INVESTIGATION OF 8TH GRADE STUDENTS' SCIENCE ACHIEVEMENT IN TURKEY: RESULTS FROM MONITORING AND EVALUATING ACADEMIC SKILLS STUDY (ABIDE) 2016

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Approval of the Graduate School of Social Sciences

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ABSTRACT

INVESTIGATION OF 8TH GRADE STUDENTS' SCIENCE ACHIEVEMENT IN TURKEY: RESULTS FROM MONITORING AND EVALUATING ACADEMIC SKILLS STUDY (ABIDE) 2016

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The purpose of this study is to investigate the relationship among attitudinal constructs (interest in science lesson and self-efficacy toward science), demographics (school type, mothers' and fathers' level of education), and the 8th grade students' science achievement. To this end, students' science achievement score and student questionnaire through Monitoring and Evaluating Academic Skills Study (ABIDE) 2016 which is carried out by Republic of Turkey Ministry of National Education were used to examine this relationship. Data were received from General Directorate of Measurement, Assessment and Examination Services. The sample of the study is 3888 8th grade students who participated in ABIDE 2016. This study was designed as a correlational research. According to the results of descriptive statistics, it was found that the mean value of students' science achievement scores was in the medium level. The results of the one- way ANOVA revealed that students' science achievement scores significantly differentiated with respect to their

school types and mothers' and fathers' level of education. Furthermore, the results of multiple regression analysis showed that students studying at a private secondary school instead of a public secondary school, mothers' and fathers' level of education, interest in science lesson and self-efficacy toward science significantly and positively contributed to the prediction of students' science achievement scores. Additionally, the fathers' level of education appeared as the best predictor of science achievement.

Keywords: ABIDE 2016, Self- efficacy toward Science, Interest in Science, Science Achievement

ÖZ

AKADEMİK BECERİLERİN İZLENMESİ VE DEĞERLENDİRİLMESİ ÇALIŞMASI (ABIDE) 2016 SONUÇLARINA GÖRE TÜRKİYE'DEKİ 8. SINIF ÖĞRENCİLERİNİN FEN BİLİMLERİ BAŞARISININ İNCELENMESİ

Çalık, Gül

Yüksek Lisans, İlköğretim Fen ve Matematik Eğitimi

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Bu çalışmanın amacı, Millî Eğitim Bakanlığı tarafından yürütülen Akademik Becerilerin İzlenmesi ve Değerlendirilmesi Çalışması (ABIDE) 2016 ile öğrencilerin fen bilimleri başarı testi puanları ve öğrenci anketi verilerini kullanarak, Türkiye'deki ortaokul 8. sınıf öğrencilerinin fen bilimleri başarı puanları ile tutumsal yapı ölçüleri (fen dersine yönelik öz yeterlik, fen dersine ilgi) ve demografik özellikler (okul türü, annenin ve babanın eğitim düzeyi) arasındaki ilişkiyi araştırmaktır. Veriler Millî Eğitim Bakanlığı, Ölçme, Değerlendirme ve Sınav Hizmetleri Genel Müdürlüğünden teslim alınmıştır. Çalışmanın örneklemini ABIDE çalışmasına katılan 3888 8. sınıf öğrencisi oluşturmaktadır. Bu çalışma, ilişkisel (korelasyonel) bir araştırma olarak tasarlanmıştır. Betimsel analiz sonuçlarına göre, öğrencilerin fen bilimleri başarı puan ortalamasının orta düzeyde olduğu görülmüştür. Yapılan tek yönlü varyans analizi (ANOVA) sonucunda, öğrencilerin fen bilimleri başarı

puanlarının okul türü, annenin ve babanın eğitim düzeyine göre farklılaştığı sonucuna ulaşılmıştır. Ayrıca çoklu regresyon analizinin sonucuna göre devlet okulu yerine özel okulda eğitim görmek, annenin ve babanın eğitim düzeyi, fen dersine ilgi ve fen dersine yönelik öz yeterliğin, öğrencilerin fen bilimleri başarı puanını tahmin etmede anlamlı ve pozitif yordayıcıları olduğu görülmüştür. Ek olarak, babanın eğitim düzeyinin fen bilimleri başarı puanının en iyi yodayıcısı olduğu bulunmuştur.

Anahtar Kelimeler: ABIDE 2016, Fen Dersine Yönelik Öz Yeterlik, Fen Dersine İlgi, Fen Bilimleri Başarısı

To the people who make my life more beautiful

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CHAPTER 1

INTRODUCTION

Continuous changes in economic, technological, and social conditions accelerate the importance of education. Education is a complex process, which refers to a system including input, output, and control phases of interaction between them. To understand this dynamic system, it is important to show and evaluate the linkages among components of the system that affect student achievement. Therefore, student achievement can be measured by classroom assessments or nationally and international large-scale assessments (Turgut & Baykul, 2012).

Large-scale assessment and evaluation are defined as standardized activities on a regional, national, or international scale, covering a large student population (Simon, Ercikan & Rousseau, 2013). According to Kirsch, Lennon, Davier, Gonzalez, and Yamamoto (2013), large-scale assessment and evaluation are knowledge, skills, or behavior in a particular domain. The purpose of these activities is to define a researched universe or universes. For this reason, large-scale assessment and evaluation practices play an important role in the decision-making process of educational policies. In fact, Reddy (2005) argued that some countries determine educational reforms based on the results of such studies.

In recent years, as well as governments and policymakers, the public also gives attention to the results of international educational assessment studies. These international studies reveal the educational achievement differences among countries (Beaton et al., 1999). Because of that reason, many governments are interested in international comparative studies in educational assessment. Therefore, to understand their current situation, governments compare their educational systems with other countries' national education policies, evaluate and improve their educational systems accordingly (DPT, 2009). Moreover, Madaus

and Kellaghan (1992) stated that such assessment studies effect policy, curriculum, and practice because of data driven decision making. To be more precise, in the light of the results of these studies, policymakers find it inevitable to do chances on the educational system to increase its quality; even these changes take many years to affect.

High-quality comparative information is obtained by international large-scale assessments considering the outputs of education systems. These assessments are conducted systematically, and the number of countries participating in any these assessments has grown over the past decades (Lockheed, Prokic-Breuer & Shadrova, 2015). There are different international large scale assessments carried out in most countries. For example; Programme for International Student Assessment (PISA) and Programme for the International Assessment of Adult Competencies (PIAAC) sponsored by the Organization for Economic Cooperation and Development (OECD), Trends in International Mathematics and Science Study (TIMSS) and Progress in Reading Literacy Study (PIRLS) sponsored by the International Association for the Evaluation of Educational Achievement (IEA). All of these assessment programs aim to measure students' cognitive skills by applying achievement or performance tests and surveys participated by students, teachers, and school administrators to evaluate the linkages among components of the system.

Countries also build their own assessment capacity through national assessments. For example, the case for National Assessment of Educational Progress (NAES) that is conducted by National Assessment of Educational Progress (NAEP) to measure student achievement at national in the United States (NCES, 2017). The National Foundation for Educational Research (NFER), which conducts studies to determine student achievement in the UK (NFER, 2017). Moreover, to determine student achievement, tests are conducted under the International Standard Classification of Education (ISCED) in Europe; Iceland, Portugal, Scotland, Luxembourg, the Netherlands, Denmark, Malta, Ireland,

Slovenia, Latvia, Sweden, Estonia, Poland, Norway, Germany, Romania, Italy, Belgium-French Community, Bulgaria, England, Lithuania and Austria.

1.1 Study Context

The Turkish education system is headed by Republic of Turkey Ministry of National Education (MoNE). Due to the education system falls under the supervision of MoNE, it has an immensely centralized governance structure. Particularly, it has a strong autonomy and responsibility for coordinating education dimensions such as policy making, planning curriculum, constructing schools, providing and developing educational materials. Therefore, when it is necessary, the immediate changes are restricted because all decisions related with national education are made by MoNE while school managements and teachers in the field have little autonomy (OECD, 2013; Öztürk, 2011).

The level of Turkish formal education is divided into three levels, which are primary school education (grades 1 to 4), lower secondary school education (grades 5 to 8) and upper secondary school education (grades 9 to 12). Each level is four years because of this reason the system is called 4+4+4 Education System. Compulsory education has been increased from 8 to 12 years in 2012 (OECD, 2013). MoNE has the responsibility for compulsory education, which is 12 years, and it is free of charge in public schools.

Education is one of the most important dimensions that shows the development level of the country. In an education system, science education has a vital role because science is close with the society's development. Science is a dynamic, essential global subject and new discoveries are increasing every day. Today, there is a need for individuals who have scientific thinking skills, the ability to solve the problems they face in their daily lives, and be creative, productive and innovative. Effectiveness in science education in both knowledge and thinking skills is important because it helps society development (Martin, Mullis, Foy & Stanco, 2012). In line with these needs, Ministry of National Education is determined the skills that students are desired to improve in the science education program. The goal of the science curriculum is to grow students who have science

process skills, engineering and design skills and life skills such as analytical thinking, creative thinking, entrepreneurship, communication, and teamwork (MoNE, 2018). That's why in Turkey, during the compulsory education period, a student starts to study science education at 3rd grade until 8th grade. At the upper secondary education level, science education divided into specific branches.

With the rapid innovations of technology and science, the needs of society change. In the light of these needs, MoNE was given attention to the national education system by renewing the curriculum. Therefore since 2004, the Turkish science curriculum has been revised in terms of innovations in technology, educational sciences, and subject field. Simultaneously, it has been renovated in terms of philosophy of education and methods of assessment with respect to the needs analysis (Ayas, 2012). In the program, it was stated that the elementary school curricula were developed with new philosophy based on "learning how to learn" principles which lead students to ask questions and think about concepts (MoNE, 2005a). In other words, the science curriculum has been changed according to the constructivist approach. With the developed curriculum, the student will no longer be a passive recipient or any acceptor of knowledge, and a teacher will only lose out of the role of information resource (Kayıkçı & Sabancı, 2009).

Consequently, after the changeover of curriculum, development movement has never been stopped and the science curriculum has been updated in 2018. During this development movement, the ideas of stakeholders have been taken into consideration. Moreover, the science curricula of the other countries have been examined and training programmes for teachers have been conducted by MoNE in cooperation with the academia of education. Moreover, teachers and administrators' opinions on programs and weekly course schedules were collected through the questionnaires developed by the departments of Programs and Teaching Materials in MoNE, the branch reports of the cities were examined, open-ended questionnaires for branches were collected, and the reports prepared by education faculties in the branch scales were examined (MoNE, 2018).

According to this update, the special expectations of the science curriculum developed by the Board of Education are aiming to educate all individuals in science literate, training students so that they can solve problems encountered in any area of everyday life by using scientific method (MoNE, 2018). Also, developing career awareness and entrepreneurial skills related to science, taking responsibility for everyday life problems and using knowledge of science, science process skills and other life skills to solve these problems. One of the other aims is to improve the ability of scientific thinking habits and decision making by reasoning and using sociological theories. All in all, it can be said that the goal of science curriculum is to improve student's science process skills, life skills, and engineering and design skills. It is seen that the science curriculum has been more student-centered, give importance to not only cognitive abilities but also affective and psychomotor abilities.

Although many improvement attempts have been made in the science curriculum, Turkish science education still has some problems. Rosier (1990) states that professionals in education, such as Ministry of Education are responsible for periodic monitoring and evaluation of educational activities to determine if there is a continuous improvement in the outcomes of students' learning. In order to see the reflection of changes in the curriculum, many countries give attention to national and international researches and surveys. Due to the fact that Turkey participates in international projects periodically in order to examine whether the desired quality of education is applied in a contemporary manner or not (MoNE, 2005b).

Monitoring educational systems and examining the outcomes of these systems within and between the countries have an important role in a developing country. International large-scale assessment studies provide countries to assess the strengths and weaknesses of their educational systems (Stanat & Lüdtke, 2013). In order to analyze these outcomes among countries there are many international studies and Turkey participates some of them such as PISA and TIMSS. MoNE states that participating in these projects enables Turkey to see what extent they are

making progress in education, to evaluate and improve the educational system, and to redesign policies in the light of the results of these projects (MoNE, 2013).

One of the international projects that Turkey attends is TIMSS, which is organized by IEA. IEA is a non-profit and non-governmental organization, which is founded in 1958. In the education field, the purposes of IEA are to inform countries about their level of teaching and learning in mathematics and science and to help them to improve their educational systems (Mullis et al., 2012). National Research Council (1996) states that TIMSS figures out the differences in mathematics and science curriculum, the effect of culture on the curriculum, its relations with teachers and students, the role of teachers and their teaching approaches, the meaning of national curriculum and the differences in educational practice among countries. The students that TIMSS concerns are at the last grades of primary and lower-secondary schools (4^{th} and 8^{th} grades). Within the scope of TIMSS, to collect information from countries, there are questionnaires applied to students who are participated in the teachers of participated students, school administrators and parents just for 4^{th} grade students.

The first time that Turkey attended TIMSS was1999 and participated in the last time is 2019. It is shown that in the National TIMSS Report of Turkey (MoNE, 2016a), although 8^{th} grade science score is increasing from 1999 to 2015, all results are below the TIMSS mean score, which is 500. In 1999, the science score mean of Turkey is 433, and respectively in 2007 is 454, in 2011 is 483, in 2015 is 493 and in 2019 the study report has not been shared yet. In the report, it is also mentioned that the science achievement mean of the 8^{th} grade students who are interested in science is higher than the students who are not very interested in science.

Another international project in which Turkey also participates in is PISA as one of the reputable comparative studies of educational achievement. This project has been organized by the OECD since 2000. PISA has been conducted every three years to 15 years old students, near the end of the compulsory education. The general purpose of PISA is to measure the ability of 15-year-old students to use the knowledge and skills learned in school in their daily life

(OECD, 2016). In other words, this is an assessment to measure the readiness of students to participate fully in society (Ceylan & Berberoğlu, 2007).

PISA focuses on the main school subjects. It has measured not only science and mathematics performance but also reading performance among OECD countries. Each application has a major subject such as the core subject is science literacy in PISA 2006 and PISA 2015. PISA aims to find out how much students can apply their academic knowledge of these subjects in real life. For this reason, PISA uses the term "literacy" instead of using the term "achievement" or "success". To be more specific, science literacy means in terms of PISA that students are able to describe the questions, which are related to science, explain the reasons behind these questions and be interested in issues related to science such as global environmental issues. Apart from standardized tests, the questionnaire related to students, parents, teachers, and schools are conducted by PISA. In spite of the fact that it is optional to join the survey of parent and teacher, student and school surveys are compulsory. With the help of these questionnaires, data has been gathering about the motivations of students, their opinions about themselves, their psychological characteristics about learning processes, school environments, and their families. This data is used to interpret the data obtained from the cognitive field results (OECD, 2007).

Turkey has participated in PISA since 2003 every three years and the last one was conducted in 2018. Although the OECD international mean score is 500, the science literacy score is 434 in PISA 2003, 424 in PISA 2006, 454 in PISA 2009, 463 in PISA 2012, 425 in PISA 2015, and 468 in PISA 2018. The results show that the score of science literacy are below the OECD mean score in Turkey. Furthermore, surveys are an important part of the PISA and provide valuable information that helps improve the test results (MoNE, 2016b). Due to being a participant country of PISA, Turkey is provided to compare Turkish and other countries' education systems with regards to educational policies, teaching strategies, the competence of teachers and materials used in classrooms (MoNE, 2013).

According to the information given, it is seen that Pısa and TIMSS data are detailed and extensive, which helps countries to find the answers of many problems both in science and mathematics education. These international studies allow policymakers to evaluate the cognitive and affective skills such as attitude, interest of students in their own country and give a chance to compare with other countries in the world. Additionally, these exams show that how education systems are similar and different among countries and what that means for students. All in all, they may be able to cause educational reform, policies, and changes in curriculum.

As clarified in detail, 8th grade Turkish students' science performance is lower than the mean of IEA and OECD, which is 500; however, higher levels of science performance are emphasized clearly in the curriculum. The results obtained both national and international large-scale assessment studies show that the success of science is low in Turkey (Özden, 2007). Hanushek (2008) states that the output of education, which is student achievement, is related to several input variables such as school characteristics, students' family background, or peer influences. That is why students' science achievement is affected by many factors. In order to determine which variables affect positively or negatively are important for future science education. Many types of research have been done to investigate the variables which affect science achievement. The studies examine the factors influencing the science achievement in Turkey show that such variables teacher, student and parental characteristics, school characteristics, the quality of teaching tools, teacher training, the use of teaching and learning techniques and the learning environment affect students' achievement (Keser, 2003).

The environment of schools takes an important part in students' behavior and achievement because pupils spend most of their time in schools (Dam, 2008). The type of school that can have a direct impact on student learning, participation in what has been taught, motivation levels, feelings of well-being, belonging, and interaction with teachers (Mallick & Kaur, 2016). There are some studies investigated related school based factors such as school type. Özbay (2015) used data from PISA 2012 to explore differences in the performance of students in

mathematics, reading, and science literacy among school types and geographic regions in Turkey. According to the result of the study, although students' achievement in all learning areas differed significantly with respect to geographical regions and school types, the major difference was found among school types. This study also supports the research of Berberoğlu and Kalender (2005). The authors indicated that the type of school can be also considered as a factor that affects students' mathematics achievement according to PISA 2003 results. By using PISA 2006 data, Alacacı and Erbaş (2010) found that school types affect students' achievement of mathematics performance, and Albayrak (2009) indicated that science achievement of the students also differed significantly with respect to school type. The reason was reported that because of the quality of schools are differed in Turkey.

On the other hand, Shelley and Yıldırım (2013); in a study on PISA 2009 data, it was found that although school type is not a statistically significant predictor of science achievement, it was a predictor of mathematics achievement. Furthermore, Ökten (2019) studied the variables at school and student level that affect together with the mathematics-reading-science performances of Turkish students that participated in PISA 2009-2012-2015 practices. The result of the study showed that students' mathematics-reading-science performances did not differed with respect to school type. The studies related to the effect of school type on achievement were based on international large scale assessment results. However, there are limited number of studies related to the effect of school type on achievement based on national studies in Turkey (Baloğlu, 2010).

The relationship between students' parents' characteristics and academic achievement is also found in the literature. Khan, Iqbal and Tasneem (2015) stated that the first education in the family environment affects the personality structure, social and mental development of the student. Many studies have indicated that the parent's socioeconomic status is the best predictor of academic achievement (Coleman et al., 1966). Additionally, parental education is considered the most stable aspect of the socio-economic situation. Therefore, parental education is the

factor that plays a vital role in a child's academic success and development (Cornell & Grossberg, 1987). In the study of Cameron and Heckman (2001), long-term determinants of academic achievement were predicted as parental education and family income, and it was emphasized that policies that would affect these factors should be established in order to increase academic achievement in the long term. Under parental characteristics, researchers examine various variables such as education of parents, family income, geographical location (urban/rural), and distance to school (Hansen, Heckman and Mullen, 2004).

Researchers have studied the relationship between achievement and sociodemographic variables, for instance, education level of parents. Anıl (2009) investigated the relationship of some factors related to science literacy based on PISA 2006, and it was found that both parents' level of education had a relationship with students' science achievement. Also, fathers' level of education had the strongest relation than mothers'. There are some studies supported the same results (Acar Güvendir, 2013; 2014; Çeçen, 2015; Erdoğdu & Erdoğdu, 2014; Karabay, 2012; Oral & McGivney, 2013; Özer, 2009). On the contrary, there have been few studies reporting the lack of relationship between mothers' level of education and student achievement. For instance, according to the Turkey's Inequality Determinants of Student Success report, there was not a significant relationship with mothers' level of education and students' achievement (Dinçer & Uysal Kolaşin, 2009; Usta, 2014).

