

Changes in Literacy of Students in Turkey by Years and School Types: Performance of Students in PISA Applications

H. Eren SUNA *

Hande TANBERKAN **

Mahmut ÖZER ***

Abstract

The assessment of students' academic achievement via international monitoring studies provides important insights to participating countries. Besides the cognitive performance of students, educational equity is one of the emphasized topics within the scope of Programme for International Student Assessment (PISA) study. Results regarding educational equity are quite important in Turkey because academic achievement differences among school types are relatively high in Turkey. Although a wide range of studies is conducted to examine the performance differences between school types in Turkey, it is observed that most studies focus on mean scores of school types. The aim of this study is to examine the change in student ratios at a basic- and advanced level of proficiency by school types in PISA applications between 2003 and 2018. Results show that approximately all students in science high schools and social sciences high schools have basic proficiency in all literacy fields and throughout PISA 2003 and PISA 2018. The ratio of students with basic proficiency in Anatolian high schools and Anatolian imam hatip high schools tends to be increased. However, the ratio of students with advance proficiency seems to be low in all school types in Turkey except science high schools. Steps to decrease the achievement differences between school types in Turkey within the scope of findings are suggested.

Keywords: Academic achievement, educational equity, PISA proficiency, school types, school tracking

INTRODUCTION

The assessment of students' academic achievement and literacy levels through international monitoring studies provides important feedback to the participating countries about their educational processes. These monitoring studies allow participating countries to assess the status of their students in cognitive and affective areas within the framework of international criteria. Today, the Programme for International Student Assessment (PISA), Trends in International Mathematics and Science Study (TIMSS), Progress in International Reading Literacy Study (PIRLS) and International Computer and Information Literacy Study (ICILS) focusing on students' academic skills and Study on Social and Emotional Skills, and International Civic and Citizenship Education Study (ICCS) focusing on their cognitive skills are examples of these monitoring efforts (Australian Council for Educational Research-ACER, 2014; Hopfenbeck et al., 2018; International Association for the Evaluation of Educational Achievement-IEA, 2010; Rutkowski, Rutkowski and von Davier, 2014; Thomson, 2019).

Today, one of the most important goals of education is to provide students with the ability to use the knowledge and skills they have acquired at school in their daily lives and apply them in the situations they are unfamiliar with (Malik, 2018). In this way, the knowledge and skills acquired by the students are transferred from the theoretical context to real life, and it makes it easier for students to internalize these skills (Organization for Economic Cooperation and Development-OECD, 2019a). These skills, which are defined as literacy, include students going beyond theoretical knowledge, making decisions, and solving problems in various situations (Darling-Hammond, 2014; Hopfenbeck et al., 2018). Literacy

* PhD., Ministry of National Education, Ankara-Türkiye, herensuna@gmail.com, ORCID ID:0000-0002-6874-7472

** PhD., Ministry of National Education, Ankara-Türkiye, handetanberkan@gmail.com, ORCID ID: 0000-0001-7142-5397

*** Prof. PhD., Ministry of National Education, Ankara-Türkiye, mahmutozer2002@yahoo.com, ORCID ID: 0000-0001-8722-8670

To cite this article:

Suna, H. E., Tanberkan, H. & Ozer, M. (2020). Changes in literacy of students in Turkey by years and school types: Performance of students in PISA applications. *Journal of Measurement and Evaluation in Education and Psychology*, 11(1), 76-97. doi: 10.21031/epod.702191

Received: 11.03.2020

Accepted: 20.03.2020

is also considered important for students to be successful in business life in the long term and to participate actively in lifelong learning processes (OECD, 2019a; OECD, 2019b; Ozer, 2019b).

