secondary school students the unit "electricity in our lives" increased the students' achievement and retention of the information learned. As a result, students in the experimental group were more successful than the control group students.

Keywords: Electricity in our lives, academic achievement, retention, 7th grade students, technology, technological classrooms.

Introduction

Societies have been competing to produce and use new technologies since the beginning of human history. Countries producing new technologies and following the technology closely have developed and improved more quickly, while countries that do not keep pace with technology and science have lagged behind in many fields (Wood & Ashfield, 2008). One of the criteria of a good education system is to grow creative and productive individuals who are a step ahead in science and technology. The education system has been demonstrated to be very clearly affected by these rapidly developing technological innovations (Celen, Celik & Seferoglu, 2011). Not only do students need to learn to be qualified individuals; so do the teachers who will guide them. New developments affect students, teachers, and learning environments (Akpinar, 2003). The key to a well-adjusted, modern society is an innovative education system that uses new technologies. Benefits from the opportunities offered by science and technology greatly depend on the teachers' knowledge and skills (Tor & Erden, 2004). Teachers must use technological opportunities to educate students according to the needs of the age of science.

At present, education systems are ineffective without benefiting from technology, so the Ministry of Education has implemented a continuous dynamic curriculum. With the help of the science amendment in 2004, Science Curriculum became the Science and Technology Education Program. The new program has given attention to activities based on a constructivist approach as opposed to a traditional one. Smart boards have been used in schools since the 1990s (Beeland, 2002) and are already incorporated into the education systems in many countries, especially developed countries like America and Britain. In 2002, Information Technology (IT) became widespread with the inclusion of interactive whiteboards in classrooms.

Smart Boards

Smart boards, which are controlled by touching the screen, are essentially technological tools that can create miracles when used correctly. Smart boards can be

updated quickly and easily and are seen as an essential piece of the classroom of the future (Minor, Bracken, Geisel, & Unger, 2006). Teachers must help their students prepare for this future by preparing appropriate learning environments and engaging students in interactive learning rather than passing on information passively. Student-centered regulations must include technology in alternative teaching methods in order to create such a learning environment and to achieve permanent and meaningful learning.

Since the 1990s it has been possible to study the use of smart boards in many countries around the world, especially Britain and the USA. The literature holds many studies related to the positive effects of smart boards on learning environment, students' interest, and students' effective participation in the lessons. For this purpose, the Ministry of Education is investing constantly in technology in all educational institutions. At this point, one of the steps of the Ministry's Fatih Project (Increase Opportunities and Technology Improvement Movement) is also to equip all classrooms with smart boards. At present, the concept of modern classroom technology has taken the place of the concept of classical education. In this study, one of the units of a 7th grade science and technology lesson is defined as a sample lesson. The name of the unit is "electricity in our lives."

Audiovisual equipment is very important to ensure permanent learning. The more a planned learning activity appeals to a student's senses, the more the event of learning is permanent. When the concept of time is fixed, people remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of both what they hear and what they see, 70% of what they say, and 90% of both what they do and what they say (Cilenti, 1991). Therefore, when many senses are used in an educational activity, the rate of recall is increased. It is important to organize the classroom according to the process of teaching by doing and living in order for students to remember what they learned. Science and technology education issues include abstract concepts and events that the students often have difficulty understanding, causing students to feel that science lessons are difficult. These kinds of thoughts can negatively affect students' success. This study is especially important for the students having difficulty in science lessons in terms of making the lesson more enjoyable by using a smart board and thereby achieving more permanent learning.

This study aims to provide permanent and effective learning using smart boards and to compare these students with a group taught according to the 2005 Science and Technology Program in terms of academic success and information recall.

Few studies exist in the literature concerning such a significant technological investment in Turkey. Evaluating the returns of this investment in the academic field is important in terms of determining the planning process. In addition, studies on information retention in science education supported by smart boards have not been conducted in Turkey. As a result, the current study aimed to investigate the effects of smart boards on science education.

Method

This section explains and justifies the methods used to analyze the effect of smart board use in science and technology lessons. It presents the participants, sources of data, and measurements of the variables in addition to providing detailed information about the statistical analysis.