Although school and parents play an important role in students' science achievement, many researchers point out that the influence of interest and self-efficacy also have a positive effect on students' science achievement. In science education, it is emphasized that it is very important that the students' interest level in science (De Jong, 2008; Gilbert, 2006; Osborne & Collins, 2000; Whitelegg & Parry, 1999). Interest is not a property of the object or something that exists in mind, but as a result of the association of mind and object (Valsiner, 1992). It is a psychological condition characterized by excitement, concentration and attention that arise from interactions between individuals and interests (Hidi, 2006). When

the researches related to the interest in lessons, it has been observed that studies have been conducted to determine the interest of secondary school students in science lesson (Demirel & Keleş, 2016; Emre, 2012; Erten, 2008; Güven Yıldırım & Köklükaya, 2016; Karalar, 2018). In addition, studies indicating that there is a relationship between interest in lesson, academic motivation (Aypay & Eryılmaz, 2011) and academic achievement (Adeyinka, Adedeji & Sam Olufemi, 2011; Akın, Uğur & Akın, 2015). Moreover, students' interest in the lesson has an impact on the academic motivation (Akın et al., 2015; Krapp, 2002; Schiefele, 1991) and academic achievement (Akın et al, 2015; Laçin Şimşek & Nuhoğlu, 2009). İnci (2019) stated in her doctoral dissertation that student interest in science lessons has a direct and positive effect on classroom engagement, academic motivation, and science achievement.

The self-efficacy refers to one belief in their capabilities to be success in a specific area of behavior. The research about self-efficacy was begun with Bandura's studies (1977). The person who has high self-efficacy has also higher academic performance. Thus, self-efficacy is used to predict the achievement (Zimmerman, Bandura & Martinez-Pons, 1992), career choices (Betz, 2004), performance, and persistence (Lent, Brown & Larkin, 1984) of students. Moreover, self-efficacy has an important effect on people's behavior and performance (Betz, 2004). The studies show that students who have high self-efficacy have high achievement in science (Aktamış et al., 2016). Aktamış, Özenoğlu Kiremit and Kubilay (2016) studied with secondary school students and reached this result by using a survey. Uğraş (2018) also studied with 7^{th} grade students about the relationship between science achievement and self-efficacy. It was found that there is a positive relationship between self-efficacy and science achievement.

Looking at the examples given, it is understood that these large-scale studies help countries to find out the weaknesses and strengths of their education system. Although each country has a different educational system, students take the same test all over the world in PISA and TIMSS. To be more specific, each country has its curriculum for each lesson, such as science education. Researchers

said the lack of a standard model designed to assess the predictors of scientific achievement could be due to there are different cultural and educational institutions in the countries (Dryden, 1987; Wang & Staver, 1996). For this reason, each country has its problems, which affect the science achievement of students. Extensive studies on the variables of science achievement, which impact negatively or positively, may help the authority to find solutions to the problems of their own cultural, educational science education.

One of the significant indicators for development in education is systematic data collection on all students through large-scale testing (Decker & Bolt, 2008). With the help of participating in international large-scale assessment studies, countries increase their own national assessment capacity, such as administrative and technical (OECD, 2016). Therefore, MoNE carried out a large-scale assessment study, which is Determination of Student Achievement (Öğrenci Başarısının Belirlenmesi Çalışması [OBBS]) in 2002; however, this study has not been going on anymore (MoNE, 2002).

When the objectives of the education programs in the Turkish education system are examined, it is seen that they focus on students' ability of what they learn at school and what they can do with what they learn. This situation requires that students should be measured to what they have learned at school and how they have used them in their daily life. Moreover, higher order thinking skills of students also should be measured. In order to address all these needs, MoNE developed its own cultural large-scale assessment, which is called Monitoring and Evaluation of Academic Skills (Akademik Becerilerin İzlenmesi ve Değerlendirilmesi [ABIDE]) in 2016. With the help of this study 8th grade students' ability to use the knowledge and skills, which they have gained in school can be measured in 2016 (MoNE, 2017). Fortunately, not like OBBS, ABIDE study has been started to conduct every two years.

Although international studies give a chance to researchers and policymakers to figure out the identification of factors affecting learning and problems, such a study like ABIDE can give MoNE an idea of what factors and

how much it would need an intervention for the solution to problems. In the light of the results from a national study, it could be developed or adapt to the curriculum to have a high quality of education, analyzed how pedagogy and curriculum are related to social and educational contexts at a cultural level and determined the predictors of achievement in different branches. Student academic skills have received extensive attention from researches and policymakers day by day. In ABIDE report, it is stated that ABIDE has focused on not only Turkish and social sciences skills but also mathematics and science skills of 8th grade students. This study focuses on measuring higher order thinking skills based on the objectives of each lesson. Therefore, ABIDE study is similar to PISA in terms of focuses on to measure skills and similar to TIMSS in terms of based on objectives. Additionally, PISA and TIMSS are generally monitoring in a country based so; they do not provide any feedback at the level of city based. However, it is necessary to sample at the provincial level in order to monitor the specific situations of each province and to give feedback (MoNE, 2017). With the help of this study, Turkey collects data from each province, which represents the whole country.

Except for achievement tests, data from students, teachers, and headmaster of the school was collected by using questionnaires in ABIDE. The student questionnaire includes not only variables of socioeconomic status, attitude toward schools, peer victimization, family pressure of students but also affective skills of students for each lesson such as interest in lessons and self-efficacy toward science so on. By using national data of this large-scale study, researchers have a chance to do secondary analysis and figure out the variables, which affects science achievement of students.

1.2 Purpose of the Study

The main purpose of this study is to investigate the relationship among attitudinal constructs (interest in science lesson and self-efficacy toward science), demographics (school type, mothers' and fathers' level of education) and 8th grade

students' science achievement score by using students' science achievement test score and student questionnaire data in Turkey through ABIDE 2016.

1.2.1 Research questions

The study focused on the following research questions and related sub-questions:

1- What is the science achievement competence level of 8th grade students according to the results of Monitoring and Evaluating Academic Skills Study: ABIDE 2016?

2- What is the difference of Turkish 8th grade students' science achievement according to school type, mothers' level of education and fathers' level of education with the results of ABIDE 2016?

   a) Is there a significant mean difference in 8th grade students' science achievement scores in terms of school type?

   b) Is there a significant mean difference in 8th grade students' science achievement scores in terms of mothers' level of education?

   c) Is there a significant mean difference in 8th grade students' science achievement scores in terms of fathers' level of education?

3- How well do the attitudinal constructs (interest in science lesson and self-efficacy toward science) and demographics (school type, mothers' and fathers' level of education) predict science achievement of 8th grade students?

1.3 Significance of the Study

The ability to understand basic scientific concepts and theories and to solve scientific problems becomes very important. Nevertheless, in the last 15 years, there has been a remarkable decrease in the ratio of students studying science at some universities in some OECD countries (MoNE, 2010b). The reason for this can vary and some researchers suggest that students' affective skills can also play an important role, as well as the impact of the science curriculum (OECD, 2007). To get information about the countries education system, not only achievement

about lessons such as science and mathematics but also affective skills of students and teachers' have been measuring by international studies.

Turkey participated in international studies that allow assessing in an objective manner of the education system. However, the success of Turkey in these studies has been affected by the different education systems of countries that are participated in international tests, cultural, and translation differences that may happen during the adaptation of tests to different languages and the variety of school types in Turkey. To reduce the impact of these factors ABIDE study has an important role. With the help of this study, researchers have a chance to look at the education system in Turkey within the framework of a national level, and it helps to find the solution to problems.

MoNE (2005a) states that in this technology and information age, all societies, especially the developed countries, have an effort to improve the quality of science education because it is believed that science education plays an essential role in the future of society. There are many different dimensions, such as students' attitudes towards science, teaching approaches, teacher characteristics, or philosophy of the curriculum that affect students' achievements of science. This study aimed to investigate the factors affecting students' science achievement. Based on the result of different researches, it is thought that determining the factors affecting science success is important for science teaching. Therefore, this study will contribute to the current situation by showing the factors that affect the science achievement and how well effective these factors are in science achievement. Such a study is considered to shed light on the educational policy-makers to find solutions to the problems, to take necessary precautions to enhance the science achievement of students, and for educational researchers about their future studies such as to provide for observing the changes in science education.

How to increase science achievement is an important concern, and also science achievement, interest in science lessons and self-efficacy toward science are also emphasized. Because the main purpose of science education in Turkey is to provide students access information that is to acquire knowledge skills, higher

order thinking skills, rather than instructing the current knowledge to the students. For this reason, in addition to policymakers, teachers may also use the result of this study. They prepare lessons and use different teaching methods to affect students' interest and self-efficacy in science lessons according to the results of this study. Moreover, the data set of ABIDE was used for the first time in an academic study. With the help of this present study, it can be seen that whether the factors which are thought to have a relationship with science achievement support the same results with international studies or not. Furthermore, there is no study related to ABIDE except a few reports and booklets published by General Directorate of Measurement, Assessment and Examination Services. Therefore, this study will be first on this issue.

1.4 Definition of Important Terms

In this section, the operational definitions of important terms were given to provide deeper information about this study.

Science Achievement refers to the mean of science scores in the Monitoring and Evaluating Academic Skills Study, ABIDE.

School type is defined as different kinds of school organizations. In this study, school type refers to secondary schools (imam hatip secondary school, public secondary schools, and regional boarding secondary school) and private secondary schools in Turkey.

Interest in science lesson refers to the scores related to students' interest in science lessons received from ABIDE students' questionnaire.

Self- efficacy toward science refers to the scores related to students' self-efficacy toward science received from ABIDE students' questionnaire.

CHAPTER 2

LITERATURE REVIEW

2.1 International Large Scale Assessments

Large scale assessments are needed to compare the skills and knowledge of people across countries in education. The goal of these scales is to describe a population, or populations, of interest. These large-scale assessments have been applied for 50 years on a broader range of populations and influence policymakers around the world (Davier, Gonzalez, Kirsch & Yamamoto, 2013). International large-scale assessments (ILSAs) are examined under seven chapters as funding and aid, evidence for policy, international relations, national politics, technical capacity building, economic rationales, and curriculum and pedagogy (Addey, Sellar, Steiner-Khamsi, Lingard & Verger, 2017). ILSAs provide evidence for police and shape education. They also provide commensurate data across national to develop a global infrastructure by generating, managing, and analyzing. The increase in the importance of ILSAs is begun with the legacy of Cold War, to show supremacy in educational systems (Trohler, 2013). By falling of the Berlin Wall in November 1989, the USA framed its education as an economic resource. ILSAs' development increased by investigating for universals in the relationships between literacy, education and prosperity (Hamilton & Barton, 2000). To quantify economic potential, education system of a country became vital. Moreover, scores of ILSAs are used to compare the academic achievements of students from one country to those of other countries (Cook, 2006). Comparability means that if assessments measure the same constructs across groups, which are compered and supply measures on the same scales that have similar levels of uncertainty. Comparability analysis has two important aspects that are the investigation of differential item functioning and identification of its sources (Sandilands, Oliveri, Zumbo & Ercikan, 2013).

The start of applying an ILSA was implementing of International Adult Literacy Study (IALS) in 1994 by OECD. Then, PISA was developed and applied first in 2000. The UEA implemented TIMSS for the first time in 1995. After that, three regional large-scale assessments were developed that are PERCE, SERCE, and TERCE. Participant countries increased of TIMSS and PIRLS during 2000s. OECD redeveloped its IALS program into Program for International Assessment of Adult Competencies (PIAAC). PIAAC is applied in over 35 countries, and OECD calls middle- and low-income countries. UNESCO Institute for Statistics (UIS) developed an IALS-equivalent called as the Literacy Assessment and Monitoring Program (LAMP) in 2003 in order to measure literacy and numeracy skills across a variety of languages (Guadalupe, 2015). However, LAMP was not gained enough global prestige due to many staff changes, poor political support, and many methodological and conceptual challenges. Thus, OECD programs drew attention from low and middle-income countries. PISA was redeveloped into PISA for Development (PISA-D) by OECD in 2012 to make the PISA instruments more appropriate for low- and middle-income countries. EU also started to develop an international assessment to assess the outcomes of tertiary education that is Measuring and Comparing Achievements of Learning Outcomes in Higher Education (CALOHEE) in 2016. The purpose of CALOHEE was to measure the performance of bachelor and master students in Health Care (Nursing), Engineering (Civil Engineering), Social Sciences (Education) Humanities (History), and Natural Sciences (Physics) across Europe.

ILSAs were implemented in a great number of countries. The reasons of participation of countries were specified as producing evidence for policy; technical capacity building and developing national assessments; obtaining funding and aid; improving international relations; responding to or driving national political agendas; driving economic growth; and informing curriculum and pedagogy. Evidence for a policy means that data assessment provides reliable evidence for policymaking and provides the evaluation and benchmarking of educational performance (OECD, 2014; UIS, 2004; IEA, 2015). Technical capacity building and national assessments were other reasons for participation because

participation is justified in relation to building such capacities and is conceived as a technical process that does not involve an allocation of values. Capacity building in psychometrics became a rationale for all low, middle, and higher-income countries. Participation is related to funding and aid conditions because it is driven by donor encouragement of low and middle-income countries (Lockheed et. al., 2015). ILSAs' purposes are not only about education, but countries also participate in making a statement about political or economic status; to adjust their values with an international community; to access to political, economic or trade entities; or due to pressure to participate as signatories of global commitments.

The purpose of international relations was related to membership in international organizations that administer ILSAs or initiatives that have been promised by countries. Moreover, participation was enhanced by pressures associated with national politics coming from ministries and institutions or can be a response to special interest lobbies, media pressure, and public opinion (Addey, 2015; Steiner-Khamsi, 2003). Another reason for participation in ILSAs is economic growth because these scales are indicators for economic competitiveness and attractiveness to the corporate world. The final reason was related to curriculum and pedagogy. ILSAs measure not only acquiring the curriculum of students but also measure the capacity to apply skills learned over the first 15 years of life. Moreover, countries participate ILSAs for the need for more reliable, comparative data to provide countries for the global economy through quality and equity-driven educational systems and the need to contribute to generating ILSA-based policy knowledge as a member of the international community (Addey et al., 2017).

In conclusion, ILSAs provide an opportunity to shed light on the educational goals of a country or geographic region and the contexts within which education is occurring. Participation in international assessments shows a country's loyalty to education (Nyroos & Wiklund-Hörnqvist, 2012). Turkey participated PISA for the first time to assess the quality of education system in 2003 (Alacacı & Erbaş, 2010). PISA is applied to 15-years old students to assess their knowledge in

reading, mathematics, and science to real-life problems, rather than the acquisition of specific curriculum content. Assessments are made every three years. In addition to assessing curriculum, students, family, and instructional factors that help to explain differences in performances are collected through PISA, and these data are collected by questionnaires. The questionnaire is about students' personal background, their learning habits and their engagements with attitudes towards science, mathematics, and literacy. To collect data for demographic characteristics of students and characteristics of the learning environments, the questionnaire for principals is used. One other questionnaire is used for parents to explore the relationship between student's achievement and family factors. The results of PISA 2003 were very low in Turkey. This shows that Turkish students perform badly in comparison with students in other countries. Thus, PISA results were used to reform the education system in Turkey by the government officials (Gür, Çelik & Özoğlu, 2011). The types of the major determinants of students' achievement were examined, and family background was found the major reason of opportunity for education (Berberoğlu & Kalender, 2005).

In addition to PISA, TIMSS has been drawn interest among countries. This assessment is used to measure and compare mathematics and science achievement in different countries and has been conducted since 1995 (Bagata, Geske, & Kislova, 2004). The science content includes life science, earth science, chemistry, physics, environmental and resource issues; scientific inquiry, nature and science (Bagata et al., 2004). Mathematics context includes fraction and numbers, measurement, data presentation, analysis and probability, algebra and geometry into simple situations in routine (Bilican, Demirtaşlı & Kilmen, 2011). Moreover, TIMSS includes three conceptual frameworks that are input–process outcome, organizational and school effectiveness studies, and an educational indicator approach (Zuzowski, 2003). TIMSS was implemented in 1999 for the first time in Turkey to eight grade students. Turkey did not participate in TIMSS 2003. The results of TIMSS were low in 1999-2007- 2011- 2015 in Turkey. Student-centered classrooms' grades were low in science. A significant difference was also found between high performing and low-performing schools. Moreover, parents'

education level, classroom practices, and attitudes toward science were factors that affect students' achievement (Aypay, Erdoğan & Sözer, 2007).

In conclusion, Turkey's ratings were low in ILSAs in compared to other countries in science achievement. The reasons for low achievement are related to some factors, such as students' interest in science, self-efficacy, parents' education level, and school types, which are discussed now under headings (Aydın, Erdağ & Taş, 2011).

2.2 Science Achievement

Achievement is defined as reaching meaningful aims step by step for an individual (Baltaş, 1997). When achievement is referred to in education, it is defined as a whole of behaviors consistent with program aims (Demirtaş & Güneş 2002). Korobova and Starobin (2015) defined academic achievement as a degree to reach the educational objectives of students and evaluation with measuring results. Academic achievement can be associated with many factors.

When science achievement is considered, it is seen that it is influenced by many variables. These variables can be categorized as school and non-school related. Moreover, perceptions of instructions, attitudes of students toward science, and background of students such as ethnicity, family size, student learning, motivation, and socioeconomic status effect students' achievement in science (Schibeci & Rilay, 1986). Studies that show the relationship between science achievement and learning approach (BouJaude, 1992; Cano, 2005; Cavallo, 1996; Cavallo, Rozman & Potter, 2004). Cano (2005), for example, found that a deep learning approach increase achievement. Similarly, Cavallo (1996) found that meaningful learning approach is effective on students' achievement. Von Secker and Lissitz (1999) also imply that instructional characteristics affect students' achievement. For example, Stohr-Hunt (1996) searched for the effects of hands-on activities on science achievement. He studied with 8^{th} grade students for a month. It was found that hands-on activities have a positive impact on science achievement. Jones, Sugalan, Mundy, and Fedynich (2018) explored the effects of laboratory use in science class on students' achievement. They studied with 8^{th} grade students and

used labs with high hands-on experiences. Their results showed that laboratory use increases students' science achievement.

In addition to instructional variables, students' intellectual abilities are related to the science achievement. Some students believe that their intellectual abilities are different. While some students believe that intellectual abilities are basically fixed, some students believe that intellectual abilities can be cultivated and developed through application and instruction (Dweck, 2008).

2.3 School Type

School type is one of the factors that has a relationship with science achievement. The studies about school type include single-sex schools and coeducational schools. Dhinds and Chung (2010) explored the relationship between school type and science achievement. They studied with high school students in different types of schools, such as coeducational schools and single-sex schools. They found that there is a significant difference between students in different schools on science achievement and this difference was in favor of single-sex schools for girls. Similarly, achievement of students in single-sex schools for boys was higher than students in coeducational schools. In a similar study of Young and Fraser (1992) with Austrian students, the science achievement was explored in different school types as private, government, single-sex and coeducational. In their study, no significant difference was found in science achievement of students attending coeducational government, Catholic, and private schools. Beside, a significant difference was found between girls in single-sex schools and girls in coeducational schools in science achievement in favor of girls in single-sex schools. There was no significant difference between boys and girls who attend both single-sex or coeducational schools. The reason for this difference can be explained such that boys and girls in single-sex schools can pay full attention during their science lesson without being disturbed by the opposite sex. However, changing from coeducational to single-sex classes can include complex changes in role expectations for students and the classroom environment (Dhindsa & Chung, 2010). Additionally, the effects of school type were explored on science

achievement in a study with Turkish students (Kalender, 2004). The school types were public, regional boarding and private secondary school. There was a significant difference was found among these school types with respect to their science achievement score.

2.4 Parent Level of Education

The studies exploring the effect of family commitment reported that parent education is an important factor in the improvement of student achievement (Wang & Wildman, 1995). In an early study of Alvord (1972), the relationship between students' achievement and parent education was explored. Parent education level was categorized as less than 8^{th} grade, more than 8^{th} grade, but less than high school, high school graduate, and beyond high school. Significant correlations between science achievement and parent education level were found at all three levels, which are elementary, junior high, and high school students.

In a similar study of George and Kaplan (1998), parent involvement in students' school activities was related to parent education. Parents' education level was categorized as did not finish, college graduate, and PhD or Master graduate. A significant difference was found between parent involvements in terms of parent education level. Students of higher educated parents had better achievement in science than students of lower educated parents. Marschark, Shaver, Nagle and Newman (2015) also explored the effects of parent education level on science achievement. Their result was also similar that there is a significant relationship between parents' education level and science achievement.