PISA, which has been implemented by OECD since 2000, international monitoring study with the highest participation in which students' literacy is assessed in mathematics, science, and reading (OECD, 2019a). PISA is implemented in three-year periods, and in each PISA application, one of the reading, mathematics, and science literacy is considered as the primary area. In addition to cognitive tests, student, teacher, and school-level surveys are conducted, and detailed information about the education systems of the participating countries is obtained. In this way, PISA provides essential findings of the literacy performance of students as well as the relationship between many educational variables, such as school characteristics, family, and student characteristics, with student performance (National Economic and Social Council-NESC, 2012). In the selected major area, detailed analyses are carried out in terms of student performance and various educational and economic indicators.

One of the main topics focused on PISA study is equality in education. In this context, the relationship between various socioeconomic and demographic information obtained through questionnaires and literacy performance of students is examined (OECD, 2019a; OECD, 2019b). Equality in education is evaluated academically under two main titles: access to education and quality of education (Ferreira, Gignoux and Aran, 2010; Önder and Güçlü, 2014). Equality in access to education is generally analysed with basic statistics in the field of education such as schooling rates, attendance and dropout rates, distribution of student and school types. Academic achievement studies conducted at the national and international scale provide important findings to measure the impact of school-level characteristics (Hanushek and Wößmann, 2007; Scheerens, 1992).

Achievement differences within- and between schools and the performance of students in different gender groups and socioeconomic levels presented in PISA results are reported in detail (OECD, 2016; OECD, 2019). Therefore, PISA results provide valuable feedback to the participating countries about the educational equality of opportunity as well as the literacy of the students.

The differences arising from school-related factors in terms of literacy evaluated within the scope of PISA are the indicators taken into consideration in terms of equality in education (Eğitimde Reform Girişimi-ERG, 2009; Levin, 2003). Acquiring basic literacy to students regardless of the type of school has vital importance in ensuring educational equality. The fact that school characteristics have a stronger effect on students' academic outcomes than many variables (Greenwald, Hedges and Laine, 1996; Wang, Haertel and Walberg, 1993) requires determining the level of explanation of student performances within- and between-school differences, and detailed studies in which these results are interpreted (OECD, 2007). Results of within- and between-school differences are evaluated in the context of educational equality of opportunities (Inter-American Development Bank, 2012; OECD, 2014). Countries both conduct detailed studies on differences between proficiency levels and focus on the reflections of these differences to school types in literacy areas.

Turkey have participated in PISA regularly since 2003. The fact that the academic achievement differences existed for a long time at the levels of both secondary school and high school is a common finding of national and international studies. Studies which focus on PISA results of Turkey is mostly dependent on mean scores of school types (Albayrak, 2009; Ataş and Karadağ, 2017; Berberoğlu and Kalender, 2005; Çiftçi, 2006; Erdoğan, 2018). However, this is the first comparative study which focuses on the distribution of students to proficiency levels by school types in Turkey. Accordingly, the variation between the student distributions to proficiency levels in PISA applications by school types is examined in this study. Besides mean scores, interpretation of the student distribution to proficiency levels becomes important due to the fact that students at both ends of Turkey's performance scale are high. Therefore, this study is critical because it focuses on literacy performance changes of Turkish students in PISA applications and examines this change on the distribution of students' level of proficiency. The study findings will provide detailed feedback on the change of student ratios with basic and advanced qualifications by years and school types. Findings of the study provide detailed insights

about the variation of student ratios at basic- and advanced level of proficiency by school types and years.

The Achievement Differences between School Types in Turkey

Academic studies have been performed for a long time to identify school-related factors which affect students' academic skills. It has been empirically demonstrated that various factors and family characteristics of schools have had a significant impact on student achievement since the 1960s. In the Coleman report (1966), which is the first example frequently emphasized in this regard, school characteristics were shown to be related to student achievement. Although the advanced statistical and methodological methods commonly used today are not used, the results obtained in the Coleman report have also been confirmed in the studies performed after (Coleman, Hoffer and Kilgore, 1982; Coleman and Hoffer, 1987; Mortimore et al., 1988; Rosenholtz, 1985; Scheerens and Creemers, 1989).