Research Design

This study involved an experimental design with a control group and a pre-test, post-test, and permanence test. Experimental designs control external variables in order to protect internal validity, measure the dependent variables, and investigate the cause-and-effect relationships between variables (Buyukozturk, 2001). If the researcher's purpose is to examine the research subjects in the cause-effect relationship by asking 'why,' the most appropriate study method to use is the experimental method (Cepni, 2007).

Participants

The study group consists of two 7th grade classes - a total of 75 students - in Kastamonu secondary school in Turkey during the 2013-2014 academic year. The classes were similar to each other according to academic level; the grade point averages from their 6th grade science and technology report cards were used to determine this. Class 7-A's grade point average was 79.8. This class learned using the 2005 Science and Technology Program (N=38), so 7-A is the control group. Class 7-B's grade point average was 80.2. 7-B was the experimental group that and were presented with lessons reinforced with smart board support (N=37).

Validity and Reliability

A multiple choice achievement test consisting of 25 questions about the unit "electricity in our lives" was used as the study's data collection tool. There is no direct measure of whether the students reach their educational goals, so the behavior tests used in education instead measure the subject. In other words, achievement tests must cover the critical behaviors students are expected to gain, and screening tests (subjects or unit tests) must cover baseline behavior (Atilgan, Kan, & Dogan, 2011). Some of the test questions were asked in the previous year in the SBS exam conducted by the Ministry and the other part was prepared by researchers with the help of the science and physics instructors. An achievement test consisting of 30 questions was prepared to ensure content validity. The test was multiple choice with four options. After the necessary corrections, the test was administered to 135 8th grade students who had taken this lesson before in order to examine the reliability and discriminant level of the test, but these results were not included in the study group data. The resulting data was tested using the KR-20 (Kuder Richardson-20) method, and the test's reliability was found to be 0.749.

The reliability estimation using KR-20 reveals to what extent the questions measure what they are intended to measure according to the covariance between the test questions (common variances) and the variance of these questions. If the

correlation is close to 1.00, the reliability of the test is high, and if it is close to 0.00, the reliability of the test is low (Celik, 2006). In the achievement test, correct answers were given a score of "1" while incorrect and omitted answers were scored as "0." After the test was applied, the items were analyzed. Item analyses were made to find defective questions and analyze the questions that needed to be developed. The items' difficulty index (the percentage that each question was answered and how many students answered it) and discriminant index (separating the students who know the questions and at what rate) were found in this analysis.

All of the students' papers were scored for item analysis. These are listed starting with the highest score. Twenty-seven percent of the listed papers constituted the top group. The same number of the lowest-scored paper was taken and a sub-group was formed. For all items, item difficulty index (p) and item discrimination index (r) were found and, according to these results, the researchers decided to remove five questions from the achievement test. The final test consisted of 25 questions. The reliability level of this finalized version of the test (KR-20) was found to be 0.797, meaning the test served its purpose.

In the control group, subjects were treated according to the 2005 Science and Technology Program. The activities in textbooks and student workbooks were performed as much as possible and the topics are lectured in accordance with the curriculum. The activities in their books were performed by using the methods such as lecture, question and answer, demonstration experiments and problem-solving. At the beginning of each lesson, the previous lesson had been reminded and linked with the new subject.

Students in the experimental group learned the topic in an interactive way through the smart board and the activities of the control group. The activities such as interactive whiteboard learning objects, various animations and so on were presented to the experimental group during the lesson through the internet.

Data Analysis

Data has been tested by the dependent sample t-test and independent sample t-test analysis at the .05 level of significance by using Statistical Packages for Social Sciences (SPSS 20) software.

Findings

Findings obtained from the study were demonstrated in Tables 1-7. Each table of these tables compares a sub-problem of this study. The pre-test data of the experimental and control groups are presented in Table 1.

Table 1.