2.5 Interest in Science Lesson

Interest is defined as understanding the association between a person and object by means of person-object theory of interest (Krapp & Prenzel, 2011). The term of interest has three forms. Interest is known as a psychological stage of specific moments (Ainley & Ainley, 2011). These moments are dynamic elements of experiences of students and students' reports of their experiences within a short period (Ainley, Hidi, & Berndorff, 2002). Another moment is a situational interest that occurs with respect to a specific situation. The other moment is the

environmental stimuli that trigger the focus of attention at the moment (Hidi, 1990). Moreover, interest is also defined as personal-oriented, comparatively stabled disposition connecting with a specific area or a subject. Thus, interest in science is related to specific subject, such as biology, physics, and chemistry or a specific area, such as the study of animals, or a concrete operation or object such as lab manipulations, and an abstract scientific activity such as formulating a scientific problem or question or analyzing data (Hansi & Potvin 2015). A four-phase model of interest was developed by Hidi and Renninger (2006). The first phase is a triggered situational interest that is prompted by environmental aspects that temporarily alter students' affective and cognitive processing (Palmer, Dixon & Archer, 2016). The third and fourth phase is emerging individual interest and well-developed individual interest that refers to the development of an ultimately enduring disposition to actively seek reengagement with specific content over time (Hidi & Renninger, 2006).

The interest can develop the quality of learning (Ainley, Hidi, & Berndorff, 2002) and increase the likelihood that students will continue learning outside the classroom. Mills, Tomas, Whiteford, and Lewthwaite (2018) explored the relationship between interest in science and achievement. A significant positive relationship between interest and achievement was found. They proposed that students' individual interest in learning science comes from early attentional and affective phases of their development. The study of Schiefele, Krapp, and Winteler (1992) proved this relationship by conducting meta-analysis of studies. On the other hand, studies showed that students have low interest in science. The reasons for the decrease of interest in science were stated as teacher-centered instruction or using the difficult language of science and teaching irrelevant topics to students' lives (Aikenhead, 2006; Avraamidou & Osborne, 2009; European Commission, 2007; Kruckeberg 2006). Connecting science content with students' life increases students' interest. Jack and Lin (2014) stated novelty, involvement and meaningfulness as sources of interest. A novel activity or task include unfamiliar disciplinary content knowledge, practical work and provide choice to promote student autonomy (Linnenbrink-Garcia, Patall & Messersmith, 2013; Palmer et al.,

2016). Being active of students in the learning process may cover physical and cognitive engagement and interaction of students with peers and the teacher (Jack & Lin, 2014). By manipulation of materials or models in hands-on activities or group works, students' involvement is provided. The meaningfulness of the content means the relevance of students' pre-instructional knowledge and their daily life with the content. Teaching topics that are related to students' interests can improve students' interest (Linnenbrink-Garcia et al., 2013; Palmer et al., 2016.)

2.6 Self-efficacy toward Science

Self-efficacy is known as people's beliefs in their ability to influence events affecting their lives (Bandura, 1977). Self-efficacy theory which is hypothesized by Bandura (1977) implements that self-efficacy has an effect on individual's choice of activities, effort, and persistence. Beliefs about self-efficacy have four principal sources of information. First one is mastery sources that include success and failure. Success builds a belief in one's efficacy. Failure undermines success, especially when frequent failures occur in early phases in the development of competencies. The second source of information is known as social modeling. Sources of competencies and motivation are served by models. The third source of information is social persuasion. People exert greater efforts if realistic boots in efficacy are served. The fourth source of information is physiological states, which are the way pf individuals' self-efficacy beliefs on physiological and affective states such as stress, anxiety, fatigue, and mood are interpreted (Bandura, 2006).

Self-efficacy is influenced by four types of experience related to cognitive beliefs that are enactive attainment, vicarious experience, verbal persuasion, and physiological states. Enactive experiences are shown on the outcomes of personal experiences. Vicarious experience depends on an observer's self-comparison with outcomes attained by a model. Verbal persuasion has limited impact on students' self-efficacy due to dependence on the credibility of the persuader. Physiological states are physiological reactions, such as fatigue, stress, and other emotions that are often presented as indicators of physical incapability (Zimmerman, 2000).

In the literature, it was seen that self-efficacy beliefs are related to other self-beliefs, motivation constructs, and academic choices, changes, and achievement (Malpass, O'Neil & Hocevar, 1999; Zimmerman & Bandura, 1994). The study of Liu and Schallert (2010) with middle school students explored the relationship between self-efficacy and science achievement. By the results of the paired t-test, it was seen that self-efficacy increases students' science achievement. A similar study was conducted by Britner and Pajares (2006) with middle school students to find self-efficacy prediction of science achievement. They used a scale to find self-efficacy levels of students. By conducting multivariate analyses of covariance, it was confirmed that self-efficacy is a strong predictor of achievement in science. In a similar study of Kirbulut and Uzuntiryaki-Kondakçı (2019) with 8^{th} grade students, the effects of self-efficacy on science achievement were explored. They found that self-efficacy is a predictor of science achievement.

In conclusion, science achievement of students depends on some variables, such as interest of students in science, self-efficacy toward science, school type, and parents' education level. To assess the relationship between students' science achievement and these variables, large assessment scales such as TIMSS and PISA are important. This study explores the relationship between interest in science lesson and self-efficacy, school type, parents' level of education and 8^{th} grade students' science achievement by using a national large scale assessment data, which is ABIDE 2016.

CHAPTER 3

METHODOLOGY

This chapter presents the design of the study, population and sampling, variables, instruments, data collection, data analysis, assumptions, and limitations of the study.

3.1 Design of the Study

The investigation of how science achievement of the 8th grade secondary school students who joined the ABIDE 2016 differ with school type, mothers' and fathers' level of education and how these students' school type, mothers' and fathers' level of education, interest in science lesson and self-efficacy toward science contribute to the prediction of their science achievement are the main purposes of this study. In this current study, a quantitative research with non-experimental study was realized. To examine these relationships a correlational research was performed. Correlational research describes an existing relationship between variables and clarifies an important phenomenon by identifying relationship among variables (Fraenkel, Wallen & Hyun, 2012).

3.2 Population and Sampling

ABIDE 2016 is a local study that has been investigated in Turkey; therefore, the target population of ABIDE would be all 8th grade secondary students who studied the 2015-2016 academic year in Turkey. Therefore, it was not easy to reach this population, an appropriate sample was identified and stratified sampling method was used for sampling. This method was applied as a sampling method owing to its effectiveness in studies, which increases the likelihood of representativeness (Fraenkel et al., 2012).

According to ABIDE report (MoNE, 2017), to identify the sample of the study, all the numbers of secondary schools and sections in Turkey were provided by Strategy Development Department, MoNE. Schools and sections where students with special education needs were excluded from the sample. In order to give more qualified information about the number of sections which were determined for 81 provinces, as noticed before, the stratified sampling method was used. By using the subgroups (strata), which are shown in Table 3.1, section numbers were distributed proportionally for each province and approximate 38.000 number of students were reached.

Table 3.1

Subgroups Created for Stratified Sampling in ABIDE 2016

Section											
Province						Countryside					
Public			Private			Public			Private		
Double-shift education			Full-time education			Double-shift education			Full-time education		
Imam H. SS	Secondary S	Regional Boarding SS	Imam H. SS	Secondary S	Regional Boarding SS	Imam H. SS	Secondary S	Regional Boarding SS	Imam H. SS	Secondary S	Regional Boarding SS

(*Note.* Revised from "Akademik Becerilerin İzlenmesi ve Değerlendirilmesi 8. Sınıflar Raporu" by Ministry of National Education, 2017, pg.16.)

In the present study, the data obtained from the ABIDE sample was used with the same subgroups and proportions. Therefore, the sample of the study is 3888 students who participated in ABIDE 2016.

3.3 Variables

3.3.1 Independent variables

In the present study, there were five independent variables: school type, mothers' level of education and fathers' level of education, interest in science lesson and self-efficacy toward science. School type, mothers' and fathers' level of

education variables were considered as categorical variables, on the other hand, others were continuous (quantitative) variables.

School type: Students have a chance to study at different types of schools in Turkey. Students registering in imam hatip secondary school follow extra lessons about religion (Islam). There is an additional fee that has to be paid to study at a private secondary schools and the price varies from school to school. Another school type is regional boarding secondary schools, which are located generally in villages or low socioeconomic status regions. Students studying at these schools are staying at dormitories. Lastly, public secondary schools prevail in each part of Turkey. Hence in this study, this variable classifies the school types of the students as "Imam Hatip Secondary School", "Public Secondary School", "Private Secondary School", and or "Regional Boarding Secondary School".

Mothers' and fathers' level of education: These variables classify the education level of students' mother and father who are "Never went to school or left primary school", "Primary school graduate", "Secondary school graduate", "High school graduate", "Associate's degree", "Bachelor's degree", and or "Postgraduate degree".

Interest in science lesson: This variable is a continuous variable, which is the sum of the factor scores of the students' responses to the items related to interest in science lessons in the questionnaires applied in the ABIDE 2016 study.

Self-efficacy toward science: This variable is a continuous variable, which is the sum of the factor scores of the students' responses to the items related to science self-efficacy in the questionnaires applied in the ABIDE 2016 study.

3.3.2 Dependent variable

The dependent variable of the present study is science achievement score of students that was considered as quantitative variable measured by ABIDE 2016 science achievement test.

3.4 Instruments

ABIDE 2016 data set includes not only Turkish, mathematics, science and social sciences achievement tests but also student, teacher and school questionnaires as instruments. In this present study, students' science achievement test scores and responses given to student questionnaire were used. Accordingly, information about ABIDE 2016 science achievement test and student questionnaire are presented in this section.

3.4.1 Science achievement test

According to ABIDE report (MoNE, 2017), ABIDE study is similar to PISA in terms of focusing on skills measurement and TIMSS, where it is based on objectives; therefore, achievement tests and questionnaires were prepared in this vision. A range of questions was used to assess students' skills and knowledge in science. Two question formats were used in ABIDE 2016. They are multiple choice and open-ended questions. Both item types have a different specification in assessing students' learning. The multiple choice questions used in science achievement test provide four response items to the students and there is only one correct answer to these four response options. The other item type is open-ended questions in which a written response is constructed by students by using their own words. For assessment of the students' science achievement who participated in ABIDE 2016, rubrics were used for the open-ended questions. Constructed response items were graded 0-1, 0-2 and 0-3.

Students' responses to each open-ended question were evaluated by two evaluators. When any differences were observed between the evaluators' scores on student responses, the student's response was evaluated by the higher evaluator. The score given by the higher evaluator to the student's response was determined as the final score. Furthermore, interrater reliability was analyzed for each open-ended question in the booklets and it was seen that the value of Cramers's V is over 0.80 that means interrater reliability is considerably high (MoNE, 2017). In other words, the evaluators' scores on student responses were reliable. The examples of the science achievement test items and rubrics are given in APPENDIX-A.

12 booklets were used in ABIDE 2016 study, and the number of items in each booklet is 20. 18 items that were used before in the pilot study and item statistics used for assessment in science achievement of students. Besides, the rest of them were used for the first time. Increasing the item pool for the following studies is the reason why used two more questions were used in booklets. Moreover, approximately half of the items in each booklet were open-ended and the other half were multiple-choice. Additionally, reliability values were calculated for each booklet in terms of internal consistency. There were three forms of science achievement booklets called A, B, and C. The reliability coefficient of the A booklet was r=0.83, B booklet was r=0.82, and C booklet was r= 0.81 (MoNE, 2017).

After the implementation, to be able to decide students' competence levels, ability estimation, and standardization study were realized (MoNE, 2017). Table 3.2 shows the level of competence in science lessons and score equivalent according to ABIDE 2016.

Table 3.2

The Competence Levels of 8th Grade Students' Science Achievement Score According to ABIDE 2016

Level of Competence	Score
Fundamental low	Lower than 326.72
Fundamental	Up to 437.80 included 326.72
Medium	Up to 518.20 included 437.80
Medium high	Up to 571.50 included 518.20
Advanced	571.50 and above

(*Note.* Revised from "Akademik Becerilerin İzlenmesi ve Değerlendirilmesi 8. Sınıflar Raporu" by Ministry of National Education, 2017, pg. 27.)

It is seen that five competence levels were identified according to students' science achievement scores, which are "Fundamental low", "Fundamental", "Medium", "Medium high", and "Advanced". In this present study, first research question was examined according to these competence levels.

3.4.2 Student questionnaire

All of the 8th grade students who were participating in ABIDE 2016 were supposed to take a student questionnaire, which covers some background information about themselves, such as their families, home and school environment. Moreover, there are some items related to their opinions about schools, homework, Turkish, mathematics, science and social sciences lessons and education in their schools. Also, the items related to lessons were included the interest, attitude, value, and self-efficacy toward each lesson. The questionnaire took approximately 30 minutes.

In this present study, by using the student questionnaire, the data received about 8th grade students' school type, mother and fathers' education level, interest in science lesson, and self-efficacy toward science were used. The items for interest in science lesson and self-efficacy toward science were prepared as a 5-point Likert-type ranging from 1 "Strongly disagree" to 5 "Strongly agree". The items related to interest in science lesson of the student questionnaire are listed in Figure 1.

Indicate how much you agree or disagree with each statement related to Science and Technology lesson? *Mark one option for each statement*	Strongly Agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly disagree (1)
Science and Technology is an important lesson.	o	o	o	o	o
Science and Technology is my favorite lesson.	o	o	o	o	o
I like go to the black board in Science and Technology lesson.	o	o	o	o	o
I would like to have a job related to Science and Technology.	o	o	o	o	o
I like reading book, journal, article etc. about Science and Technology.	o	o	o	o	o

Figure 1. *(Continued)*

I like the games like puzzle, riddle etc. that related to Science and Technology.	o	o	o	o	o
I like watching movies and documentaries about Science and Technology.	o	o	o	o	o

Figure 1. Items of the Student Questionnaire Related to 8th Grade Students' Interest in Science Lesson

The items related to self-efficacy toward science of the student questionnaire are listed in Figure 2.

Indicate how much you agree or disagree with each statement related to Science and Technology lesson? *Mark one option for each statement*	Strongly Agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly disagree (1)
I learn Science and Technology easily.	o	o	o	o	o
I can solve difficult questions about Science and Technology.	o	o	o	o	o
I am better than my classmates in Science and Technology lesson.	o	o	o	o	o
My teacher says I am good at in Science and Technology.	o	o	o	o	o

Figure 2. Items of the Student Questionnaire Related to 8th Grade Students' Self-Efficacy toward Science

3.5 Data Collection

ABIDE study was carried out by the General Directorate of Measurement, Assessment and Examination Services in 81 provinces of Turkey in 2016. Student achievement scores were obtained from Turkish, mathematics, science, and social studies achievement tests. Moreover, 8th grade students, teachers and school

administrators participated in the surveys. Survey data was collected by providing personal access to the electronic environment.

In this study, students' science achievement and some characteristics were in the focus of the present study. Students' science achievement score and the student questionnaire data set to be used in this research were received from one of the department of Ministry of National Education which is Data Analysis Monitoring and Evaluation Department of the General Directorate of Measurement, Assessment and Examination Services on 17 September 2019 (APPENDIX-C).

3.6 Data Analysis

The data obtained from science achievement test and students' responses given to the questionnaire were used for the present study. For analyzing the present study data, both descriptive and inferential statistical analyses were performed by means of SPSS 25.0 statistical program. According to research questions in which data collection and analysis methods were performed are shown in Table 3.3.

Table 3.3

The Research Design of the Study

Research Questions	Data Collection Methods	Data Analysis Methods
1. What is the science achievement competence level of 8th grade students according to the results of Monitoring and Evaluating Academic Skills Study: ABIDE 2016?	Science Achievement Test of ABIDE 2016 (Multiple and open-ended questions)	*Descriptive statistics:* Frequency, percentages, mean
2- What is the difference of Turkish 8th grade students' science achievement according to school type, mothers' and fathers' level of education with the results of ABIDE 2016?	Science Achievement Test and Student Questionnaire of ABIDE 2016	*Descriptive statistics:* Frequency, percentages, mean *Inferential statistics:* One-way ANOVA

Table 3.3 *(Continued)*

a. Is there a significant mean difference in 8th grade students' science achievement scores in terms of school type? b. Is there a significant mean difference in 8th grade students' science achievement scores in terms of mothers' level of education? c. Is there a significant mean difference in 8th grade students' science achievement scores in terms of fathers' level of education?		
3- How well do the attitudinal constructs (interest in science lesson and self-efficacy toward science) and demographics (school type, mothers' and fathers' level of education) predict science achievement of 8th grade students?	Science Achievement Test and Student Questionnaire of ABIDE 2016	*Descriptive statistics:* Frequency, percentages, mean *Inferential statistics:* Multiple Linear Regression

Descriptive Statistics: In this study, to answer the first research question and to give some information about the sample, descriptive statistical analyses were performed in terms of the frequency, the percentage, and the mean.

Inferential statistics: Inferential statistics are certain types of procedures that allow researchers to make generalization based on findings from a sample. In this study, two inference techniques were used. These techniques were One Way Analysis of Variance (ANOVA) and Multiple Linear Regression Analysis.

For the 2nd research question and sub-questions, to determine the relationship among students' school type, mothers' and father education level on science achievement, ANOVA was performed. ANOVA is appropriate to analyze variation when the dependent variable classifies in three or more groups. Also, variation both within and between groups is analyzed statistically (Fraenkel et al., 2012).

For the 3rd research question, the prediction of students' science achievement by their school type, mothers' and fathers' level of education, interest in science lesson, and self-efficacy toward science was examined utilizing Multiple Linear Regression Analysis. This technique can be used to explore and determine the correlation between one continuous dependent variable and two or more independent variables or predictors (Pallant, 2007).

In general, the multiple regression equation takes the following form:

$$\boldsymbol{Y} = \boldsymbol{a} + \boldsymbol{b_1}X1 + \boldsymbol{b_2}X_2 + \ldots.. + \boldsymbol{b_n}X_n + \boldsymbol{\varepsilon}$$

In the model, $\boldsymbol{Y}$ is the dependent variable, $\boldsymbol{X_1, X_2, ..., X_n}$ are independent variables, $\boldsymbol{a, b_1, b_2, ..., b_n}$ are coefficients (unknown parameters) and $\boldsymbol{\varepsilon}$ is the error term (Ünver & Gamgam, 2006).

3.7 Assumptions of the Study

The following assumptions of the present study were relevant to this study:

1. It is assumed that the sample of the study in ABIDE 2016 represents the population in Turkey.
2. It is assumed that the total science score of the students reflects their real achievement.
3. It is assumed that all participants of ABIDE 2016 answered the questionnaire by giving correct information about themselves and reflecting their true feelings.

3.8 Limitations of the Study

The generalizability of the data obtained in this study has been made within the framework of the following limitations:

1. This study is limited to science achievement score of 8th grade school students who participated in ABIDE 2016.
2. The present study is limited to the answers of 8th grade students participated in ABIDE 2016 to selected items from questionnaire.

CHAPTER 4

RESULTS

This study investigated the factors affecting 8th grade students' science achievement in Turkey through ABIDE 2016. The purpose of this chapter is to provide a detailed description of the results of the study. The key findings that emerged from the data are categorized under sections, which correspond to the three research questions of the study.

4.1 Competence Level of Students According to Students' Science Achievement Score in ABIDE 2016

As described in chapter three, five competence levels were identified according to students' science achievement score (SAS) in ABIDE 2016 (See Table 3.2). In the present study, the first research question was asked to determine the science competence level of 8th grade students. Firstly, the descriptive statistics of 8th grade students' science achievement scores in Table 4.1 and secondly, the frequency of students according to science competence levels are presented in Table 4.2. The findings of the first research question are presented with respect to result of ABIDE 2016.

Table 4.1

Descriptive Statistics of 8th Grade Students' Science Achievement Score with Respect to ABIDE 2016

		Statistic	Std.Error
Science Achievement Score	Mean	500.28	1.41
	Median	502.42	
	Minimum	292.07	
	Maximum	748.47	

Table 4.1 *(Continued)*

	Std. Deviation	88.20	
	Skewness	0.03	0.04
	Kurtosis	-0.62	0.08
	N	3888	

In Table 4.1, it is seen that the mean value of SAS of students is ($\bar{x}$= 500. 28). According to Table 3.2, this score is in the medium competence level. Furthermore, when skewness and kurtosis values were examined, it was found that these values were in the range of [-1, +1], and therefore, SAS did not deviate significantly from the normal distribution. In other words, SAS of students was normally distributed in ABIDE 2016.