The main reason for simultaneous examining the effects of school and family characteristics on student achievement is that these variables are related. According to Bourdieu (1986), factors such as the condition of the family in the social structure, the resources it has, and the educational level of the family members determine the academic achievement of the students to a considerable extent. The fact that students from more rooted, wealthier and more educated families are also more successful academically, is explained by the concept of social reproduction (Bourdieu, 1986; Bourdieu and Passeron, 2010; Ozer and Perc, 2020). The characteristics of the families can also be effective in the selection of schools where students will continue their education. Therefore, if there are significant differences in academic achievement among these school types, it is possible that the distribution of students to school types is related to family characteristics.

The fact that there are considerable differences between the academic skills of students in different types of schools is shown by academic studies in Turkey for a long time. The results of PISA 2003, which Turkey participated in PISA for the first time, showed that Turkey is the country where the between-school differences explain the student performance ratio at maximum level (OECD, 2007). Çiftçi (2006) showed in PISA 2003 that one of the factors that have a significant effect on Turkish students' mathematical literacy performance is school type. It has been found that students in science high schools, Anatolian high schools and private high schools perform significantly better in mathematics compared to other students. Berberoğlu and Kalender (2005) aimed to determine the academic achievement differences between school types by using the Student Selection Exam (ÖSS) results and PISA results. The findings of the study showed that there were significant and considerable achievement differences between school types in both the ÖSS and PISA context. Alacacı and Erbaş (2010) aimed to determine the effects of school-related and student characteristics on student performance by controlling the family characteristics and demographic characteristics of Turkish students in PISA 2006. The results showed that even when the family and demographic characteristics are controlled, 55% of the variance in student performance is explained by school characteristics. Yalçın and Tavşancıl (2014) analysed the data in three PISA applications between 2003 and 2009 by data envelopment method and examined the school effect on student achievement. In the study, it was determined that the significant performance differences between the school types continued at a similar level in all three applications, the most effective school type among the secondary education institutions was science high schools and the lowest effective school type was the vocational high schools. Albayrak (2009) aimed to determine the variables that affect the science performance of Turkish students in PISA 2006. Findings of the study showed that one of the effective factors on students' literacy performance is the type of school. The science literacy scores of students in science high schools and Anatolian high schools, which accept students with high placement scores, were found to be significantly higher than students in other schools. Özdemir (2016) examined the effect of socioeconomic variables on students' mathematics literacy scores in order to examine the status of the Turkish education system on equality. With PISA 2012 Turkey sample data, results show that type of school is the factor that leads to biggest difference on student performance in mathematics. Erdoğan (2018) and Ataş and Karadağ (2017) analysed PISA 2015

data for Turkey with hierarchical linear modelling and showed that school type has a significant effect on the reading literacy of the students.

The findings on academic achievement differences between school types in Turkey is not limited to international monitoring studies. It is also possible to observe considerable achievement differences between the school types in the monitoring studies performed to assess the academic performances of students and the results of the stage-transition examinations. In High School Entrance Examination (LGS), it is found that the performance of students differentiated significantly by secondary school types and high school types they are placed (Ministry of National Education-Milli Eğitim Bakanlığı-MEB, 2018a). One of the obvious examples of the difference between the academic performances of students in different high schools can be seen in the results of the 2018 University Entrance Examination (Ölçme, Seçme ve Yerleştirme Merkezi-ÖSYM, 2018). It can be seen in the results of earlier versions of University Entrance Examination (ÖSS and ÖYS), which were conducted in 1995 that academic achievement differences have remained in existence for a long time between high school types (Köse, 1999). In the 8th grade application carried out in 2016 within the scope of the Monitoring and Evaluation of Academic Skills (ABİDE) project, it was emphasized that there are significant and considerable differences in all areas between the performances of students in different secondary school types (MEB, 2016). Literacy differences between school types between schools are examined via proficiency distributions of students in PISA rather than mean scores in contrast to other studies.