The Pre-Test Data of Experimental and Control Groups of Academic Achievement Scores for the Unit "Electricity in Our Lives"

Group	N	\bar{X}	SD	t	p
Pre-test data of the experimental group	37	10,81	4,149	0,707	,482
Pre-test data of the control group	38	10,21	3,146		

When you look at the Table 1 again, you see that arithmetic average of both groups is almost the same ($\bar{X}_{\text{control}}=10.21$; $\bar{X}_{\text{experimental}}=10.81$) in the achievement test which is a multiple-choice, pre-test consisting of 25 questions. When you have a look at the data again, you can see that there isn't a significant difference between the groups ($t=0.707$, $p > .05$). This result shows that before the application the prior knowledge of the both experimental group and control group is very close to each other as a result, academic success of both groups are very close, their prior knowledge and experience seems to be similar. In addition, both groups of 6th grade grades in science and technology lessons are very close to each other (6-A: 79.8; 6-B: 80.2). This supports the results found. The pre-test and post-test data of the control group are presented in Table 2.

Table 2.

The Pre-Test and Post-Test Data of the Control Group of Academic Achievement Scores Related to the Unit "Electricity in Our Lives"

Group	N	\bar{X}	SD	t	p
Pre-test data of control group	38	10.21	3.146	-12.172	.000
Post-test data of control group	38	16.63	4.457		

The data in Table 2 ($t=-12.172$; $p < .05$) shows that there was a significant difference in the control group between the data of before and after the application. In conclusion, it is clear that learning occurs in any environment. It can be said that there are positive effects on the academic success of the control group students. The pre-test and post-test data of the experimental group are presented in Table 3.

Table 3.

The Pre-Test and Post-Test Data of the Experimental Group of Academic Achievement Scores Related to the Unit "Electricity in Our Lives"

<i>Group</i>	<i>N</i>	\bar{X}	<i>SD</i>	<i>t</i>	<i>p</i>
<i>Pre-test data of experimental group</i>	37	10.81	4.149	-12.732	.000
<i>Post-test data of experimental group</i>	37	19.11	4.363		

Table 3 ($t=-12.732$; $p<.05$) shows that, after the application process, the experimental group learned the unit "electricity in our lives" with support from the smart boards. Consequently, it has been defined that the use of teaching methods supported by smart boards had a positive effect on academic achievement. The post-test data of the experimental and control groups are presented in Table 4.

Table 4.

The Post-Test Data of the Experimental and Control Groups of Academic Achievement Scores Related to the Unit "Electricity in Our Lives"

<i>Group</i>	<i>N</i>	\bar{X}	<i>SD</i>	<i>t</i>	<i>p</i>
<i>Post-test data of experimental group</i>	37	19.11	4.364	2.431	.018
<i>Post-test data of control group</i>	38	16.63	4.457		

In Table 4, the average post-test scores of the experimental group were $\bar{X}=19.11$ and the average post-test scores of the control group were $\bar{X}=16.63$. A significant difference statistically was found between the achievement scores of the two groups ($t=2.431$, $p<.05$). Therefore, the teaching methods with smart boards used in the experimental group increased the students' success more than the traditional Science and Technology Curriculum applied to the control group. The success of the students in the experimental group was greater than that of the students in the control group. The permanence test data of the experimental and control groups are presented in Table 5.

Table 5.

The Permanence Test Data of the Experimental and Control Groups Related to the Unit "Electricity in Our Lives"

<i>Group</i>	<i>N</i>	\bar{X}	<i>SD</i>	<i>t</i>	<i>p</i>
<i>The permanence test for experimental group</i>	37	18.81	4.129	2.555	0.013
<i>The permanence test for control group</i>	38	16.26	4.494		

When analyzing the data in Table 5, the average permanence test score of the experimental group was $\bar{X} = 18.81$. The average permanence test score of the control group was $\bar{X} = 16.26$. The permanence test achievement scores were found to be significantly different between the two groups ($t=2.555$, $p < .05$).

As a result, it can be said that the teaching method applied for the experimental group is more permanent than the method applied for the control group. The data from the post-test and permanence test scores of the control group are presented in Table 6.

Table 6.