Table 4.2

Science Competence Level of 8th Grade Students with Respect to ABIDE 2016

Competence Level	f	(%)
Fundamental low	58	1.5
Fundamental	980	25.2
Medium	1156	29.7
Medium high	817	21
Advanced	877	22.6
Total	3888	100

When the frequency and percentage of the SAS competence level were examined, as shown in Table 4.2, the highest percentage belongs to medium level (29.7%) and the lowest percentage belongs to fundamental low level (1.5%). Although the level of SAS is in the medium level, 43.6% of students score is over 437.80 which is the boundary value of being over medium level. To see 8th grade students' science competence level in detail, Figure 3 is presented.

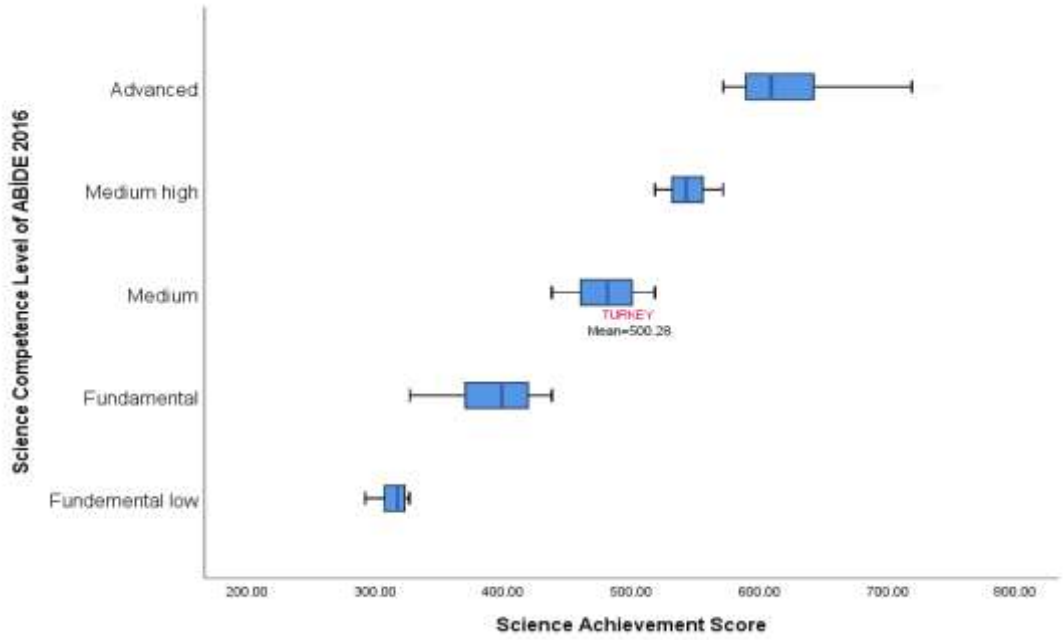

Figure 3. Boxplot of Science Competence Level of 8th Grade Students with Respect to the Results of ABIDE 2016

Competence levels, according to students' science achievement scores, are given in Figure 3. In the graph, the dark line in the middle of the filled boxes gives the mean value of the region. The lines extending to the top and bottom of the box give the minimum and maximum range of values at the specified capability level. It is seen that the mean value of 8th grade Turkish students' science achievement score is in the medium competence level, according to ABIDE 2016.

4.2 Descriptive Statistics Results of Independent Variables

Three categorical and two continuous independent variables were investigated with the purpose of this present study. In this part, students' profile depicts in terms of categorical variables. The descriptive statistics of the student questionnaire items used to obtain continuous variables are also presented.

a) School Type

Table 4.3 provides information about the descriptive statistics of students' SAS according to school type.

Table 4.3

Descriptive Statistics of School Type According to 8th Grade Students' SAS in ABIDE 2016

School Type	N	%	x̄	SS
Imam Hatip Secondary School	327	8.4	500.19	79.10
Public Secondary School	3277	84.3	497.07	87.80
Private Secondary School	179	4.6	575.74	76.20
Regional Secondary Boarding School	105	2.7	471.97	86.14
Total	3888	100		

As seen in Table 4.3, the great percentage of the students studied at governmental secondary schools (95.4%). These schools are imam hatip secondary school (8.4%), public secondary school (84.3%), and regional boarding secondary school (2.7%). However, 4.6% of students studied at private secondary school. Additionally, it is seen that the mean value of the students' science achievement score studying at imam hatip secondary school was ($\bar{x}$= 500.19), public secondary school ($\bar{x}$= 497.07), private secondary school ($\bar{x}$= 575.74), and regional boarding secondary school ($\bar{x}$= 471.97). The students who were studying at private secondary school had the highest SAS mean value and regional boarding secondary school students had the lowest.

b) Mothers' level of education

In this present study, another factor investigated in relation to science achievement is mothers' level of education. Eight choices were presented for this item in the questionnaire. One of the choices was "I do not know" for the students who do not know their mothers' education level" and it was found that 101 students selected this option. Except for that item, descriptive statistics of mothers' level of education according to 8th grade students' SAS is given Table 4.4.

Table 4.4

Descriptive Statistics of Mothers' Level of Education According to 8th Grade Students' SAS in ABIDE 2016

Mothers' level of education	N	%	x̄	SS
Never went to school or left primary school	452	11.9	453.08	84.86
Primary school graduate	1679	44.3	494.81	84.49
Secondary school graduate	776	20.5	494.86	80.28
High school graduate	592	15.6	526.52	80.87
Associate's degree	46	1.2	579.63	83.71
Bachelor's degree	202	5.3	586.31	80.51
Postgraduate degree	40	1.1	561.48	87.12
Total	3787	100		

As clear in Table 4.4, students' mothers who were graduated from primary school had the highest percentage (44.3%), and the lowest percentage was postgraduate degree (1,1%), that is master or PhD. Also, 7.6% of the mother continued to study after graduated from high school. Table also displays that students whose mother had Bachelor degree had the highest mean value in ABIDE 2016 (x̄= 586.31). Although the mean value of scores increase correspondingly to the level of education, there is a decrease in students' score whose mother had a postgraduate degree (x̄= 561.48). Additionally, the students whose mother never went to school or left primary school had the lowest mean value of SAS (x̄= 453.08).

c) Fathers' level of education

Not only mothers' level of education but also fathers' level of education was one of the independent variables of this study. Eight choices were given to students to get information about their fathers' level of education. 93 students who don't know their father level of education and Table 4.5 gives information about descriptive statistics of 8th grade students SAS according to the education level of their fathers.

Table 4.5

Descriptive Statistics of Fathers' Level of Education According to 8th Grade Students' SAS in ABIDE 2016

Fathers' level of education	N	%	x̄	SS
Never went to school or left primary school	138	3.6	451.93	82.04
Primary school graduate	1308	34.5	477.10	84.15
Secondary school graduate	891	23.5	485.98	81.92
High school graduate	960	25.3	518.36	81.17
Associate's degree	109	2.9	559.01	82.81
Bachelor's degree	321	8.5	567.42	79.84
Postgraduate degree	68	1.8	589.81	72.91
Total	3795	100		

As indicated in Table 4.5, the percentage of students' mother and father level of education was similar. 34.5% of the students' father was graduated from primary school, and just 1.8 % had a postgraduate degree such as master or PhD. Additionally, students whose father never went to school or left primary school had the lowest mean value of SAS in ABIDE 2016 ($\bar{x}$= 451.93). It was found that the SAS of students increases as the father education level increases. Therefore, the highest mean value belongs to students whose father had a postgraduate degree ($\bar{x}$=589.81).

d) Interest in science lesson

Interest in science lessons was one of the continuous variables of this study. There were seven items related to interest in science lessons in the questionnaire applied in the ABIDE 2016 study. This variable was produced by using the students' responses to the seven items given in Table 4.6 that is related to interest in science lesson. For the inferential statistics, each student's interest in science lesson factor score was calculated by performing factor analyses.

Table 4.6

Descriptive Statistics of the Questionnaire Related to Interest in Science Lesson of Students' in ABIDE 2016

Interest in Science lesson	SA(5)		A(4)		UD (3)		D(2)		SD (1)		$\bar{x}$
	f	%	f	%	f	%	f	%	f	%	
1. Science and Technology is an important lesson.	2332	62.4	755	20.2	388	9	126	3.4	188	5	4.32
2. Science and Technology is my favorite lesson.	1423	38.1	1109	29.7	609	16.3	262	7	333	8.9	3.81
3. I like go to the black board in Science and Technology lesson.	1704	45.6	922	24.7	550	14.7	231	6.2	332	8.9	3.92
4. I would like to have a job related to Science and Technology.	1365	36.5	883	23.6	713	19.1	279	7.5	499	13.3	3.62
5. I like reading book, journal, article etc. about Science and Technology.	1602	42.8	907	24.3	548	14.7	260	7	422	11.3	3.80
6. I like the games like puzzle, riddle etc. that related to Science and Technology.	1688	45.1	918	24.6	501	13.4	247	6.6	385	10.3	3.88
7. I like watching movies and documentaries about Science and Technology.	1721	46	831	22.2	509	13.6	219	5.9	459	12.3	3.84

Table 4.6 presents frequencies and mean value of the items about interest in science lessons. As clear in the table, the scale was 5 Likert-type ranging from 1 "Strongly disagree (SD)" to 5 "Strongly agree (SA)". The mean value of the items changes from 4.32 to 3.62 over 5. The item which has the highest mean value was ($\bar{x}$=4.32) "Science and Technology is an important lesson.". The item following respectively was "I like go to the black board in Science and Technology lesson." with the mean value ($\bar{x}$= 3.92), "I like the games like puzzle, riddle etc. that related to Science and Technology." ($\bar{x}$= 3.88), "I like watching movies and documentaries about Science and Technology." ($\bar{x}$=3.84), "Science and Technology is my favorite lesson." ($\bar{x}$=3.81)", "I like reading book, journal, article etc. about Science and Technology." ($\bar{x}$=3.80). Lastly, the lowest mean value of the item was ($\bar{x}$=3.62) "I

would like to have a job related to Science and Technology.". Additionally, the median value of each item is 3 and all the items' mean value is more than median value that means 8th grade Turkish students' interest in science lesson is positively high.

e) Self-efficacy toward science

The last continuous variable was self-efficacy toward science in this study. To measure the students' self-efficacy toward science, four items listed below were used in the student questionnaire. The scale was 5 Likert-type ranging from 1 "Strongly disagree (SD)" to 5 "Strongly agree (SA)". Frequency and mean value of the items about self-efficacy toward science are illustrated in Table 4.7.

Table 4.7

Descriptive Statistics of the Questionnaire Related to Self-efficacy toward Science of Students' in ABIDE 2016

Self-Efficacy toward Science	SA(5)		A(4)		UD (3)		D(2)		SD (1)		$\bar{x}$
	f	%	f	%	f	%	f	%	f	%	
1. I learn Science and Technology easily.	1565	41.9	1341	35.9	412	11	203	5.4	218	5.8	4.02
2. I can solve difficult questions about Science and Technology.	1132	30.3	1312	35.1	697	18.6	282	7.5	316	8.5	3.71
3. I am better than my classmates in Science and Technology lesson.	967	25.9	1244	33.3	837	22.4	364	9.7	327	8.7	3.58
4. My teacher says I am good at in Science and Technology.	1291	34.5	1164	31.1	685	18.3	312	8.3	287	7.7	3.76

As shown in Table 4.7, the mean value of the items changes from 4.02 to 3.58 over 5. The item "I learn Science and Technology easily." had the highest mean value ($\bar{x}$=4.02). Respectively, the item follows "My teacher says I am good at in Science and Technology" with a mean value ($\bar{x}$=3.76) and "I can solve difficult questions about Science and Technology." ($\bar{x}$=3.71). The lowest mean value of the item ($\bar{x}$=3.58) was "I am better than my classmates in Science and Technology

lesson.". According to results, all of the items' mean value is higher than the median value, which is 3; therefore, it can be said that 8th grade Turkish students' self-efficacy toward science is high.

4.3 Students' Science Achievement Score According to Their School Type, Mothers' and Fathers' Level of Education in ABIDE 2016

The findings of the second question are presented in this part. The research question was, "What is the difference of Turkish 8th grade students' science achievement according to their school type, mothers' level of education and fathers' level of education with the results of ABIDE 2016?". For analyzing sub-questions of the second research question, one-way ANOVA test was conducted at a significance level of 0.05. Some assumptions were needed to be tested before analyses. Pallant (2007) stated the assumptions of ANOVA, which are independence of observations, random sampling, normality, and homogeneity of variances. The assumptions of ANOVA were tested for three different groups of data.

In order to determine the first assumption, which is the distribution of 8th grade students' SAS according to their school type, mothers' and fathers' level of education, Kolmogorov-Smirnov test was conducted. The statistics are given in Table 4.8.

Table 4.8

Test of Normality Results of 8th Grade Students School Type, Mothers' and Fathers' Education Level According to ABIDE 2016

School Type	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Imam Hatip Secondary School	0.03	327	0.20
Secondary School	0.03	3277	0.00
Private Secondary School	0.04	179	0.20
Regional Boarding Secondary School	0.06	105	0.20

Table 4.8 (Continued)

Mother level of education			
Never went to school or left primary school	0.07	452	0.00
Primary school graduate	0.03	1679	0.00
Secondary school graduate	0.02	776	0.20
High school graduate	0.04	592	0.01
Associate's degree	0.10	46	0.20
Bachelor's degree	0.05	202	0.20
Postgraduate degree	0.11	40	0.20
Father level of education			
Never went to school or left primary school	0.07	138	0.20
Primary school graduate	0.03	1308	0.00
Secondary school graduate	0.04	891	0.00
High school graduate	0.04	960	0.01
Associate's degree	0.08	109	0.06
Bachelor's degree	0.04	321	0.20
Postgraduate degree	0.08	68	0.20

According to Table 4.8, most of the groups' significance level of Kolmogorov-Smirnov test was over 0.05, which means that students' SAS was normally distributed. In order to test whether the groups whose significance level was lower than 0.05 were normally distributed or not, skewness and kurtosis values were controlled. For these groups, skewness and kurtosis values were in the range of [-1, +1] (APPENDIX-B); therefore, it can be said that there were not important deviations from normality (Tabachnick & Fidell, 2013). Overall, it was assumed that all groups' score was normally distributed.

Another assumption is the homogeneity of variances. In order to test this homogeneity Levene's test was applied. Table 4.9 represents the results of Levene's test for all independent variables.

Table 4.9

Levene's Test Statistics of 8th Grade Students School Type, Mothers' and Fathers' Education Level According to ABIDE 2016

Independent Variable	Levene Statistics	df1	df2	Sig.
School type	5.66	3	3884	0.00
Mother level of education	1.54	6	3780	0.16
Father level of education	1.74	6	3788	0.11

Table 4.9 explains whether the variability of scores for each of the groups is similar or not. It was found that Levene's test statistics for mothers' and fathers' level of education was not significant and only students' school type was significant, which means that the variability of scores for school type is not homogeny. However, Morgan, Leech, Gloeckner and Barrett (2004) stated that ANOVA could be preferred since it is a robust analysis when the homogeneity of variances assumption was violated. After conducting ANOVA analyses, it was determined whether there was any difference among groups or not. If there was a difference among groups, post hoc test was performed to see which groups had this difference. Based on Levene's test results, LSD test was used for equal variances, and Tamhane's T2 test was used for unequal variances.

Another assumption is independence observations, which means that one students' score should be observed individually (Morgan et al., 2004). In ABIDE 2016, each student participated in the study individually (MoNE, 2017). Therefore, it was assumed that the observations were statistically independent.

The last assumption is that the data is randomly sampled from the population of interest and measured at the interval level. In the present study, the sample was selected randomly from the sample of ABIDE 2016 study. After all assumptions were examined, ANOVA analyses was conducted and the results of sub-questions are listed below.

In addition to assumptions, in order to examine how effective the independent variable is on the dependent variable, the effect size value, which is eta square (η^2) was also calculated. The effect size takes values between 0.00 and

1.00 and interprets as follows; 0.00≤ η2 <0.06 is small effect size, 0.06≤ η2 <0.14 is a medium effect size, and η2 ≥0.14 is a large effect size (Cohen, 1988).

4.3.1 Students' science achievement score and their school type

To realize the difference between 8th grade students' science achievement score and their school type according to the result of ABIDE 2016, one-way ANOVA results are displayed in Table 4.10.

Table 4.10

ANOVA Results for School Type of Students According to ABIDE 2016

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	1137120.12	3	379040.04	50.58	0.00	0.038
Within Groups	29103964.69	3884	7493.29			
Total	30241084.81	3887				

The results indicated that there is significant difference in terms of students school type with respect to their SAS ($F(3, 3884)= 50.58$, $p=< .05$, $\eta^2= 0.038$). In order to determine the differences among school types, post hoc test was computed. According to Tamhane's T2 test results, there were significant mean differences among all types of school students with respect to their scores obtained from ABIDE 2016 science achievement test except for the difference between imam hatip secondary school and public secondary school. Additionally, the students who were studying at private secondary school have the highest SAS mean value, and regional boarding secondary school students have the lowest score (see Table 4.3).

When the effect size (eta square) value, which shows how effective the independent variable is on the dependent variable, was examined, it was seen that the school type had a small effect size with $\eta^2= 0.038$ on students' ABIDE 2016 science achievement score. The significant difference between science achievement scores may also be due to the sample size.

4.3.2 Students' science achievement score and their mothers' level of education

The results of one-way ANOVA with respect to the 8th grade students' mothers' level of education and science achievement scores were presented in Table 4.11. Also, students who do not know their mothers' education level was executed from the sample.

Table 4.11

ANOVA Results for Mothers' Level of Education According to ABIDE 2016

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	3417253.305	6	569542.21	82.79	0.00	0.116
Within Groups	26002488.64	3780	6878.96			
Total	29419741.95	3786				

Above the table, namely Table 4.11 shows that there is a significant mean difference among students mothers' level of education with respect to their SAS ($F(6, 3780)= 82.79$, $p=< .05$, $\eta^2= 0.116$). To see which education level significantly differ from the other ones, post hoc analysis was performed. LSD test results showed that there was significant difference among all level of education except for primary and secondary school graduated mothers and mothers who have Associate's, Bachelor's or Postgraduate degree. In other words, if the mother graduated from primary and secondary school, students' SAS do not differ statistically. Moreover, there was no significant difference among mothers' who had Associate's, Bachelor's or Postgraduate degrees with respect to students' SAS.

When the effect size (eta square) value, which shows how effective the independent variable is on the dependent variable was examined, it was seen that mothers' level of education had a medium level effect size with $\eta^2= 0.116$ on students' ABIDE 2016 science achievement score.

4.3.3 Students' science achievement score and their fathers' level of education

To determine whether there is a significant difference between students' father level of education with respect to their SAS, one-way ANOVA analysis was conducted, and the results were given in Table 4.12. Also, students who do not know their father education level was executed from the sample.

Table 4.12

ANOVA Results for Fathers' Level of Education According to ABIDE 2016

	Sum of Squares	df	Mean Square	F	Sig.	η^2
Between Groups	3888871.04	6	648145.17	95.87	0.00	0.132
Within Groups	25608484.98	3788	6770.42			
Total	29497356.02	3794				

According to Table 4.12, differences in the education level of fathers were significant with respect to students SAS ($F(6, 3788)= 95.87$, $p=< .05$, $\eta^2= 0.132$). In order to see which education level significantly differs from the other ones, post hoc analysis was performed. Based on the results of LSD test, there was significant mean difference between all levels of education with respect to students' SAS except for those whose father had a degree of Associate's or Bachelor's.

When the effect size (eta square) value, which shows how effective the independent variable is on the dependent variable, was examined, it was seen that fathers' level of education had a medium level effect with $\eta^2= 0.132$ on students' ABIDE 2016 science achievement score.

4.4 Prediction of 8th Grade Students Science Achievement Score According to ABIDE 2016

The findings of the third question are presented in this part. The third research question of the present study is "What is the contribution of students' school type, mothers' and fathers' level of education, interest in science lesson and self-efficacy toward science to the prediction of 8th grade students' achievement in science?". To find the contribution of these variables, Multiple Regression

Analysis was conducted at a significance level of 0.05. The following sections present the preliminary analyses and the results.