Proficiency Levels in PISA Studies

In PISA, mean scores, rankings, status according to the OECD average and distribution of students at proficiency levels are used to assess the status of the participating countries in terms of literacy. All of these statistics provide information from different perspectives in terms of students' literacy. However, the distribution of students in their level of proficiency provides more detailed information about the current status of students in terms of literacy compared to other statistics (OECD, 2019a). In countries where there is no significant difference between their mean scores, the distribution of students by their level of proficiency and their mean scores by socioeconomic levels can differ significantly. This situation creates the possibility of ignoring detailed educational indicators only if the focus is on ranking or mean score of countries (Gür, Çelik and Özoğlu, 2012; Ozer, 2020; Woessman, 2016).

Proficiency levels provide a concrete relationship between the scores of students in each literacy field and their cognitive skills in this field (OECD, 2017; OECD, 2019a). According to the scores of students in mathematics, science, and reading, it is determined which level of proficiency they are and what cognitive skills they have in these fields (OECD, 2017). Establishing proficiency levels is an important step in PISA test development processes. Student performances in literacy are assessed on a continuous scale in the fields of mathematics, science, and reading. In addition, creating cut-off points and proficiency levels to define student skills provides concrete feedback to participating countries. Each proficiency level defines the capabilities and skills that students can do in the relevant literacy field. As the proficiency levels are defined to cover a certain score range, it is natural to expect a partial difference between the skills of the students at the lower limit and the upper limit of this range. Despite this, the proficiency levels allow valid predictions about the capabilities and skills of all students at that level (OECD, 2017). As of PISA 2009, six proficiency levels are used in the fields of mathematics, science, and reading literacy (NESC, 2012; OECD, 2019a).

In PISA applications, the second proficiency level is considered to be the minimum level expected to be achieved in order to demonstrate basic skills in the related field (OECD, 2019a). OECD defines the second level of proficiency as “the level that students should reach in order to solve practical problems and use their capacities” (OECD, 2019a, p.89). The second level of qualification is also considered to be the minimum qualification level that every student should achieve in the United Nations Sustainable Development Goals at the secondary education level (OECD, 2019a). It provides important feedback to

the participating countries in terms of the level of students who have a basic level of cognitive skills in mathematics, science, and reading literacy. In fact, the OECD lists the participating countries in PISA reports in addition to their mean scores in terms of student ratio of having basic literacy. The fifth and sixth proficiency levels within the framework of PISA represent the highest level of performance. In this context, the ratio of students at the level of five and sixth proficiency provides vital feedback in terms of the ratio of students at advanced proficiency levels (top performer) within the total. Participating countries are also ranked according to the ratio of students at advanced proficiency levels (OECD, 2016; OECD, 2019a).

Proficiency levels are determined in PISA applications which it is the major field (mathematics, science, and reading) (OECD, 2017). Therefore, proficiency levels in the field of reading were determined in 2000, when the first PISA application was conducted, proficiency levels in mathematics in 2003, and proficiency levels in science in 2006. After defining proficiency levels, they do not remain constant and can be updated throughout PISA applications. For example, in PISA 2003 and PISA 2006 applications, five proficiency levels have been defined in the field of reading literacy. PISA 2009 is the first application in which six proficiency levels are defined in all fields. In PISA 2018, all updates and comparability analyses related to proficiency levels were carried out, and how to make proficiency level comparisons in the most appropriate way was determined again. In line with the results, comparisons were made in the PISA 2018 report between 2003-2018 in the field of mathematics, between 2006-2018 in the field of science, and between 2009-2018 in the field of reading (OECD, 2019a).