The Data of Academic Achievement Post-Test and Permanence Test for the Control Group

<i>Group</i>	<i>N</i>	\bar{X}	<i>SD</i>	<i>t</i>	<i>p</i>
<i>The post-test of control group</i>	38	16.63	4.457	2.217	0.033
<i>The permanence test of control group</i>	38	16.26	4.494		

According to the results of the t-test for dependent groups, there is a significant difference between the post-test and permanence test scores of the control group ($t=2.217$, $p < .05$), but while the average post-test score for the control group was $\bar{X} = 16.63$, the average score of the permanence test was $\bar{X} = 16.26$, which is quite similar. The post-test and permanence test data for the experimental group are presented in Table 7.

Table 7.

The Data of Academic Achievement Post-Test and Permanence Test for the Experimental Group

<i>Group</i>	<i>N</i>	\bar{X}	<i>SD</i>	<i>t</i>	<i>p</i>
<i>The post-test for experimental group</i>	37	19.11	4.364	0.938	0.354
<i>The permanence test for experimental group</i>	37	18.81	4.129		

According to the results of the t-test for dependent groups, there is no significant difference between the post-test and permanence test scores of the experimental group ($t=0.938$; $p>.05$). As a result, the information seems to be more permanent in the experimental group.

Discussion and Conclusion

When the two groups' post-test scores were analyzed, a significant difference was detected in favor of the experimental group in spite of there being no significant difference between the groups' pre-test scores. Researchers conducted the lessons in both groups. The achievement test was implemented as a pre-test to measure the prior knowledge of both groups before starting the lessons, was applied again as the post-test after the application was finished, and was also administered as the retention test four weeks after the application. Results showed that learning took place in both groups, but the academic success of the experimental group was found to be greater than that of the control group. When the retention test results were analyzed, it was found that, while both groups retained some of the information, the average score in the experimental group was greater than that of the control group. Therefore, the use of smart boards contributes to the learning of science and technology lessons and the information learned with this method is more permanent.

In light of the data obtained in this study, the use of smart boards in teaching 7th grade secondary school students the unit "electricity in our lives" increases academic achievement and learning retention. The use of smart boards positively affects students' academic achievement in science education. This is consistent with literature data. According to Schmid (2008), the success in students' language learning process was positively affected in classrooms equipped with interactive/smart boards. Tezer & Deniz (2009) stated in their work, 'The impact of solving equations using interactive board in mathematics on learning,' that achievement in 8th grade math classes has increased. Using smart boards to teach mathematics to freshmen, Akcayir (2011) found that smart boards increase students' motivation for academic achievement. Tekin (2013) found students learning physics education through the use of smart boards to have significantly different academic achievements than classmates taught using traditional curriculum. This difference in

favor of the experimental group in which a smart board was used is consistent with other similar studies (Lopez, 2010; Elvers, 2000; Gencoglu, 2013; Uzun, 2013).

In addition to academic achievement, this research also intended to measure longer-term learning retention. When the results were analyzed, the ratio of students in the experimental group - the one with the smart board, that is - to remember what they had learned was higher than the ratio for the control group.

Therefore, lessons learned with the aid of smart boards were found to be more permanent. These results are consistent with similar studies in the literature. Akgun (2014), analyzing the result of his work in teacher interviews, reached the conclusion that smart board applications leave a lasting impact on teaching. Ekici (2008), found that smart boards made a significant difference in favor of the experimental group for 6th grade students' success and persistence. Altincelik (2009) stated that interactive whiteboard use succeeded in increasing students' motivation and persistence in learning, and Tate (2002) found that the use of smart boards increases the learning retention.

An increase in student participation was observed during the study lesson with the smart board. This result was also noticed in similar studies, like Altincelik (2009), Akcayir (2011), and Tate (2002). The use of smart boards has been shown to have a positive impact on the scientific processing skills, success, and motivation of the experimental group students.

While doing this research, it was important that the researchers have the ability to use the smart board technology so that the effects of education supported by smart boards and other student-centered teaching methods could be thoroughly investigated. This research, which was applied here to 7th grade classes, can and should be applied to other classes as well. Studies should consider various smart board applications to eliminate misconceptions. The effects of using smart boards with students with learning disabilities still needs to be fully investigated. The implementation period of the present research is four weeks and includes four hours a week of lessons. The research could be carried out with a longer-range study, as well. The present study was conducted with a limited working group. Generalizations to a wider population about the impact of education supported by interactive whiteboards can only be made by studying larger and more various groups.