4.4.1 Preliminary analyses

In this present study, five independent variables thought to be related to students' science achievement were investigated. One of the independent variables is the school type of students, which is a categorical variable, and these categories are not hierarchical. Because of this reason, "dummy" variables were created for school type. There were four categories related to school type; therefore, three dummy variables were created. Public secondary school which had the highest frequency was determined as the reference group. First dummy variable was coded "ST1" and related to imam hatip secondary school, second dummy variable was coded "ST2" and related to private secondary school, and last dummy variable was coded "ST3" and related to regional boarding secondary school. Also, some abbreviations were used, such as "MEL" for mothers' level of education and "FEL" for fathers' level of education. Moreover, the data of a student who signed "I don't know" for their mothers' and fathers' level of education were excluded from the data set while analyzing for this question.

After organizing data set, there are several assumptions needed to be considered. Absence of outliers both dependent and independent variables, independence of residuals, linearity, absence of multicollinearity and singularity, homoscedasticity of residuals, normality, and ratio of cases to independent variables are the assumptions of multiple regression analysis that were controlled and the results are presented below. Besides, missing data analysis is displayed.

4.4.1.1 Analysis of missing data

There was some missing data in the data set of ABIDE 2016, since it's a survey study. Because of that, the sample of the study also includes some missing data. To handle missing data firstly, data cleaning was done before the research questions were analyzed. Students who had no data of science achievement score, school type, mothers' and fathers' education level were excluded from the sample. Secondly, the missing values were analyzed and it was determined that the

percentage of missing values were under 5%. If the number of missing data is extremely small (less than 5% of the total number of cases) and these values are considered to be randomly missing data. Hence, these values may be omitted from the sample (Tabachnick & Fidell, 2013). Therefore, these missing values were deleted from the data set.

4.4.1.2 Analysis of outlier

One of the important assumptions is outliers, which affect the result of multiple regression analysis. In detail, outliers are very low or very high scores that can arise while the researchers are entering the data, the participants in the sample can be the member of the population or different from the rest of the sample (Tabachnick & Fidell, 2013). To handle the presence of outliers in the sample, extreme values in the data set were also omitted at first. The raw science achievement scores were transformed to the standard Z scores and values outside the [-3.3, +3.3] range was defined as an outlier and deleted from the data set (Tabachnick & Fidell, 2013). Later, Mahalanobis distances were examined on the independent variables. To identify the outliers in the present study, the critical value of chi-square was determined which is 24.32 for df=7 and $p < .001$. By looking this critical value, there were 25 cases determined as potential outliers. For this reason, Cook's distance of these cases was examined, and it was found that all cases were in the range of [0, 0.01], which are not higher than +1. Moreover, the standardized residuals also showed that there were no outliers because the range of standardized residuals was from -2.89 to 3.19. According the Tabachnick & Fidell (2013), the acceptable range is [-3.3, +3.3]. All in all, in the light of these findings, it was decided that there were no outliers among the independent variables.

4.4.1.3 Linearity, normality, and homoscedasticity of residuals

In order to examine the assumption of linearity, normality, and homoscedasticity of residuals, the scatterplot given below was investigated (Pallant, 2007).

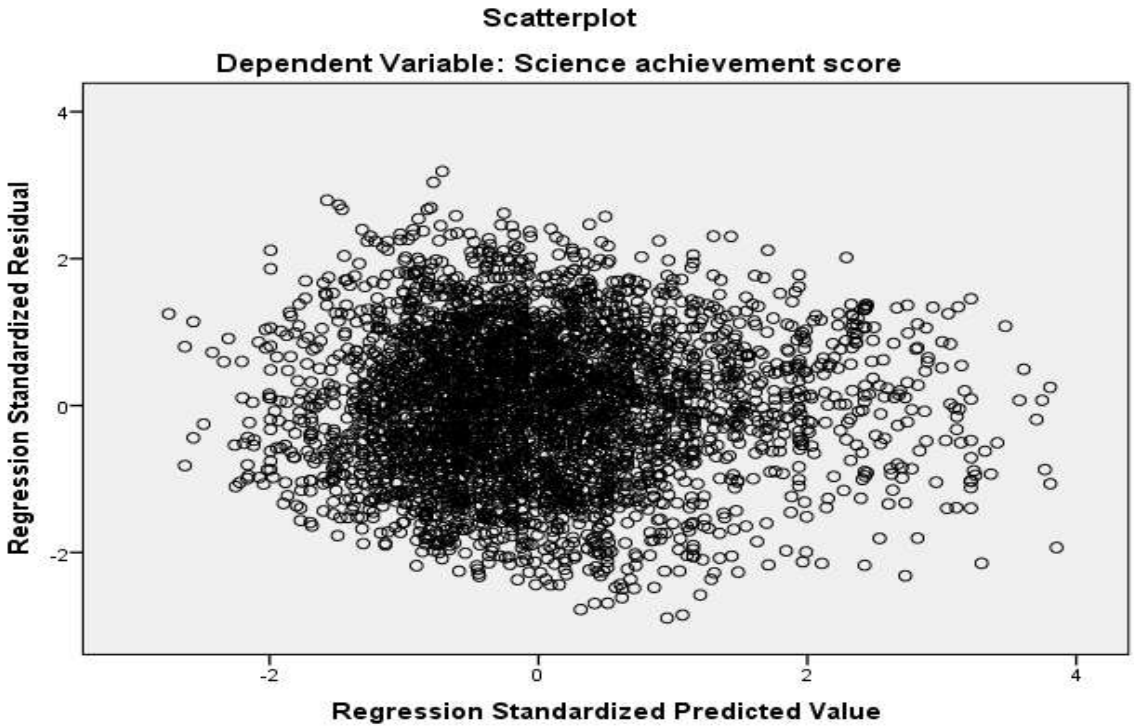

Figure 4. Regression Standardized Residual vs. Regression Standardized Predicted Value

As clear in Figure 4, the assumptions related to linearity, normality, and homoscedasticity of residuals were met. According to scatter plot, the distribution of residuals is normal around the predicted dependent variables scores, the relationship between residuals and predicted dependent variables scores are linear, and variability of residuals are nearly equivalent for all predicted dependent variables scores.

4.4.1.4 Multicollinearity and singularity

Another critical assumption is multicollinearity and singularity, which influence the multiple regression analysis and cause logical and statistical problems (Tabachnick & Fidell, 2013). In order to examine whether there is a multicollinearity problem or not among variables, the bivariate correlation among independent variables can be examined or Tolerance, VIF, and CI values can be controlled. In this present study, not only correlation but also collinearity statistics were examined.

Firstly, the bivariate correlation among variables was computed. The value of correlation should be smaller than 0.90, which shows there is no multicollinearity problem (Büyüköztürk, 2018). In other words, there should not be high-level relationships between the independent variables. The correlation values among variables are shown in Table 4.13.

Table 4.13

Correlation among Variables

	SAS	ST1	ST2	ST3	MEL	FEL	Interest	Self-efficacy
SAS	1							
ST1	-0.03**	1						
ST2	0.19**	-0.07**	1					
ST3	-0.04**	-0.05**	-0.04*	1				
MEL	0.32**	0.00	0.33**	-0.09**	1			
FEL	0.36**	0.01	0.30**	-0.07**	0.62**	1		
Interest	0.16**	-0.02	0.00	0.05**	0.03*	0.04**	1	
Self-efficacy	0.23**	-0.03*	0.05**	0.02	0.08**	0.12**	0.64**	1

**Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

(***Note.***SAS: Science Achievement Score, ST1: Imam Hatip Secondary School, ST2: Private Secondary School, ST3: Regional Boarding Secondary School, MEL: Mother Level of Education, FEL: Father Level of Education, Interest: Interest in Science Lesson, Self-efficacy: Self-efficacy toward Science)

As seen in Table 4.13, there was a low correlation between independent variables, which indicates that these variables can be included in the regression analysis. Secondly, Tolerance, VIF, and CI values were examined. If the Tolerance value is less than 0.10, VIF value is greater than 10 and CI value is greater than 30, there is a multicollinearity problem (Tabachnick & Fidell, 2013). In this present study, the range of Tolerance values was from 0.59 to 0.99, VIF values were from 1.01 to 1.70 and CI values were from 1 to 7.11. By looking at these findings, the absence of multicollinearity was supported.

4.4.1.5 Independence of residuals

In order to conduct multiple regression analysis, independence of residuals was also examined by looking Durbin-Watson statistic. According to the values, it is seen that residuals are independent of each other, as the values between 1.5 and 2.5. In this present study, the value of Durbin-Watson statistic was 1.95, which is in the acceptable range.

4.4.1.6 Ratio of cases to independent variables

Before conducting multiple regression analysis determining a sufficient sample size should be considered. According to Tabachnick & Fidell (2013), the minimum sample size was calculated by this formula: $N > 50 + 8m$ (where m = number of independent variables). In this current study, 7 independent variables were investigated, and the minimum sample size should be at least 106 with respect to formula. Hence, the sample of this study was 3789, this assumption was also handled.

To summarize, the assumptions of the multiple regression analysis were examined in detail, and all of them were satisfied.

4.4.2 Multiple linear regression analysis

To find the answer to the third question and to see how students' school type, mothers' and fathers' level of education, interest in science lesson, and self-efficacy toward science contribute to the prediction of their science achievement, multiple regression analysis was conducted. The results of the analysis are given in Table 4.14.

Table 4.14

The Result of the Multiple Regression Analysis According to ABIDE 2016

	B	Std.Error	β	t	Sig.
Constant	427.23	3.67		116.39	0.00
ST1	1.19	4.70	0.00	0.25	0.80
ST2	29.89	6.65	0.07	4.49	0.00

Table 4.14 *(Continued)*

ST3	-9.25	8.25	-0.02	-1.12	0.26
MEL	9.24	1.31	0.14	7.07	0.00
FEL	14.87	1.23	0.23	12.07	0.00
Interest in science lesson	4.22	1.69	0.05	2.50	0.01
Self-efficacy toward science	13.96	1.70	0.16	8.21	0.00
R=0.429			R^2= 0.184		
$F_{(7, 3731)=}$120.36			p=0.00		

(***Note***.SAS: Science Achievement Score, ST1: Imam Hatip Secondary School, ST2: Private Secondary School, ST3: Regional Boarding Secondary School, MEL: Mother Level of Education, FEL: Father Level of Education)

According to the results of analyses, the F value of the regression equation was found to be significant (F(7, 3731) =120.36, p < .01), which means that the regression equation is significant. It was found that studying at a private school instead of a public secondary school (ST2), mother and father level of education, interest in science lesson and self-efficacy toward science explained 18.4% of the variance in the students' science achievement score (R=0.43, R^2=0.18, p < .01).

By looking the standardized regression coefficient (β) in Table 4.14, the relative importance of predicted variables in the students' science achievement is father level of education (β=0.23, p<0.05), self-efficacy toward science (β=0.16, p<0,05), mother level of education (β=0.14, p<0,05), studying at a private school instead of a public secondary school (β=0.07, p<0.05), interest in science lesson (β=0.05, p<0.05), studying at a regional boarding secondary school instead of a public secondary school (β=-0.02, p<0.05) and studying at a imam hatip secondary school instead of a public secondary school (β=0.00, p<0.05). However, studying at a regional boarding secondary school or imam hatip secondary school instead of a public secondary school was not statistically significant.

With respect to β coefficient, fathers' level of education had the highest value, which means that it had the strongest contribution to the prediction of students' science achievement score. This is followed by secondly self-efficacy toward science and thirdly mothers' level of education. Although studying at a private secondary school instead of a public secondary school and interest in

science lessons had contribution to explaining dependent variable, this contribution was not as strong as the rest of the variables. Moreover, the contribution of all the independent variables to the prediction of 8th grade students' science achievement score was positive, except for those studying at a regional boarding school instead of a secondary school.

According to the results of multiple regression analysis, the regression equation for predicting science achievement score is given below.

Y= **427.23** + **29.89*** (ST2) + **14.87*** (FEL) + **13.96*** (Self-efficacy) + **9.24***(MEL) + **4.22*** (Interest)

4.5 Summary of the Results

In this current study, at first 8th grade students' science competence level was determined according to the result of ABIDE 2016. Secondly, five independent variables thought to be related to 8th grade students' science achievement scores were investigated in ABIDE 2016. Thirdly, it was examined whether science achievement score differs with students' school type, mothers' and fathers' level of education by conduction of ANOVA. Lastly, the contribution of school type, mothers' and fathers' level of education, interest in science lessons and self-efficacy toward science was investigated to predict science achievement scores of 8th grade students. The results of this study can be summarized as follows:

- The science competence level of 8th grade students, according to their science achievement score in ABIDE 2016 was at the medium level.
- 8th grade students' science achievement score in ABIDE 2016 differed with their school type, mothers' and fathers' level of education.
- Father level of education, self-efficacy toward science, mother level of education, studying at a private secondary school instead of a public secondary school and interest in science lesson significantly contributed to the prediction of 8th grade students' science achievement score in ABIDE 2016.

- Father level of education had the strongest contribution to the prediction of students' science achievement score in ABIDE 2016.
- Interest in science lessons had the lowest contribution to the prediction of students' science achievement scores in ABIDE 2016.

CHAPTER 5

CONCLUSION, DISCUSSION AND IMPLICATIONS

This chapter of the study begins with the summary of the research then continues with the conclusion and discussion. In addition, implications and recommendations for further studies are given place.

5.1 Summary of the Research Study

The present study is a correlational research having the purpose of investigating the factors which are taught to be related to the 8th grade students' science achievement with respect to the result of ABIDE 2016. The factors were determined as students' school type, their mothers' and fathers' level of education, interest in science lesson, and self-efficacy toward science. For this purpose, the data of the study were obtained from one of the department of Ministry of National Education which is Data Analysis, Monitoring and Evaluation Department of the General Directorate of Measurement, Assessment and Examination Services. Science achievement test scores of the students and selected items from the student questionnaire were used as instruments of the current study. Firstly, 8th grade students' science competence level was identified according to ABIDE report, and it was found that the mean value of students' science achievement score was at the medium level. Secondly, to examine whether students' science achievement score differs with their school type, mothers' and fathers' level of education, one-way ANOVA was conducted. Results revealed that students' science achievement scores significantly differentiated with respect to their school type, mothers' and fathers' level of education. Lastly, to investigate the contribution of school type, mothers' and fathers' level of education, interest in science lesson, and self-efficacy toward science on students' science achievement score, multiple regression analysis was conducted. Results showed that studying at a private secondary school instead of a public secondary school, mothers' and fathers' level

of education, interest in science lesson, and self-efficacy toward science significantly and positively contributed to the prediction of 8th grade students' science achievement score in ABIDE 2016. The fathers' level of education appeared as the best predictor of the science achievement and interest in science lessons had the lowest contribution to the prediction of students' science achievement scores in ABIDE 2016.

5.2 Conclusion and Discussion

The findings of the current study and discussion in line with the previous studies were presented in this section.

5.2.1 Science competence levels of students

In the current study, the percentage of the science competence levels of the 8th grade students was examined according to the result of ABIDE 2016 study. It was found that 1.5% of the students are at fundamental low level, 25.2% of them are at fundamental level, 29.7% of them are at medium level, 21% of them are at medium high level, and 22.6 % of them are at advanced level. Also, the mean score of the 8th grade students is at the middle level. These levels were determined by MoNE in accordance with ABIDE study. The competencies of students at this level are given below:

Students will be able to:

- Express the definition of some basic concepts related to science and know the process or tasks of some.
- Explain the function of most organs related to the human body.
- Explain the process of most basic physical events.
- Know the names of most natural phenomena and the process of some of them.
- Interpret the changes in the process of natural phenomena.
- Make comparisons between information/data which is close to each other.
- Interpret tables and graphs created with simple data (MoNE, 2017).

5.2.2 Students' science achievement in relation to school type

When the 8th grade students' science achievement score was examined in terms of their school type (imam hatip, private, regional boarding and public secondary schools), it was found that students' science achievement scores significantly differentiated in accordance with their school type except for imam hatip secondary schools and public secondary schools. The current study supported the findings of the related large-scale exams such as PISA. According to the last national PISA report, considering the average science literacy and mathematics scores of the different types of schools in Turkey, in the past years also encountered, it appears that serious differences still persist among schools (MoNE, 2016b). For each PISA project that Turkey participated in since 2003, not only students' science literacy mean score but also mathematics mean score differed highly with respect to their school types. To realize the source of differences in the mean score of the students, it was calculated that how much of the variance of students' achievement score stems from the difference among schools. This means that, it is an indication of how similar the schools in that country are for providing students with the skills in a particular field (eg. science). It was found that the rate of inter-school variation in science literacy and mathematics scores in Turkey was higher than the OECD rate for PISA 2003, 2006, 2009 and 2015(MoNE 2005b; 2010a; 2010b; 2013; 2016b). For instance, according to students' mathematics mean scores, the low variance rate in Finland due to the difference between schools indicates that different schools in the country offer almost the same learning opportunities. On the contrary, the high variance rate in Turkey displays that some schools are far behind others with respect to academic achievement of students (MoNE, 2013).

According to this current study, one of the important results of the multiple regression analysis was that studying at a private secondary school instead of public secondary school was predicted the 8th grade students' science achievement score significantly and positively. Moreover, there was a significant mean difference in science achievement scores of public secondary schools and private

secondary schools. When 8th grade national reports of TIMSS study were examined, the results of the current study related to school types with respect to the 8th grade students' science achievement in ABİDĒ 2016, were also in the same line with findings of the TIMSS, which is one of the international large-scale assessment project that Turkey attends. The differentiation of students' science and mathematics scores with respect to their school types was addressed by identifying the schools' economic level and sources (MoNE, 2011; 2014). It was reported that the 8th grade students who were studying at a school whose economic level was in the low level and the educational sources were insufficient, had lower mean score of science and mathematics achievement than the students who were studying with the opposite conditions (MoNE, 2011; 2014). This means that when one of the school types has better conditions, that affects student' academic achievement scores positevely. One point to be noted that it is also known that private schools provide good quality education and have enough quality of sources than public secondary schools in Turkey (Kalender, 2004). Therefore, this was an expected result.

The findings of the current study were also supported by researches conducted in Turkey. Özbay (2015) indicated that not only students' science achievement (Berberoğlu & Kalender, 2005), but also mathematics (Alacacı & Erbaş, 2010) and literacy achievement (Yıldırım, 2012; Şengül, 2011) of the students differed because of the different types of school that they attended. Moreover, Çavuşoğlu, Şen, Uçar & Uçar (2013) found that the type of school that students attend is effective to the achievement in favor of private schools. Furthermore, studies in United States of America (Coleman & Hoffer, 1987; Lubienski, 2001, 2003), United Kingdom (Archer, 1984; Thorpe, 2006; Jones, Pampaka, Swain & Skyrme, 2017), Australia and Spain (Delprato & Chudgar, 2018) and Indonesia (Newhouse & Beegle, 2005) were supported that the school type does make a significant difference on students' academic achievement.

On the other hand, there were limited research results contradict with the studies reporting a significant difference between public and private schools

favoring private school students. Goldhaber (1996) in the USA, Reçber (2011) in Turkey and Kim (2018) in South Korea found no significant achievement advantage in private schools. There are many reasons behind the difference in students' science achievement in terms of school types such as socioeconomic level of the students, teacher quality and educational sources; therefore, different types of schools provide different educational opportunities. For instance, as it mentioned previously, regional boarding secondary schools are opened in low socioeconomic regions; on the contrary, there is a fee to be paid to study at a private secondary school. Chubb and Moe (1990) and Coleman (1997) claimed that public schools are considered as input-oriented organizations and responsible for bureaucracies, not for consumers. Thus, public schools do not have structural incentives to innovate, develop, or respond to demands for quality from the groups that they serve. In contrast, private schools are viewed as free of the bureaucracy and regulation that prevent performance in the public sector. Therefore, it is not surprising to find a relationship between school type and science achievement.

5.2.3 Students' science achievement in relation to mothers' and fathers' level of education

According to the findings of the current study, it was found that the 8th grade students' science achievement score were differed not only the education level of mothers' but also fathers' level of education. Furthermore, in spite of the fact that the results of multiple regression analysis display that both of their contribution to the prediction of science achievement scores were positively significant, the fathers' level of education had stronger contribution than mothers'.