Purpose of the Study

The aim of this study is to examine the change in student ratios at basic- and advanced level of proficiency by school types in PISA applications between 2003 and 2018. For this purpose, answers to the following questions were sought:

1. Is there any significant difference between students with basic proficiency ratios by type of school in Turkey in PISA applications between 2003 and 2018?
 - 1.a. Is there any significant difference between the student ratios at second and higher proficiency levels by school types in PISA applications between 2003 and 2018 in mathematics literacy?
 - 1.b. Is there any significant difference between the student ratios at second and higher proficiency levels by school types in PISA applications between 2006 and 2018 in science literacy?
 - 1.c. Is there any significant difference between the student ratios at second and higher proficiency levels by school types in PISA applications between 2009 and 2018 in reading literacy?
2. Is there any significant difference between students with advanced proficiency ratios by type of school in Turkey in PISA applications between 2003 and 2018?
 - 2.a. Is there any significant difference between the student ratios at the fifth and sixth proficiency levels by school types in PISA applications between 2003 and 2018 in mathematics literacy?
 - 2.b. Is there any significant difference between the student ratios at the fifth and sixth proficiency levels by school types in PISA applications between 2006 and 2018 in science literacy?
 - 2.c. Is there any significant difference between the student ratios at the fifth and sixth proficiency levels by school types in PISA applications between 2009 and 2018 in reading literacy?

METHOD

Research Design

This study in which the change of students' distribution at PISA proficiency levels in PISA studies between 2003-2018 by the school types has been performed in the correlational design. In the research, the current situation is examined without any intervention, and this situation reveals the descriptive structure of the study (Karasar, 2005). Comparisons between school types and years lead to the correlational aspect of the study.

Population and Sample

The research population is constituted by students who are 15 and continuing formal education in the years 2003, 2006, 2009, 2012, 2015, and 2018 in Turkey. In PISA applications, students are selected by stratified sampling. Participating countries and economies are expected to identify labels that best represent 15-year-old students (OECD, 2017). The international research centre determines the schools to be applied through random sampling among the schools in the relevant levels. Following the determination of the relevant schools, students studying in these schools are also selected randomly. Schools located in different types of schools in 12 regions covered by Turkey Statistical Region Units Classification (Turkey-İBBS 1) created by socioeconomic level similarity in Turkey are included in the sampling process.

The data of all students in Turkey sample of PISA practices between 2003 and 2018 were used in the research. The number of students participating in the PISA survey between 2003 and 2018 ranged from 4.855 to 6.890 in Turkey. The distribution of students by school type in Turkey sample of PISA applications between 2003 and 2018 is shown in Table 1.

Table 1. Distribution of Students by School Type in PISA Turkey Sample between 2003 and 2008.

<i>School Type</i>	<i>PISA 2003</i>		<i>PISA 2006</i>		<i>PISA 2009</i>		<i>PISA 2012</i>		<i>PISA 2015</i>		<i>PISA 2018</i>	
	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
Anatolian High School	3238	66.69	2824	57.14	2659	53.22	2719	56.08	2155	36.56	3013	43.73
Anatolian Fine Arts H. School	-	-	-	-	32	0.64	-	-	40	0.68	42	0.61
Anatolian İmam Hatip High School	-	-	-	-	-	-	-	-	906	15.37	943	13.69
Multi Program Anatolian H. School	-	-	278	5.63	268	5.36	178	3.67	285	4.83	273	3.96
Science High School	63	1.30	35	0.71	100	2.00	35	0.72	40	0.68	291	4.22
Vocational and Technical Anatolian High School	1435	29.56	1689	34.18	1800	36.03	1693	34.92	2268	38.47	2143	31.10
Secondary School	119	2.45	116	2.35	137	2.74	120	2.48	121	2.05	22	0.32
Police College	-	-	-	-	-	-	68	1.40	-	-	-	-
Social Sciences High School	-	-	-	-	-	-	35	0.72	80	1.36	163	2.37
Total	4855	100	4942	100	4996	100	4848	100	5895	100	6890	100

As seen in Table 1, between 2003 and 2018, the change in 15-year-old student population in Turkey has led to changes in the distribution of students within the sample by the school types. Similar to the student population, there were important changes in school types during this period. Despite these changes, in order to make comparisons between school types, existing school types in 2009 and before have been converted to current school types within the scope of the research, as shown in Table 2. The similarity between the old school types and the current school types is taken into consideration in this transformation.