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Fen ve Teknoloji Dersinde Akıllı Tahta Kullanımının Etkisi

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Özet

Problem Durumu: Fen dersleri konuları bakımından daha ziyade soyut kavramlar içerdiğinden, öğrenciler konuları anlamada zorlanmaktadır. Bu durum, öğrencilerde fen ile ilgili konuların daha zor olduğu kanısının oluşmasına neden olmakta ve fen derslerindeki başarıyı olumsuz yönde etkileyebilmektedir. Bu çalışmada, fen konularından biri olan yaşamımızdaki elektrik ünitesi ve bu ünite içerisindeki konu başlıkları, akıllı tahta kullanılarak, konuların öğrenciler tarafından daha kolay anlaşılacağı ve yorum yapabilecekleri düşünülmüştür.

Milli Eğitim Bakanlığı, tüm eğitim kurumlarında teknolojiye sürekli yatırım yapmaktadır. Geline nokta FATİH (Fırsatları Arttırma ve Teknolojiyi İyileştirme Hareketi) Projesi olarak adlandırılan projenin basamaklarından biri de bütün dersliklerin geliştirilmiş akıllı tahta ile donatılmasıdır. Bu şekilde yapılan büyük bir yatırımın, öğrenci ve öğretmen üzerinden değerlendirilmesi, bir çıktı olarak akademik alana kazandırılması, planlama sürecini ne derecede etkilediği açısından önemlidir. Bu amaç doğrultusunda yapılan bu araştırmanın, bu alandaki çalışmalara destek vereceği ve katkıda bulunacağı düşünülmektedir.

Araştırmanın Amacı: Bu çalışmada; 7. sınıf fen ve teknoloji dersi yaşamımızdaki elektrik ünitesinin öğretilmesinde akıllı tahta kullanılarak etkili ve kalıcı bir öğrenmenin sağlandığı deney grubu öğrencilerinin; akademik başarıları ve öğrendikleri bilgilerin kalıcılığı, 2005 fen ve teknoloji öğretim programına göre derslerin işlendiği ve herhangi bir müdahalede bulunulmayan kontrol grubundaki öğrencilerle karşılaştırılması amaçlanmıştır.

Araştırmanın Yöntemi: Araştırmada deneme modeli kullanılmıştır. AT kullanımının ortaokul 7. sınıf öğrencilerinin yaşamımızdaki elektrik ünitesini öğrenmelerine etkisini belirlemek amacıyla yapılan bu çalışmada; ön-test, son-test ve kalıcılık testi uygulanmış ve kontrol gruplu deneysel desen tercih edilmiştir. Bu araştırma, Kastamonu merkezde bulunan bir Ortaokulun 7. sınıflarında ön bilgileri birbirine yakın iki şube üzerinde yapılmıştır. Seçilen bu şubelerden 7-A şubesi kontrol grubu 7-B şubesi ise deney grubu olarak belirlenmiştir. Deney grubunda “yaşamımızdaki elektrik” ünitesi akıllı tahta yardımıyla işlenirken, kontrol grubunda, 2005 fen ve teknoloji öğretim programına uygun bir biçimde işlenmiştir. Uygulamaya başlamadan önce, araştırmacı tarafından geliştirilen 25 sorudan oluşan bir başarı testi hazırlanmış ve deney ve kontrol grubuna ön-test olarak uygulanmıştır. Başarı testinin geçerlik ve güvenilirlik çalışmaları yapılmış ve testin güvenilirliği 0.797 olarak bulunmuştur. Uygulama süresi 4 hafta ve haftada 4 saat olmak üzere toplam 16 saat sürmüştür. Uygulamadan sonra aynı başarı testi, son-test olarak tekrar uygulanmıştır. Hem deney hem de kontrol grubundaki öğrencilerin öğrendikleri

bilgileri hangi oranda hatırladıklarını ölçmek için, ön-test ve son-test olarak uygulanan başarı testi, 4 hafta sonra her iki gruba bir kez daha uygulanmıştır.