The related literature shows that 8th grade students' science achievement score changed in a positive way according to the education level of their parents. The research conducted by using PISA and TIMSS data are supported the results of the current study. Boztunç (2010) stated that by using the PISA 2003 and 2006 data, not only students' science achievement scores but also mathematics scores differed with respect to their parents' education level. Moreover, it was found that there is a strong positive correlation between students' science and mathematics

scores and mothers' and fathers' level of education (Thomson, Lokan, Lamb & Ainley, 2003; Dursun & Dede, 2004; Şaşmazel, 2006; Özer, 2009; Pektaş, 2010; Oral & McGivney, 2013; Erdoğdu & Erdoğdu, 2014) which shows that when the parents' education levels are getting in higher level, students' science and mathematics score increase.

Although the literature on parents' education, TIMSS and PISA reports show that the direct, positive influence of parents' education level on academic achievement (Kohn, 1963; Luster, Rhoades, & Haas, 1989; Jimerson, Egeland, & Teo, 1999; MoNE, 2003; 2010b; 2011; 2014; 2016a), Magnuson (2007), Dinçer and Uysal Kolaşin (2009) and Abosede and Akintola (2016) stated that mothers with high educational level are not prerequisites for students' academic achievement. On the other hand, according to research result of Dinçer and Uysal Kolaşin (2009), Anıl (2009), Karabay (2012), Abazaoğlu (2014) and Çeçen (2015), well - educated fathers' children have higher science achievement score.

The relationship also gives some evidence that fathers'level of education and income are significant predictors of academic achievement (Davis-Kean, 2005). It can be said that parents with high educational level allow more career opportunities for students, have a high socioeconomic level and have more resources at home (MoNE, 2010b); therefore, the fathers' education level of the students' has an important role in increasing students' science achievement score. As can be seen, studies conducted on this subject support the finding of the current study that father's education level is a variable that makes a greater difference on student's science achievement score rather than mothers' education level. In another study, Ademola and Olajumo (2009) showed that higher educated parents are more helpful to their children; hence students' achievement increase in Nigeria.

To sum up, according to the current findings and literature, it is not possible to underestimate the roles of mothers' and fathers' education level in academic achievement, especially science achievement, therefore, to upbringing of the future scientist, parents' education level has an important variable.

5.2.4 Students' science achievement in relation to interest in science lesson

The relationship between science achievement and one of the attitudinal constructs, which is interest in science lesson, was investigated in this current study. The findings show that 8th grade students' interest in science lessons was one of the significant predictors on their science achievement scores however, it was not a powerful predictor of science achievement in multiple regression analysis. Many researches having been investigated to find the relationship between interest in science lesson and science achievement (Adeyinka, Adedeji & Sam Olufemi, 2011; Akın, Uğur & Akın, 2015; Chang & Cheng, 2008; Demirci, 2018; Fishman & Pasanella, 1960; Grabau & Ma, 2017; Hulleman & Harackiewicz, 2009; Lavin, 1965; Trost,1975; Oliver & Simpson, 1988; 1990; Reynolds & Walberg, 1992; Singh, Granville & Dika, 2002; Thorndike-Christ, 1991; Tucker-Drop, Cheung & Briley, 2014). For example, Grabau and Ma (2017) indicated that there is a positive correlation between interest in science and science achievement by examining PISA 2006 data in the United States. Similarly, Demirci (2018) also find the same correlation in Turkey context by investigating PISA 2015 data in Turkey.

This result of the current study is in congruence with the findings of the various studies in the related literature. Oliver and Simpson (1990) investigated students' interest in science and their ability to succeed in science with a longitudinal study from the grade level of 6 to 10. It was reported that the relationship peaks in the ninth grade and at the tenth grade science interest becomes a strong predictor of science achievement in high school in USA. Furthermore, Chang and Cheng (2008) explored that there is a statistical correlation existed between high school students' interest in science score and science achievement with a moderate effect size in Taiwan. The result of the study also shows that students with a higher interest in science had higher science achievement score than those with a lower interest in science. Additionally, according to the TIMSS 2015 report, it was indicated that the science achievement mean score of 4th and 8th grade students who are interested in science lessons are higher than the students

who are not interested in science lesson. This result is also consistent with the result of TIMSS 2011(MoNE, 2014; 2016a).

Despite the majority of the researches, which were remarked a positive relationship between interest in science lesson and science achievement, the result of the PISA 2015 was not supported the result of current study. In the PISA 2015 report, when the affective behaviors of students were investigated in relation to science literacy, it was found that students' science interest and motivation levels were higher than the OECD average in Turkey. Additionally, generally students enjoy science lessons, want to have a job related to science, and they see themselves as more adequate than the OECD mean in the field of science. However, it is also shown that students' science achievement scores are lower that the OECD mean. In other words, in spite of the fact that students generally have a positive attitude toward science, their science achievement is low (MoNE, 2015).

Finally, considering the findings of the current study and available literature, it is important to consider the role of interest in science lessons on predicting the achievement score of 8^{th} grade students. It can be said that individuals' own motivation, learning, expectations of success in science also determine their interest in lessons. Thus, taking the attention of students to science lesson, instruction and planning process and increasing their motivational beliefs can make important contributions to the students' science achievements.

5.2.5 Students' science achievement in relation to self-efficacy

In the current study, according to the result of multiple regression analysis, one of the significant predictors of students' science achievement scores found is self-efficacy toward science. This finding is parallel to the findings in the literature which are investigating academic achievement in relation to self-efficacy (Lightsey, 1999; Deci & Ryan, 2008; Caprara, Vecchione, Alessandri, Gerbino & Barbaranelli, 2011; Trautwein, Marsh, Nagengast, Lüdtke, Nagy & Jonkmann, 2012; Komarraju & Nadler, 2013). For instance, Caprara et al. (2011) examined the relationship between self-efficacy and academic achievement of students at different levels, and as a result of the study, it was concluded that there was a

positive relationship between self-efficacy and academic achievement of students up to the age of 16 years.

Additionally, in a recent study conducted by Wang, Liang and Tsai (2018), it was determined that the self-efficacy of US students increased their academic achievement. Furthermore, according to the TIMSS reports in every study that Turkey participated in since 1999, students who have higher self-efficacy are more likely to get higher scores in science achievement. It was seen that the findings obtained from each TIMSS study applications are consistent (MoNE, 2003; 2010b; 2011; 2014; 2016a).

Although majority of the studies in the literature indicated that self-efficacy toward science is the best predictor of the science achievement, in this current study self-efficacy toward science appeared as a second predictor of the science achievement among the variables which are students' school type, mothers' and fathers' level of education and interest in science lesson (Pintrich & De Groot, 1990; Metallidou & Vlachou, 2007; Yerdelen, 2013). However, Uğraş (2018) found that students' science achievements were significantly predicted by students' motivation and science self-efficacy beliefs and explain about half of the total variance regarding their science achievements and it was reported that self-efficacy toward science was the second predictor of the study.

Consequently, according to the literature, students with high self-efficacy usually show more resistance and make more effort on the lessons upon facing the difficulties (Pintrich & Schunk, 2002; Zimmerman & Schunk, 2006; Schunk & Mullen, 2012). In other words, when the students believe that they have failed in science lessons, they feel desperate, and their science achievement scores decrease (MoNE, 2003). In this relation, it is important to see how affective domain behaviors affect science achievement.

5.3 Implications

The results of this study might have some significant implications to educational policymakers, teachers, and families regarding the school type, parents' level of education, interest in science lessons, self-efficacy toward science and achievement in science of the 8th grade students in Turkey through ABIDE 2016. Thus, this research may provide suggestions to increase science achievement in Turkey. One of the critical targets of educational policy is maximizing science achievement and implications can be considered in to compete in the national and international economic and technological area (Tucker-Drop et al., 2014).

In this current study, it was found that the mean value of the 8th grade students' science achievement score is at the medium level. Furthermore, students' science achievement score differs with their school type and studying at a private secondary school instead of a public secondary school significantly and positively contributed to the prediction of the 8th grade students' science achievement scores in ABIDE 2016. In other words, students' science achievement score can change with respect to the school that they attend. It could be because of the socioeconomic level of the students, teachers' qualities and educational sources; therefore, different types of schools provide different educational opportunities. Thus, the school based variables that affect students' science achievement scores could be examined and educational policymakers make regulations to decrease these achievement differences by providing equal opportunity and possibility to the students.

Parents' level of education should also be regarded because in the current study, it was found that students' science achievement score differentiated with respect to their mothers' and fathers' level of education. Moreover, both of them were the significant predictors of science achievement and the fathers' level of education was the best predictor among variables. Students' first education and training environment is their families. Parents have a vital role in growing up future scientists by arranging study environment homes, suggesting books, providing educational opportunities and socioeconomic levels. For this reason, studies on

adult education, parent education, cooperation between the school and family can be carried out to increase the education level of parents.

Based on the results of the current study, attitudinal constructs like self-efficacy toward science and interest in science lessons are significant predictors of science achievement score of the 8th grade students in Turkey. To be more detailed, students with high self-efficacy and interest in science show better academic performance with respect to the others with low self-efficacy and low interest in science. Indeed, self-efficacy toward science is a better predictor than interest in science. The decrease in interest in science is seen as a long-term problem that may affect the opportunities and choice of profession related to the learning of science in the future (Osborne & Collins, 2000). Mcphail, Pierson, Freeman, Goodman and Ayappa (2000) emphasize that while developing secondary school curriculum in order to protect students' interest in science during secondary school, the development level and interests of students should be taken into consideration. Therefore, curriculum and teacher awareness education are important to protect and increase students' interest in science lesson so as to enhance science achievement. So, the science curriculum should design in terms of enhancing interest in science lesson. Also, teachers should find the ways to stimulate students' interest and providing in-service training for teachers may help. The lower level of interest of young students' threats origination of the next generation scientist and also prevents becoming a scientifically literate citizen of students.

Moreover, it is claimed that individuals' self-efficacy level could be developed by a task masters, social support, and emotional somatic states (Bandura, 1994). Therefore, science teachers should implement different educational methods, guide students how to evaluate their own performance in the science activities, try to create learning materials and activities in science classrooms, and frequently encourage students to feel themselves as successful. Additionally, social supports like teachers', parents' or classmates' verbal encouragements can help the students improve their self-efficacy level. Therefore,

to increase students' science achievement, in-service training related to increasing self- efficacy of students' programmes should be prepared for the teachers.

5.4 Recommendations for Further Research

According to the findings of this study, there are some recommendations that can be suggested for further studies. ABIDE 2016 study can serve rich data set for the researchers since questionnaires containing many variables were applied to students, teachers, and school administrators so as to evaluate the academic achievement of the students as a whole. In order to better define the achievement of the students in science, studies can be done about the variables that were not used in this study. For instance, other characteristics that affect students' science achievement (class, school and family characteristics, etc.) can be examined separately within the scope of ABIDE 2016 study. Furthermore, by using ABIDE 2016 data, other factors that are thought to affect the achievement of science can be revealed as a model and advanced statistical techniques can be conducted such as structural equation modeling or hierarchical linear modeling.

Although this study focused on science achievement of the 8th grade students, students' achievements in mathematics, social studies and Turkish lessons were also measured in the ABIDE 2016 study. Thus, the variables that were examined in the current study can also be investigated for the 8^{th} grade students' achievement in mathematics, social studies and Turkish lessons. With such a study, the relationship among the same variables and students' achievement in different courses can be revealed.

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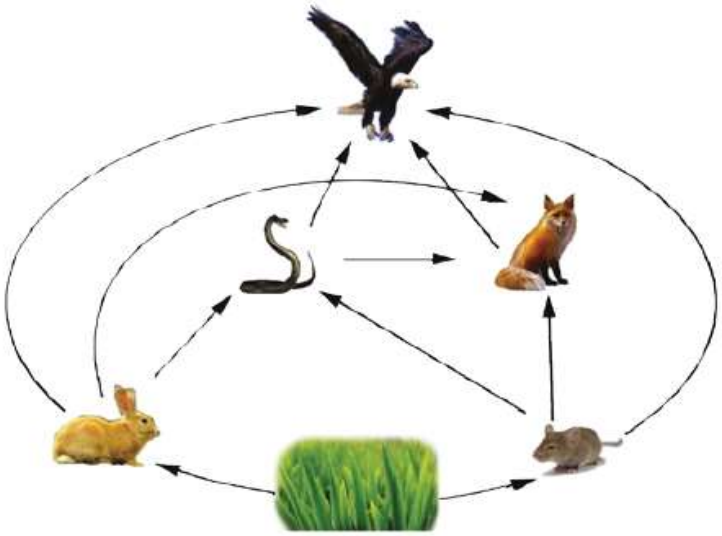
APPENDICES

APPENDIX A: QUESTION EXAMPLES AND RUBRICS

Example 1

BESİN AĞI

Bir bölgedeki besin ağı şekilde verilmiştir.



Bu besin ağının bulunduğu bölgede, insanların bilinçsiz avlanması nedeniyle yılan, tilki ve kartalların sayısı azalmıştır.

6 - 7. soruları yukarıda verilen bilgilere göre yanıtlayınız.

6. **Bu bölgedeki otsu bitki, tavşan ve tarla farelerinin sayılarında zamanla nasıl bir değişim olması beklenir?**

A) Otsu bitkiler artarken tarla faresi ile tavşan sayısının azalması.
B) Otsu bitkiler artarken tarla faresi ile tavşan sayısının değişmemesi.
C) Tarla faresi ile tavşan sayısı artarken otsu bitkilerin sayısının azalması.
D) Tarla faresi ile tavşan sayısı artarken otsu bitkilerin sayısının değişmemesi.

7. **Bilinçsiz avlanma dışında besin ağındaki tüm canlıların sayısının azalmasına neden olabilecek etkenler neler olabilir? Yazınız.**

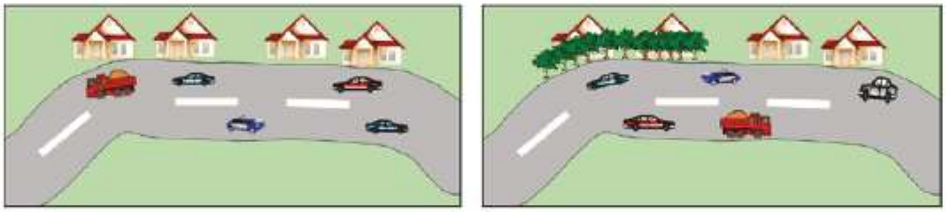
"BESİN AĞI" Bağlamına Ait Puanlama Anahtarı

Soru No:	**6**
Soru Kodu:	**F-2016-0006**
Bağlam Adı:	**BESİN AĞI**
Doğru Yanıt	**C**

Soru No	**7**
Soru Kodu	**F-2016-0007**
Bağlam Adı	**BESİN AĞI**
DOĞRU YANIT- (1 PUAN) Açıklama	• Ekosistemi ya da yaşama birliğini bilinçsiz avlanma dışında olumsuz etkileyebilecek faktörlerden en az birine vurgu yapan yanıtlar.
	• Besin ağındaki tüm canlıların sayısının azalmasını besin ağının başındaki üretici canlının sayısındaki azalma ile ilişkilendirerek açıklayan yanıtlar.
Örnek Yanıtlar	Ortamda zehirli madde birikimi
	Ortamda atık madde birikimi
	Besin zincirine yeni bir canlının eklenmesi
	Salgın hastalıklar
	Doğal afetlerle üretici canlıların yok olması (Yangın, sel, asit yağmuru, deprem vb.)
	İnsanların avlanma dışında üretici canlılara zarar vermesi (Anız yakmak gibi)
	Otların azalması
	Doğal afetler
	Çevre kirliliği
YANLIŞ YANIT- (0 Puan) Açıklama	İlgisiz ve yanlış yanıtlar.
Örnek yanıtlar	Bilinçsiz avlanma
BOŞ (-1 puan) Açıklama	Cevap kâğıdında soruya ilişkin alanda hiçbir karalamanın ya da işaretlemenin olmadığı yani alanın tamamen boş olduğu durumlar.

Example 2

Uzmanlar, trafik yoğunluğunun fazla olduğu bir yerde evlere giren toz kirliliğini azaltmanın yolları ile ilgili bir hipotez kurmuşlardır. Bunu araştırmak için görseldeki bölgede bir proje gerçekleştirmişlerdir.



Proje, aynı cadde üzerinde bulunan evlerde gerçekleştirilmiştir. Bu evlerdeki eşya yüzeyleri manyetik bir bezle silinerek dışarıdan eve giren toz kirliliğinin ölçümü yapılmış ve hepsinde kirliliğin aynı olduğu gözlenmiştir. Bu evlerin bir kısmının önüne bol yapraklı kayın ağacı fidanları dikilmiştir. Daha sonra bu evlerde toz kirliliğinin ölçümü bir kez daha yapılmıştır. Önüne ağaç dikilen evlerde manyetik bezin %50 daha az kirlendiği, diğer evlerde ise kirlilik oranında bir değişme olmadığı görülmüştür. Proje başarılı olmuştur.

10 - 11. soruları yukarıda verilen bilgilere göre yanıtlayınız.

10. Bu projede kayın ağacı, hangi özelliğinden dolayı tercih edilmiştir?

A) Nemli toprağı sevmesi
B) Kışın yapraklarını dökmesi
C) Gövdesinin kaygan ve gri renkli olması
D) Yapraklarının tüylü ve pürüzlü olması

11. Bu projenin hipotezi veya araştırma sorusu nedir? Bir cümleyle yazınız.

"KAYIN AĞACI" Bağlamına Ait Puanlama Anahtarı

Soru No	10
Soru Kodu	F-2016-0010
Bağlam Adı	KAYIN AĞACI
Doğru Yanıt	D

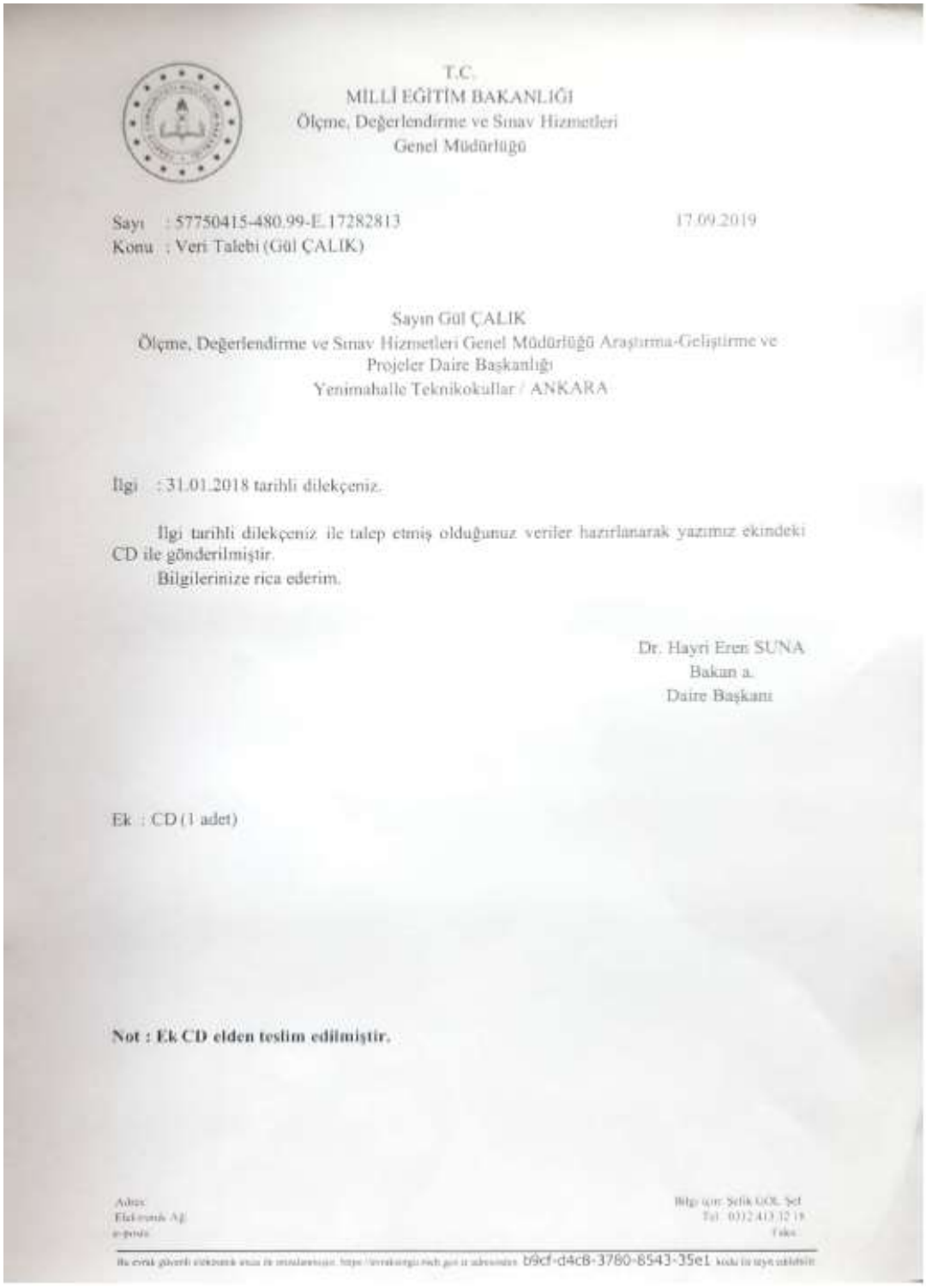
Soru No	**7**
11	**F-2016-0007**
Soru Kodu	**F-2016-0011**
DOĞRU YANIT- (1 Puan) Açıklama	Kayın ağacının toz kirliliğini azalttığına yönelik hipotez cümlesi ya da araştırma sorusunu içeren yanıtlar.
Örnek Yanıtlar	Ağaçlar sayesinde toz kirliliğini azaltabiliriz.
	Kayın ağacı toz kirliliğini önler mi?
Örnek Yanıtlar	Kayın ağacının yaprakları havadaki kirlilik maddelerini tutar mı?
	Kayın ağacının yaprakları manyetik bezdeki toz miktarını azaltır mı?
	Kayın ağacının yaprakları havadaki kirlilik yapan maddeleri tutar.
	Kayın ağacının yaprakları manyetik bezdeki toz miktarını azaltır.
YANLIŞ YANIT- (0 Puan) Açıklama	İlgisiz ve yanlış yanıtlar.
Örnek Yanıtlar	Yollardan evlere fazla miktarda toz girmesi
BOŞ (-1 puan) Açıklama	Cevap kağıdında soruya ilişkin alanda hiçbir karalamanın ya da işaretlemenin olmadığı yani alanın tamamen boş olduğu durumlar.