Table 2. Current School Types and Old School Types Before PISA 2015

<i>Old School Type</i>	<i>Current School Type</i>
Anatolian Teacher High School	Anatolian High School
General High School	Anatolian High School
Foreign Language Weighted High School	Anatolian High School
Anatolian Vocational High School	Vocational and Technical Anatolian High School
Anatolian Technical High School	Vocational and Technical Anatolian High School
Vocational High School	Vocational and Technical Anatolian High School
Technical High School	Vocational and Technical Anatolian High School

Data Collection Instruments

In the research, reading, mathematics, and science tests applied within the scope of the PISA 2003, PISA 2006, PISA 2009, PISA 2012, PISA 2015, and PISA 2018 research were used. The tests used in the PISA research consist of open-ended, short-answer, and multiple-choice items. Each subtest contains items developed for different proficiency levels. As an indicator of the students' performance in the tests, plausible values are calculated for each student (OECD, 2017). Until the PISA 2015 application, while calculating five possible values from each of the fields of mathematics, science, and reading, the possible values calculated on and after PISA 2015 were increased to ten. As the Turkey samples participating in PISA between 2003 and 2008 were taken into consideration in the study, the first plausible value (1st plausible value), which is calculated as common to all applications, was taken into account.

Data Analysis

In this study, firstly, the proficiency levels of Turkish students in six PISA applications were determined by considering the first plausible values in each field. Then, the ratio of students who have basic proficiency in each PISA application is calculated by adding the student ratios at second and higher proficiency levels. A similar practice was used in the calculation of the students at the advanced proficiency levels by summing the student ratios at the fifth and sixth proficiency levels in each PISA application.

In successive PISA applications, the ratio of changes in the proficiency level distributions was - examined with the z test method for independent sample ratios. The z test is a statistic that is also used in cases where the sample sizes are not equal, and the significance of the difference between the ratios calculated in independent samples is tested (Schumacker, 2015). The aim of the study is to compare the type of school at the secondary level; thus the students at secondary school level in Turkey sample were excluded from the study. Since Anatolian fine arts high school is included in the sample in PISA 2009 and not included in PISA 2012, the changes in this school type were examined only between PISA 2015 and PISA 2018.