Araştırmanın Bulguları: Bu çalışmada, belirlenen temel problem ve alt problemlerin çözümü için, elde edilen verilerin analizleri, bulgular ve bulgulara ilişkin yorumlar yapılmıştır. Araştırmanın hipotezleri; ,05 anlamlılık düzeyinde, SPSS 20 paket programı kullanılarak t-testi ile analiz edilmiştir. Bu araştırmadan elde edilen bulgulara göre, konuların akıllı tahta etkinlikleri ile desteklenerek işlendiği deney grubu öğrencilerinin akademik başarıları, konuların işlenişinde herhangi bir müdahalede bulunulmayan ve programa göre sürdürülen kontrol grubu öğrencilerinin akademik başarılarından daha fazladır. Etkili bir fen öğretimi ve öğrenilen bilgilerin kalıcı olması için öğrencilerin derslere aktif katılımı esastır. Akıllı tahta da, öğrencilerin aktif katılımına fırsat veren öğretim materyallerinden biridir. Ayrıca, araştırmadan elde edilen bulgular ışığında, ortaokul düzeyinde akıllı tahta destekli öğretimin öğrenilen bilgilerin kalıcılığını sağlamada ve öğrencileri derse karşı motive etmede etkili olduğu görülmüştür.

Araştırmanın Sonuçları ve Önerileri: Araştırmadan elde edilen sonuçlar; akıllı tahta kullanılarak konuların öğretilmesi öğrencileri daha başarılı yapmış ve fene karşı daha istekli oldukları görülmüştür. Bu çalışmada, her iki gruba da yaşamımızdaki elektrik ünitesine ait konular, araştırmacı tarafından anlatılmıştır. Araştırmaya başlamadan önce her iki grubun ön bilgilerini ölçmek amacıyla başarı testi ön-test olarak uygulanmış, elde edilen verilerden sonra grupların ön bilgi bakımından denk olduğu görülmüştür. Ayrıca, bu sonucu desteklemek için her iki grubun altıncı sınıf fen ve teknoloji dersi karne notlarına bakılmıştır (6-A:79.8; 6-B: 80.2). Bu da bulunan sonucu desteklemektedir. Oluşturulan bu gruplarda uygulama bittikten sonra da aynı başarı testi, son-test olarak uygulanmış ve veri analiz sonucunda deney grubu lehine anlamlı bir fark çıkmıştır. Öğrenilen bilgilerin kalıcılığını ölçmek için, uygulamadan 4 hafta sonrada aynı başarı testi tekrar uygulanmıştır. Çalışma sonrasında öğrenmenin her iki grupta da gerçekleştiği ancak deney grubunun akademik başarısının, kontrol grubunun akademik başarısından daha fazla olduğu görülmüştür. Her iki grubun kalıcılık testi sonuçları incelendiğinde, deney grubundaki öğrencilerin akıllı tahta etkinlikleri ile öğrendikleri bilgilerin daha uzun süre hafızada kaldığı ve unutulmadığı tespit edilmiştir. Bu alt probleme ait bulgular incelendiğinde, deney grubundaki öğrencilerin puan ortalamalarının kontrol grubundaki öğrencilerin puan ortalamalarından daha büyük olması, çalışmanın amacına uygun olarak, akıllı tahta kullanımının fen ve teknoloji dersinde öğrenmeye katkı sağladığını ve bilgilerin daha kalıcı olduğunu göstermektedir.

Fen derslerinde akıllı tahtanın verimli bir şekilde kullanılması ve olumlu sonuçların alınabilmesi için, gelecek nesilleri yetiştiren öğretmenlerin bu konuda yeterli bilgi ve donanuma sahip olmaları gerekmektedir. Akıllı tahta sayesinde internet kaynakları, fotoğraflar, flaş animasyonlar, videolar ve PowerPoint sunumları kullanılabilir ve öğrencilerin derse olan ilgi, tutum ve motivasyonları olumlu yönde geliştirilebilir.

Anahtar Kelimeler: Yaşamımızdaki elektrik, akademik başarı, kalıcılık, 7. sınıf öğrencileri, teknoloji, teknolojik sınıflar.