APPENDIX B: SKEWNESS AND KURTOSIS VALUES

Table: Skewness and Kurtosis Values of Dependent Variables

School Type	Skewness	Kurtosis
Imam Hatip Secondary School	-0.05	-0.46
Secondary School	0.04	-0.65
Private Secondary School	-0.18	-0.18
Regional Secondary Boarding School	0.12	-0.51
Mother level of education		
Never went to school or left primary school	0.45	-0.40
Primary school graduate	0.01	-0.64
Secondary school graduate	-0.04	-0.45
High school graduate	-0.16	-0.45
Associate's degree	-0.62	0.77
Bachelor's degree	-0.56	0.23
Postgraduate degree	-0.71	0.20
Father level of education		
Never went to school or left primary school	0.46	-0.45
Primary school graduate	0.15	-0.63
Secondary school graduate	0.11	-0.55
High school graduate	-0.21	-0.29
Associate's degree	-0.54	0.29
Bachelor's degree	-0.33	-0.20
Postgraduate degree	-0.24	-0.65

APPENDIX C: PERMISSION FOR USING ABIDE 2016 DATA



T.C.
MİLLİ EĞİTİM BAKANLIĞI
Ölçme, Değerlendirme ve Sınav Hizmetleri
Genel Müdürlüğü

Sayı : 57750415-480.99-E.17282813 17.09.2019
Konu : Veri Talebi (Gül ÇALIK)

Sayın Gül ÇALIK
Ölçme, Değerlendirme ve Sınav Hizmetleri Genel Müdürlüğü Araştırma-Geliştirme ve Projeler Daire Başkanlığı
Yenimahalle Teknikokullar / ANKARA

İlgi : 31.01.2018 tarihli dilekçeniz.

İlgi tarihli dilekçeniz ile talep etmiş olduğunuz veriler hazırlanarak yazımız ekindeki CD ile gönderilmiştir.

Bilgilerinize rica ederim.

Dr. Hayri Eren SUNA
Bakan a.
Daire Başkanı

Ek : CD (1 adet)

Not : Ek CD elden teslim edilmiştir.

Adres:
Elektronik Ağ:
e-posta:

Bilgi için: Şefik GÖL Şef
Tel: 0312 413 12 19
Faks:

Bu evrak güvenli elektronik imza ile imzalanmıştır. https://evrakdogrulama.meb.gov.tr adresinden b9cf-d4c8-3780-8543-35e1 kodu ile teyit edilebilir.

APPENDIX D: TURKISH SUMMARY/ TÜRKÇE ÖZET

AKADEMİK BECERİLERİN İZLENMESİ VE DEĞERLENDİRİLMESİ ÇALIŞMASI (ABİDE) 2016 SONUÇLARINA GÖRE TÜRKİYE'DEKİ 8. SINIF ÖĞRENCİLERİNİN FEN BİLİMLERİ BAŞARISININ İNCELENMESİ

GİRİŞ

Ekonomik, teknolojik ve sosyal koşullardaki değişimler eğitimin önemini artırmaktadır. Eğitim; girdi, çıktı, dönüt ve bunlar arasındaki etkileşimi içeren sistemi ifade eden karmaşık bir süreçtir. Bu dinamik sistemi anlamak için sistemin başarısını etkileyen bileşenleri ve bunlar arasındaki bağlantıları belirlemek ve değerlendirmek önemlidir. Bu nedenle, öğrenci başarısı sınıf içi değerlendirmeler veya ulusal ve uluslararası geniş ölçekli değerlendirmelerle ölçülebilmektedir (Turgut ve Baykul, 2012).

Gelişmekte olan ülkeler için eğitim sistemlerinin ülke içinde ve uluslararası uygulamalarla izlenmesi ve bu uygulama sonuçlarının incelenmesi önemli bir role sahiptir. Çünkü uluslararası geniş ölçekli değerlendirme çalışmaları, ülkelerin eğitim sistemlerinin güçlü ve zayıf yanlarını değerlendirmelerini sağlamaktadır (Stanat ve Lüdtke, 2013). Ülkeler arasındaki bu sonuçları analiz etmek için birçok uluslararası çalışma yapılmaktadır ve Türkiye de Uluslararası Öğrenci Başarılarını Değerlendirme Programı (Program for International Student Assessment [PISA]) ve Uluslararası Fen ve Matematik Eğilimleri Araştırması (Trends in International Mathematics and Science Study [TIMSS]) gibi geniş ölçekli çalışmalara katılmaktadır. Millî Eğitim Bakanlığı (MEB), bu projelere katılmanın Türkiye' nin eğitimde ne ölçüde ilerleme kaydettiğini görmesini, eğitim sistemini değerlendirmesini, geliştirmesini ve bu projelerin sonuçları ışığında politikaları yeniden tasarlamasını mümkün kıldığını belirtmektedir (MEB, 2013).

Türkiye ilk defa kurucu üyesi olduğu İktisadi İşbirliği ve Kalkınma Teşkilatı (Organization of Economical Co-operation and Development [OECD]) tarafından düzenlenen PISA uygulamalarına 2003 yılında katılmıştır. PISA uygulaması kapsamında matematik okuryazarlığı, fen bilimleri okuryazarlığı, okuma becerileri konu alanları ve öğrencilerin kendileri hakkındaki görüşleri, öğrenme biçimleri, motivasyon, okul ve aile ortamları ile ilgili veriler toplamaktadır. Üç yılda bir yapılan bu uygulama 15 yaş öğrencilerini kapsamaktadır. Uygulamalar sonucunda yapılan değerlendirmeler, öğrencilerin topluma katılımları için gerekli olan bilgi ve becerilerin ne ölçüde kazandırıldığını belirlemeye çalışmaktadır (OECD, 2013). OECD'nin uluslararası ortalama puanı 500 olmasına rağmen Türkiye'de fen okuryazarlığı puanı PISA 2003'te 434, PISA 2006'da 424, PISA 2009'da 454, PISA 2012'de 463, PISA 2015'te 425 ve PISA 2018'de 468'dir.

Uluslararası Eğitim Başarıları Değerlendirme Kuruluşu (International Association for the Evaluation of Educational Achievement [IEA]) tarafından düzenlenen TIMSS'e ise Türkiye ilk defa 1999 yılında katılmıştır. Bu çalışma dört yıl aralıklarla 4 ve 8. sınıf düzeyindeki öğrencilerin matematik ve fen bilimleri alanlarındaki kazandıkları bilgi ve becerilerin değerlendirilmesi, öğretim programları, öğrenci özellikleri, öğretmen ve okul özellikleri ile ilgili bilgi toplamaya yönelik bir tarama araştırmasıdır (MEB, 2016a). Türkiye Ulusal TIMSS Raporunda (MEB, 2016a), 8. sınıf öğrencilerinin fen bilimleri puanı 1999'dan 2015'e kadar artmasına rağmen tüm sonuçlar TIMSS'in ortalama puanı olan 500'ün altındadır. Türkiye'nin 1999'da fen bilimleri puanı ortalaması 433, 2007'de 454, 2011'de 483, 2015'te 493'tür. 2019 çalışma raporu ise henüz paylaşılmamıştır.

Verilen bilgiler ışığında Türkiye'deki 8. sınıf öğrencilerinin fen bilimleri performansının IEA ve OECD ortalamalarından düşük olduğu görülmektedir. Hem ulusal hem de uluslararası geniş ölçekli değerlendirme çalışmalarında elde edilen sonuçlar, Türkiye'deki öğrencilerin fen bilimleri başarısının düşük olduğunu göstermektedir (Özden, 2007). Hanushek (2008), öğrenci başarısı olan eğitim çıktısının okul özellikleri, öğrencilerin aile geçmişi veya akran etkileri gibi çeşitli

girdi değişkenleriyle ilişkili olduğunu belirtmektedir. Bu nedenle öğrencilerin fen bilimleri başarısı birçok faktörden etkileneceği söylenebilir. Gelecekte öğrencilerin fen bilimleri başarısını artırmak için hangi değişkenlerin olumlu ya da olumsuz etkilediğini belirlemek önemlidir. Bu bağlamda fen bilimlerindeki başarıyı etkileyen değişkenleri araştırmak için birçok araştırma yapılmıştır. Bu araştırmalar; öğretmen, öğrenci ve ebeveyn özellikleri, okul özellikleri, öğretim araçlarının kalitesi, öğretmen eğitimi, öğretme ve öğrenme tekniklerinin kullanımı ve öğrenme ortamının öğrencilerin fen bilimleri başarısını etkilediğini göstermektedir (Keser, 2003). Ek olarak öğrencilerin fen bilimleri başarısının, öğrencilerin fen bilimlerine olan ilgisi, fen bilimlerine yönelik öz yeterliği, aile eğitim seviyesi ve okul türü gibi faktörler ile ilişkili olduğu da bulunmuştur (Aydın, Erdağ & Taş, 2011).

Ulusal eğitim sisteminin çıktılarının niteliğine ilişkin bilgi sağlaması açısından uluslararası çalışmaların yanında belirlenen hedefler doğrultusunda MEB tarafından Akademik Becerilerin İzlenmesi ve Değerlendirilmesi Çalışması (ABİDE) yürütülmektedir. 2016 yılında Ölçme, Değerlendirme ve Sınav Hizmetleri Genel Müdürlüğü tarafından yürütülen ABİDE çalışmasının amacı, ortaokul 8. sınıf öğrencilerinin başarılarının ilerleme durumunu izlemek, öğrendiklerin akademik bilgileri günlük hayatta ne ölçüde kullanabildiklerini ve üst düzey becerilere sahip olma durumlarını belirlemektir. Bu kapsamda öğrenci başarılarını etkileyen duyuşsal özellikler, aile ve okul özelliklerinin bu beceriler ile ilişkisini ortaya koymak için öğrencilere, öğretmenlere ve okul yöneticilerine anket uygulanmaktadır. Bu çalışma MEB stratejik planında da belirtilen ulusal düzeyde bir izleme değerlendirme sisteminin kurulması amacıyla yapılmış önemli bir çalışmadır (MEB, 2017).

ABİDE çalışması 8. sınıf düzeyindeki öğrencilerin Türkçe, matematik, fen bilimleri ve sosyal bilgiler alanlarındaki becerilere sahip olma derecelerini il düzeyinde belirleme fırsatı sağlamaktadır. Bu çalışma, PISA çalışmasının matematik okuryazarlığı, fen bilimleri okuryazarlığı, okuma becerilerine odaklanması ve TIMSS çalışmasının matematik, fen bilimleri alanlarındaki kazanımlara yönelik bir çalışma olması yönüyle benzerlikler göstermektedir.

Uluslararası çalışmalar ülke geneli analiz sonuçlarına ulaşmamızı sağlarken ABİDE çalışması uzun dönemde il düzeyinde bilgi vererek her bölgenin mevcut durumuna göre geri bildirim verilmesini sağlayacaktır (MEB, 2017).

Öğrenci ve öğretmen düzeyinde Türkiye'nin katılmış olduğu uluslararası çalışmalar eğitim sisteminin objektif bir biçimde değerlendirilmesine olanak sağlamaktadır. Fakat çalışmaya katılan ülkelerin eğitim sisteminin aynı olmaması, maddelerin uyarlanmasından kaynaklı kültürel ve çeviri farklılıklarının bulunması ve okul türleri çeşidinin Türkiye'de fazla olması gibi faktörlerin Türkiye'nin ülkeler düzeyindeki başarısını etkilediği söylenebilir. Bu faktörlerin etkisini azaltmak ve yerel düzeyde veri kaynağı elde etmek için ABİDE çalışması Türkiye eğitim sistemi sorunlarına çözüm arayışında ulusal bir çerçeveden bakılmasına olanak sağlayacaktır. ABİDE uygulaması öğrenci başarı testlerinin yanı sıra öğrenci, öğretmen ve okul yöneticilerinin katılmış olduğu anketlerle mevcut durumun analizini yapmak ve ulusal izleme ve değerlendirme çalışmalarını takip etmek için zengin bir veri kaynağı sunmaktadır.

Çalışmanın Amacı

Bu çalışmanın amacını ABİDE 2016 fen bilimleri başarısı testi ve öğrenci anketi verileri kullanılarak Türkiye' deki ortaokul 8. sınıf öğrencilerinin fen bilimleri başarı puanları ile öğrencilerin okul türü, anne ve babalarının eğitim düzeyi, fen bilimleri dersine ilgisi ve fen bilimlerine yönelik öz yeterliği arasındaki ilişkisiyi araştırmaktır. Bu temel amaç doğrultusunda aşağıda yer alan sorulara yanıt aranmıştır:

1- Akademik Becerilerin İzlenmesi ve Değerlendirilmesi Çalışması (ABİDE) 2016 sonuçlarına göre 8. sınıf öğrencilerinin fen bilimleri başarısının yeterlik düzeyi nedir?
2- ABİDE 2016 sonuçlarına göre Türkiye'deki 8. sınıf öğrencilerinin fen bilimleri başarıları, okullarının türüne, anne ve babalarının eğitim düzeyine göre farklılık göstermekte midir?
    a) 8. sınıf öğrencilerinin fen bilimleri başarı puanları, öğrencilerin okul türüne göre anlamlı farklılık göstermekte midir?

b) 8. sınıf öğrencilerinin fen bilimleri başarı puanları, annelerinin eğitim düzeylerine göre anlamlı farklılık göstermekte midir?
c) 8. sınıf öğrencilerinin fen bilimleri başarı puanları, babalarının eğitim düzeylerine göre anlamlı farklılık göstermekte midir?

3- 8. sınıf öğrencilerinin okul türü, anne ve babalarının eğitim düzeyi, fen bilimleri dersine ilgisi ve fen bilimlerine yönelik öz yeterliği fen bilimleri başarılarının anlamlı yordayıcıları mıdır?

LİTERATÜR TARAMASI

Eğitimde geniş ölçekli değerlendirmeler, ülkeler arasında insanların bilgi ve yeteneklerini kıyaslayabilmek için önemlidir. Bu çalışmaların amacı bir evreni ya da evrenlerin ilgi alanlarını tanımlamaktır. Bu geniş ölçekli değerlendirmeler 50 yıldır uygulanmaktadır ve dünya genelinde politikacıları etkilemektedir (Davier, Gonzalez, Kirsch ve Yamamoto, 2013). Uluslararası geniş ölçekli değerlendirmeler yedi başlık altında incelenmektedir. Bunlar; fonlama ve yardım, politika için kanıt, uluslararası ilişkiler, ulusal politika, teknik kapasite oluşumu, ekonomik rasyoneller, müfredat ve pedagojidir (Addey, Sellar, Steiner-Khamsi, Lingard ve Verger, 2017). Geniş ölçekli değerlendirmelerin öneminin artışı, ülkelerin eğitimdeki üstünlüğünü göstermek amacıyla soğuk savaş ile başlamıştır (Trohler, 2013). Uluslararası geniş ölçekli değerlendirmelerin gelişimi ile literatür, eğitim ve refah arasındaki ilişkiyi araştıran çalışmaları arttırmıştır (Hamilton ve Barton, 2000). Ayrıca bu değerlendirmelerin sonuçları ülkeler arasında öğrencilerin akademik başarısını karşılaştırmak için kullanılmıştır (Cook, 2006).

Uluslararası geniş ölçekli değerlendirmeler pek çok ülkede uygulanmaktadır. Ülkelerin bu değerlendirmelere katılmalarının nedenleri; politika yapmak, teknik kapasite gelişimi ve ulusal değerlendirmeyi arttırmak, fonlama ve yardım, uluslararası ilişkileri güçlendirmek, ulusal politikayı güçlendirmek, ekonomik gelişimi sağlamak, müfredat ve pedagojiyi bilgilendirmektir. Bu ölçeklerin amacı sadece eğitimle ilgili değildir. Aynı zamanda ülkeler politika ve

ekonomik statü hakkında bildiri yapmak, uluslararası toplulukla değerleri belirlemek, ekonomik girişimler ve katılım için yapılan baskılardır (Addey, 2015; Steiner-Khamsi, 2003). Ayrıca ülkeler eğitim destekli ekonomilerini geliştirmek için daha güvenilir ve karşılaştırılabilir bir veri ihtiyacı hissettikleri için bu değerlendirmelere katılırlar.

Sonuç olarak, uluslararası geniş ölçekli değerlendirmeler, ülkelerin eğitim amaçlarına ışık tutmak için bir fırsat sağlamaktadır. Uluslararası değerlendirmelere katılmak bir ülkenin eğitime bağlılığını gösterir (Nyroos ve Wiklund-Hörnqvist, 2012).

YÖNTEM

Çalışmanın Deseni

Bu çalışma, ABİDE 2016 uygulamasına katılan ortaokul 8. sınıf öğrencilerinin fen bilimleri başarısının bazı değişkenler ile ilişkisini incelemeyi amaçlamaktadır. Çalışma, öğrencilerin fen bilimleri başarısının, okul türleri, anne ve babalarının eğitim düzeyleri, fen dersine olan ilgi ve fen dersine yönelik öz yeterlikleri gibi özellikler ile ilişkisini incelemesi sebebiyle ilişkisel (korelasyonel) araştırmadır. Korelasyonel araştırma değişkenler arasındaki var olan durumu tanımlar ve değişkenler arasındaki ilişkiyi belirleyerek önemli bir fenomeni açıklar (Fraenkel, Wallen ve Hyun, 2012).

Evren ve Örneklem

ABİDE 2016, Türkiye'de uygulanan yerel bir çalışmadır. Dolayısyla bu çalışmanın evrenini 2015-2016 eğitim öğretim yılında Türkiye genelinde 8. sınıfta öğrenim gören öğrenciler oluşturmaktadır. ABİDE raporunda (MEB, 2017) belirtildiği üzere çalışma için örneklem belirlenirken Türkiye' deki ortaokul sayıları ve bu okullardaki şube sayıları MEB Strateji Geliştirme Başkanlığından alınmıştır. Özel eğitime ihtiyacı olan öğrencilerin bulunduğu okul ve şubeler ise örneklem dışında tutulmuştur. Her bir il için Merkezi Ortak Sınava giren öğrenci

sayısı oranlanarak toplam şube sayısı belirlenmiş ve yaklaşık 38.000 kişilik öğrenci sayısına ulaşılmıştır. 81 il için belirlenen şube sayısı, il hakkında daha nitelikli bilgi vermesi için tabakalı örnekleme yöntemi kullanılmıştır. Bu çalışmanın örneklemini ise ABİDE çalışması örnekleminden seçkisiz olarak belirlenen 3.888, 8. sınıf ortaokul öğrencisi oluşturmaktadır.