RESULTS

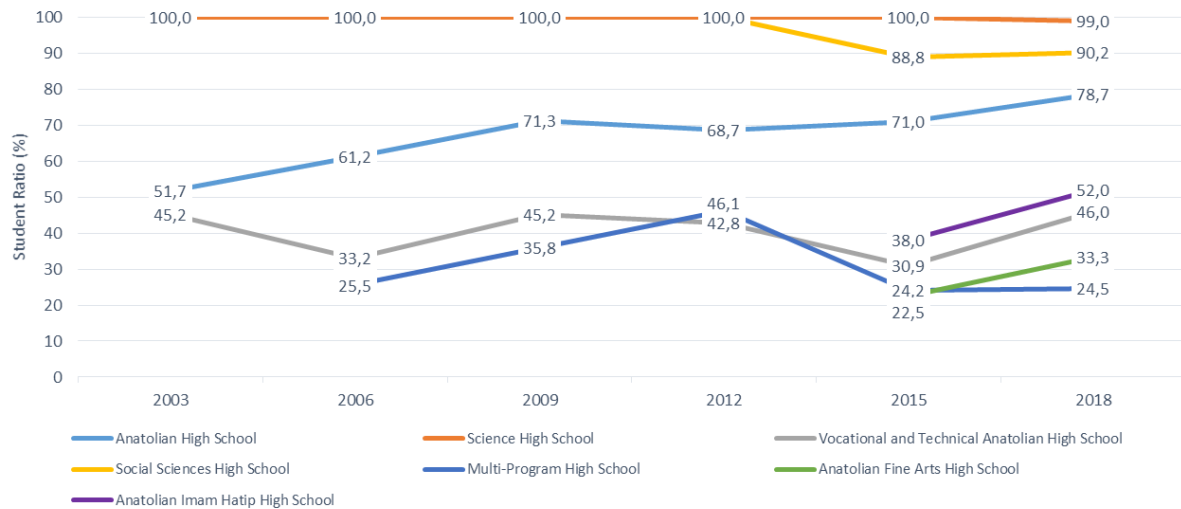
Findings of The First Research Question

Is there a significant difference between students with basic proficiency ratios by type of school in Turkey in PISA applications between 2003 and 2018?

First, findings regarding the sub-question of mathematics literacy, are presented below.

In Graph 1, the distribution of students with basic math proficiency by years and school types in Turkey between 2003 and 2018 PISA applications is given. Table 3 shows the results of the z test regarding the significance of the differences between the ratios given in Graph1.

Graph 1. Distribution of Turkish Students with Basic Mathematics Proficiency in PISA Applications by Years and School Types



As seen in Graph 1, that ratio of students having basic proficiency in mathematical literacy in Turkey shows significant differences from one PISA application to another. School types are categorized into four groups as those who tend to increase according to the performance of the students over the years, those who have a tendency to decrease, those who remain at a similar level and those who show multiple changes.

It is seen that the students whose performance has increased over the years in terms of mathematics literacy performance take education in Anatolian high schools and Anatolian imam hatip high schools. The ratio of students with basic mathematical literacy showed an overall increasing trend in Anatolian high schools between 2003 and 2018, and the ratio, which was calculated as 51.7% in 2003, reached 78.7% in 2018. Similarly, the ratio of students with basic mathematical literacy among the students studying in Anatolian imam hatip high schools increased from 38% in 2015 to 52% in 2018. While the ratio of students with basic mathematics literacy among the students studying in Anatolian fine arts high schools was 22.5% in 2015, this ratio increased to 33.3% in 2018; however, it is found that the increase was not significant.

It was determined that the mathematical literacy performances of the students in social sciences high schools decreased significantly over the years. In PISA 2012 application, despite the fact that all students performed on and above the basic proficiency level in mathematics literacy, the ratio of students with this proficiency in PISA 2015 was 88.8% and in PISA 2018, it was 90.2%.

PISA mathematics literacy performances of students in vocational and technical Anatolian high school and multi-program Anatolian high schools have reached the level in 2003 with significant increases and decreases over the years. The ratio of vocational and technical Anatolian high school students with basic mathematics literacy dropped to 30.9% between 2009 and 2015, then increased again in 2018 and reached 46%. The ratio of multi-program Anatolian high school students with basic mathematical literacy increased significantly between 2006 and 2012, but decreased significantly in 2015. In PISA 2018, it was determined that 24.5% of students studying in multi-program Anatolian high school have basic mathematics literacy and this ratio is very close to the level of 2006.

Science high schools are the only type of school whose performance does not change significantly between PISA 2003 and PISA 2018 applications. The ratio of students with basic mathematical literacy in science high schools varies between 99% and 100%.

Table 3. z-Test Results Regarding the Ratio of Students with Basic Mathematics Literacy in PISA Applications by School Types*

School Type	2006-2003	2009-2006	2012-2009	2015-2012	2018-2015
Anatolian High School	7.400*	7.904*	-2.081*	1.706	6.311*
Anatolian İmam Hatip High School	-	-	-	-	6.045*
Anatolian Fine Arts High School	-	-	-	-	1.092
Multi Program Anatolian High School	-	2.607*	2.164*	-4.880*	0.091
Science High School	x	x	x	x	-0.645
Vocational and Technical Anatolian High School	6.903*	7.258*	-1.430	-7.721*	10.346*
Social Sciences High School	-	-	-	-2.067*	0.035

* $p < 0.05$

-: School type not represented in PISA sample

x: Significance test is not performed since there is no ratio change between years.