Veri toplama Araçları

Bu çalışmada ABİDE 2016 uygulaması kapsamında geliştirilen öğrenci fen bilimleri testi ve öğrenci anketlerine ait veriler kullanılmıştır. ABİDE çalışmasında uygulanan 12 kitapçık ve A, B ve C olmak üzere toplam 3 formda yer alan testler çoktan seçmeli ve açık uçlu sorulardan oluşmaktadır. ABİDE raporunda (MEB, 2017) belirtildiği üzere esas uygulamada öğrencilere her birinde 20 soru bulunan fen bilimleri başarı testi uygulanmıştır. Bu soruların 18'i öğrenci değerlendirmesi için kullanılırken ikisi değerlendirme dışında tutularak madde havuzu oluşturmak amacıyla kullanılmıştır. Bu soruların yaklaşık yarısı açık uçlu ve diğer yarısı ise çoktan seçmeli olarak hazırlanmıştır. Çalışmada soru türleri dikkate alınarak iç tutarlılık anlamında güvenirlik katsayıları hesaplanmıştır. Fen bilimleri dersi için A formu kitapçığının güvenirlik katsayısı r=.83, B formu kitapçığının güvenirlik katsayısı r=.82 ve C formu kitapçığının güvenirlik katsayısı r=.81'dir.

ABİDE esas uygulaması sonunda açık uçlu soruların puanlanmasında analitik ve bütüncül dereceli puanlama anahtarlarından yararlanılmıştır. Her bir öğrencinin açık uçlu sorulara verdiği yanıtlar bağımsız iki değerlendirici tarafından puanlanmıştır. Bu iki değerlendiricinin verdiği puanlar arasında fark olma durumunda öğrenci cevabı başka bir üst değerlendirici tarafından incelenerek öğrencinin esas puanı verilmiştir. Başarı testinde kullanılan açık uçlu soruların değerlendirilmesinde görev alan puanlayıcılar arası iç tutarlılık hesaplaması da yapılmıştır. Fen bilimleri dersi için elde edilen Cramer's V değerleri .80'in üzerinde olduğundan değerlendiriciler arası tutarlılığın yüksek olduğu kabul edilebilir. ABİDE çalışmasında öğrencilere uygulanan başarı test sonuçlarının güvenirliği önemli bir yer tutmaktadır. Çalışma kapsamında kitapçıkların iç

tutarlılık anlamında elde edilen güvenirlik katsayıları ve değerlendiriciler arasındaki iç tutarlılık değerlerinin güvenilir sonuçlar gösterdiği savunulabilir.

ABİDE çalışmasında başarı testlerinin yanı sıra öğrenci başarısını etkileyen faktörlerin incelenmesine olanak sağlayacak öğrenci, öğretmen ve okul yöneticisi anketleri de kullanılmıştır. Bu anketler; uygulamaya katılan öğrenciler, derslerine giren alan öğretmenleri ve okul yöneticileri tarafından doldurulmuştur. Anketler elektronik ortamda kişiye özel oluşturulmuştur. Bu çalışma kapsamına 8. sınıf ortaokul öğrencilerinin okul türü, anne ve babalarının eğitim düzeyleri gibi demografik özelliklerinin yanı sıra, 5'li Likert tipi hazırlanan fen dersine ilgi ve fen dersine yönelik öz yeterlikleri ile ilgili sorulan anket maddelerine verdikleri cevaplardan yararlanılmıştır.

Verilerin Toplanması

Bu çalışmada kullanılan öğrenci fen bilimleri başarı puanı ve öğrenci anket verileri Milli Eğitim Bakanlığı, Ölçme, Değerlendirme ve Sınav Hizmetleri Genel Müdürlüğü, Veri Analizi İzleme ve Değerlendirme Daire Başkanlığından 17 Eylül 2019 tarihinde elden teslim alınmıştır.

Verilerin Analizi

Bu çalışma, SPSS 25.0 programı aracılığı ile öğrenci anketlerinden elde edilen nicel verilerin betimsel analizi frekans, yüzde, ortalama, çarpıklık ve basıklık değerlerini kapsamaktadır. Çıkarımsal analizler ise ikinci ve üçüncü araştırma sorularına yanıt aramak için yapılmıştır. İkinci araştırma sorusunda 8. sınıf ortaokul öğrencilerinin fen bilimleri başarısının, okul türleri, anne ve babalarının eğitim düzeylerine göre anlamlı farklılık gösterip göstermediğini test etmek amacıyla tek yönlü varyans analizi (ANOVA) kullanılmıştır. Üçüncü araştırma sorusunda ise 8. sınıf ortaokul öğrencilerin okul türleri, anne ve babalarının eğitim düzeyleri, fen dersine olan ilgi ve fen dersine yönelik öz yeterlikleri, fen bilimleri başarısının anlamlı yordayıcıları olup olmadığını belirlemek amacıyla çoklu doğrusal regresyon analizi kullanılmıştır.

BULGULAR VE TARTIŞMA

Türkiye'deki 8. sınıf öğrencilerinin fen bilimleri başarı puanlarının, ABİDE çalışması kapsamında belirlenen yeterlik düzeylerine göre %1.5'inin temel altı düzeyde, %25.2'sinin temel düzeyde, %29.7'sinin orta düzeyde, % 21'inin orta üstü düzeyde ve % 22.6'sının ileri düzeyde olduğu tespit edilmiştir. Birinci araştırma sorusuna yanıt olarak, 8. sınıf öğrencilerinin fen bilimleri başarı puanlarının ortalamasının orta düzeyde olduğu bulunmuştur. Bu düzeydeki öğrencilerin yeterliklerine aşağıda yer verilmiştir:

- Fenle ilgili bazı temel kavramların tanımını ifade edebilir, bazılarının işleyişini veya görevlerini bilir.
- İnsan vücudu ile ilgili çoğu organın işleyişini açıklayabilir.
- Çoğu basit fiziksel olayların işleyişini açıklayabilir.
- Doğa olaylarının çoğunun adını bazılarının da işleyişini bilir.
- Doğa olaylarının işleyişindeki değişimleri yorumlayabilir.
- Birbirine yakın bilgiler arasında karşılaştırma yapabilir.
- Basit verilerle oluşturulmuş tablo ve grafikleri yorumlayabilir (MEB, 2017).

İkinci araştırma sorusunda ABİDE 2016 sonuçlarına göre Türkiye'deki 8. sınıf öğrencilerinin fen bilimleri başarı puanlarının, okullarının türüne, anne ve babalarının eğitim düzeyine göre anlamlı farklılık gösterip göstermediğine bakılmıştır. 8. sınıf öğrencilerinin fen bilimleri başarı puanları, öğrencilerin okullarının türüne (imam hatip, özel, yatılı bölge ve devlet ortaokulları) göre incelendiğinde, öğrencilerin fen bilimleri başarı puanlarının okul türlerine göre farklılaştığı tespit edilmiştir. Ek olarak, imam hatip ortaokulları ve devlet ortaokullarında okuyan öğrencilerin fen bilimleri başarı puanları arasında anlamlı bir farklılık görülmemiştir. Ayrıca çoklu regresyon analizinin önemli sonuçlarından biri de 8. sınıf öğrencilerinin devlet ortaokulu yerine özel ortaokulda öğrenim görmeleri, fen bilimleri başarı puanlarının pozitif ve anlamlı yordayıcısı olduğu bulunmuştur.

Bu bulgular Türkiye'de yapılmış araştırma sonuçları ile desteklenmektedir. Öğrencilerin öğrenim gördükleri farklı okul türleri nedeniyle Özbay (2015) sadece fen bilimleri başarısının değil (Berberoğlu ve Kalender, 2005), aynı zamanda matematik (Alacacı ve Erbaş, 2010) ve okuryazarlık başarılarının da (Yıldırım, 2012; Şengül, 2011) farklılık gösterdiğini belirtmiştir. Ayrıca Çavuşoğlu, Şen, Uçar ve Uçar (2013), öğrencilerin gittiği okul türünün öğrenci başarısı için özel okullar lehine anlamlı farklılık oluşturduğu sonucuna ulamışlardır. Yurt dışında yapılan çalışmalarda da benzer sonuçlar görülmüştür. Amerika Birleşik Devletleri (Coleman & Hoffer, 1987; Lubienski, 2001, 2003), Birleşik Krallık (Archer, 1984; Thorpe, 2006; Jones, Pampaka, Swain ve Skyrme, 2017), Avustralya ve İspanya'da (Delprato ve Chudgar, 2018) ve Endonezya'da da (Newhouse ve Beegle, 2005) okul türünün öğrencilerin akademik başarıları üzerinde önemli bir fark yarattığı bulgusu desteklenmiştir.

Diğer taraftan, özel ve devlet okullarında okuyan öğrencilerin başarıları arasında anlamlı bir fark olduğunu bildiren çalışmalarla çelişen sınırlı araştırma sonuçları bulunmaktadır. ABD'de Goldhaber (1996), Türkiye'de Reçber (2011) ve Güney Kore'de Kim (2018) özel okullarda önemli bir başarı avantajı bulamamıştır. Öğrencilerin başarıları arasındaki farkın arkasında birçok neden olabilmektedir. Okul türlerine göre öğrencilerin sosyoekonomik düzeyleri, öğretmen kalitesi ve eğitim kaynakları gibi farklılıklar, farklı eğitim fırsatları sunabilmektedir.

Mevcut çalışmaya göre, 8. sınıf öğrencilerinin fen bilimleri başarı puanlarının sadece annelerinin eğitim düzeyi değil, aynı zamanda babalarının eğitim düzeylerine göre de farklılık gösterdiği bulunmuştur. Ayrıca çoklu regresyon analizi sonuçlarında, ebeveynlerin eğitim düzeylerinin fen bilimleri başarı puanının pozitif ve anlamlı yordayıcıları olduğu görülmüştür. Babalarının eğitim düzeyinin, öğrencilerin fen bilimleri başarılarının yordanmasında annelerinin eğitim düzeyinden daha güçlü bir katkısı olduğu anlaşılmıştır.

PISA ve TIMSS verileri kullanılarak yapılan araştırma sonuçları, bu çalışmanın sonuçlarını desteklemektedir. Boztunç (2010), PISA 2003 ve 2006 verilerini kullanarak sadece öğrencilerin fen başarı puanlarının değil, matematik

başarı puanlarının da anne ve babalarının eğitim düzeylerine göre farklılık gösterdiğini belirtmiştir. Ayrıca yapılan araştırmalarda öğrencilerin fen ve matematik başarı puanları ile anne ve babalarının eğitim düzeyleri arasında pozitif ve güçlü bir korelasyon olduğu bulunmuştur (Thomson, Lokan, Lamb ve Ainley, 2003; Dursun ve Dede, 2004; Şaşmazel, 2006; Özer, 2009; Pektaş, 2010; Oral ve McGivney, 2013; Erdoğdu ve Erdoğdu, 2014). Bu durum ebeveynlerin eğitim seviyeleri yükseldikçe öğrencilerin de fen bilimleri ve matematik puanlarının arttığını göstermektedir. Baba eğitimi ve ekonomik gelirinin akademik başarının güçlü bir göstergesi olduğunu gösteren bazı araştırmalar bulunmaktadır (Davis-Kean, 2005). Eğitim düzeyi yüksek ebeveynlerin çocukları için daha fazla kariyer imkânı sağladıkları, sosyoekonomik düzeyi yüksek ve evde daha fazla kaynağa sahip oldukları söylenebilir (MEB, 2010b). Bu nedenle, babaların eğitim düzeylerinin, öğrencilerin fen bilimleri başarı puanlarını yükseltmede önemli bir role sahip olduğu görülmektedir.

Üçüncü araştırma sorusunda 8. sınıf öğrencilerinin fen bilimleri başarısı ile fen dersine ilgisi arasındaki ilişki araştırılmıştır. Bulgular, 8. sınıf öğrencilerinin fen bilimleri dersine olan ilgilerinin, fen bilimleri başarı puanları üzerinde anlamlı yordayıcılardan biri olduğunu göstermektedir. Ancak çoklu regresyon analizi sonuçlarına göre çalışma kapsamında belirlenen değişkenler arasında fen bilimleri dersine ilgi değişkeninin güçlü bir yordayıcı olmadığı görülmüştür.

Fen bilimleri dersine ilgi ile fen bilimleri başarısı arasındaki ilişkiyi inceleyen birçok araştırma yapılmıştır (Adeyinka, Adedeji ve Sam Olufemi, 2011; Akın, Uğur ve Akın, 2015; Chang ve Cheng, 2008; Demirci, 2018; Balıkçı ve Pasanella, 1960; Grabau ve Ma, 2017; Hulleman ve Harackiewicz, 2009; Lavin, 1965; Trost, 1975; Oliver ve Simpson, 1988; 1990; Reynolds ve Walberg, 1992; Singh, Granville ve Dika, 2002; Thorndike-Christ, 1991; Tucker-Drop, Cheung ve Briley, 2014). Örneğin, Grabau ve Ma (2017), PISA 2006 verilerini inceleyerek, Amerika Birleşik Devletleri'nde öğrencilerin fen bilimlerine olan ilgi ile fen bilimleri başarısı arasında pozitif bir korelasyon olduğunu belirtmiştir. Benzer

şekilde Demirci (2018), PISA 2015 verilerini araştırarak Türkiye bağlamında da aynı korelasyonu bulmuştur.

Literatürdeki çalışmaların çoğu fen bilimleri dersine ilgi ile fen bilimleri başarısı arasında pozitif bir ilişki olduğunu gösterse de, PISA 2015 sonuçları mevcut çalışmanın sonucunu desteklememiştir. Fen okuryazarlığı ile ilgili olarak öğrencilerin duygusal davranışlarının araştırıldığı PISA 2015 raporunda, Türkiye'deki öğrencilerin fen bilimleri dersine ilgi ve motivasyon düzeylerinin OECD ortalamasının üzerinde olduğu tespit edilmiştir. Buna ek olarak, öğrencilerin genellikle fen derslerinden hoşlandığı, fen ile ilgili bir iş sahibi olmak istediği ve kendilerini fen bilimleri alanında OECD ortalamasından daha yeterli gördüğü belirtilmiştir. Ancak öğrencilerin fen okuryazarlığı puanlarının OECD ortalamasından daha düşük olduğu da görülmektedir. Kısaca, öğrencilerin genellikle fen bilimlerine karşı olumlu bir tutum sergilemelerine rağmen başarılarının düşük olduğu belirtilmiştir (MEB, 2015).

Bu çalışmada, çoklu regresyon analizlerinin sonucuna göre, 8. sınıf öğrencilerinin fen bilimleri başarı puanlarının anlamlı yordayıcılarından birinin de öğrencilerin fen bilimlerine yönelik öz yeterlikleri olduğu görülmüştür. Bu bulgu, literatürdeki öz yeterlikle ilgili akademik başarıyı araştıran sonuçlara paraleldir (Lightsey, 1999; Deci ve Ryan, 2008; Caprara, Vecchione, Alessandri, Gerbino & Barbaranelli, 2011; Trautwein, Marsh, Nagengast, Lüdtke, Nagy ve Jonkmann, 2012; Komarraju ve Nadler, 2013). Örneğin, Caprara ve arkadaşları (2011), farklı düzeylerdeki öğrencilerin öz yeterlik ve akademik başarıları arasındaki ilişkiyi incelemişlerdir. Çalışma sonucunda, 16 yaşına kadar öğrencilerin öz yeterlik ve akademik başarıları arasında pozitif bir ilişki olduğu sonucuna varılmıştır. Öz yeterliliği yüksek olan öğrencilerin genellikle zorluklarla karşılaştıklarında daha fazla direnç gösterdiği ve derslere daha fazla çaba harcarcadığını gösteren çalışmalar da bulunmaktadır (Pintrich ve Schunk, 2002; Zimmerman ve Schunk, 2006; Schunk ve Mullen, 2012). Diğer bir deyişle, öğrenciler fen bilimleri dersinde başarısız olduklarına inandıklarında, umutsuz hissederler ve fen bilimleri başarı puanları düşer (MEB, 2003).

ÖNERİLER

Bu çalışma sonuçlarının, eğitim politikası yapıcıları, öğretmenler ve aileler için okul türü, ebeveynlerin eğitim düzeyi, fen bilimleri dersine ilgi, fen bilimlerine yönelik öz yeterlik ve Türkiye'deki 8. sınıf öğrencilerinin fen bilimleri alanındaki başarıları üzerinde bazı önemli etkileri olabilir. Bu nedenle, bu araştırma Türkiye'deki fen bilimleri başarısını artırmak için bazı önerilere kaynaklık edebilir. Eğitim politikasının kritik hedeflerinden biri, fen bilimleri başarısını en üst düzeye çıkarmaktır, ulusal ve uluslararası ekonomik ve teknolojik alanda rekabet etmek için bu kritik hedefe ulaşılması gerektiği düşünülebilir (Tucker-Drop vd., 2014). Araştırma sonuçlarına göre aşağıda bazı önerilere yer verilmiştir:

- Öğrencilerin fen bilimleri başarı puanlarını etkileyen okul temelli değişkenler incelenebilir. Eğitim politikası yapıcıları da öğrencilere eşit fırsat ve olanak sağlayarak başarı farklılıklarını azaltmak için düzenlemeler yapabilir.
- Öğrencilerin ilk eğitim ve öğretim ortamı aileleridir. Ebeveynler, evdeki çalışma ortamını düzenleyerek, kitap önererek, eğitim fırsatları sunarak ve yüksek sosyoekonomik düzey sağlayarak gelecekteki bilim insanlarını yetiştirme sürecinde önemli bir role sahiptir. Bu nedenle, ebeveynlerin eğitim düzeyini artırmak için yetişkin eğitimi, ebeveyn eğitimi, okul ve aile arasındaki iş birliğini artırmaya yönelik çalışmalar yapılabilir.
- Müfredat ve öğretmen farkındalığı eğitimi, öğrencilerin fen bilimleri dersine olan ilgisini korumak ve artırmak için önemlidir. Bu nedenle, fen bilimleri dersi müfredatı, fen bilimleri derslerine ilgiyi arttırmak için tasarlamalıdır. Ayrıca öğretmenlerin, öğrencilerin ilgisini teşvik etme yollarını bulması için öğretmenlere hizmet içi eğitimler sağlanabilir.
- Öğretmenlerin, ebeveynlerin veya sınıf arkadaşlarının sözlü özendirmeleri gibi sosyal destekler öğrencilerin öz yeterlik seviyelerini geliştirmelerine yardımcı olabilir. Bu nedenle, öğrencilerin fen bilimleri dersindeki

başarılarını artırmak amacıyla, öğretmenler için öğrencilerin öz yeterliklerinin artırılmasına ilişkin hizmet içi eğitimler hazırlanmalıdır.

APPENDIX E: TEZ İZİN FORMU/ THESIS PERMISSION FORM

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Bölümü / Department : İlköğretim Fen ve Matematik Eğitimi / Elementary Science and Mathematics Education

TEZİN ADI / TITLE OF THE THESIS (**İngilizce** / English) : AKADEMİK BECERİLERİN İZLENMESİ VE DEĞERLENDİRİLMESİ ÇALIŞMASI (ABIDE) 2016 SONUÇLARINA GÖRE TÜRKİYE'DEKİ 8. SINIF ÖĞRENCİLERİNİN FEN BİLİMLERİ BAŞARISININ İNCELENMESİ / INVESTIGATION OF 8TH GRADE STUDENTS' SCIENCE ACHIEVEMENT IN TURKEY: RESULTS FROM MONITORING AND EVALUATING ACADEMIC SKILLS STUDY (ABIDE) 2016

TEZİN TÜRÜ / DEGREE**:** **Yüksek Lisans** / Master ■ **Doktora** / PhD ☐

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