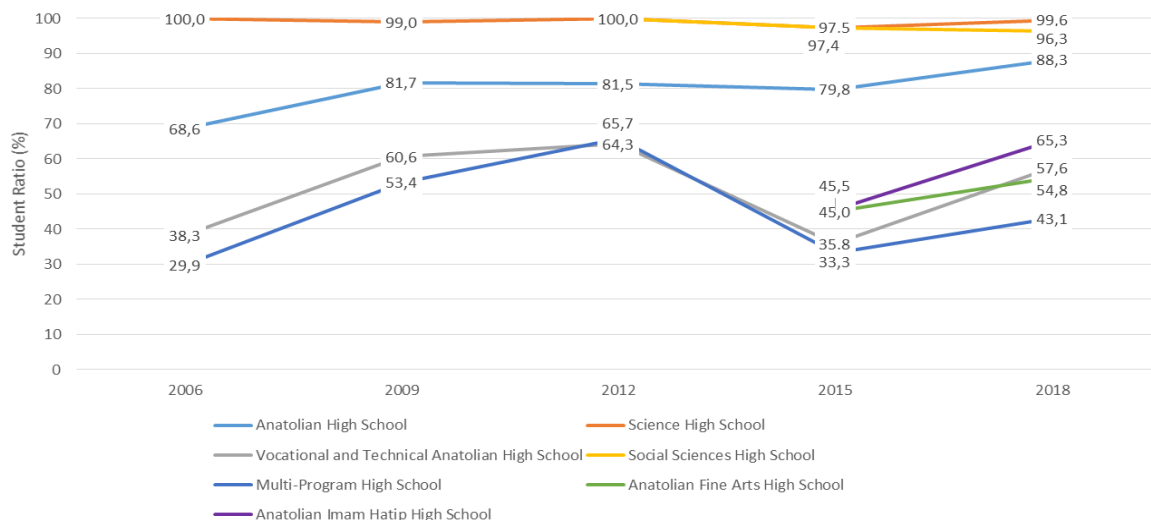
Secondly, findings regarding the sub-question of *science literacy* are presented below.

In Graph 2, the distribution of students with basic science proficiency by years and school types in Turkey between 2006 and 2018 PISA applications is given. Table 4 shows the z-test results regarding the significance of the difference between the ratios given in Graph 2.

As seen in Graph 2, the ratios of students having basic science literacy by school types show significant differences from one PISA application to another. The school type with the highest ratio of students with basic science literacy in all five applications between 2006 and 2018 is science high school. Multi-program Anatolian high school is the type of school with the lowest ratio of students reaching basic science literacy in all applications except 2012.

The ratio of students with basic science literacy in Anatolian high schools and Anatolian imam hatip high schools tends to increase. While the ratio of students with basic science literacy in Anatolian high schools in 2006 was 68.6%, this ratio reached 88.3% in 2018. Similarly, the ratio of students with basic science literacy among Anatolian imam hatip high school students was calculated as 45.5% in 2015 and 65.3% in 2018. The ratio of students with basic proficiency in Anatolian fine arts high school increased from 45% to 54.8% in 2018, but it was determined that this increase was not significant.

Graph 2. Distribution of Turkish Students with Basic Science Proficiency in PISA Applications by Years and School Types



The ratio of students with basic science literacy among students studying in science high schools and social sciences high schools does not differ significantly between PISA applications. The ratio of students with basic science literacy in PISA practices between 2006 and 2018 ranged from 97.5% to 100% in science high schools and 96.3% to 100% in social sciences high schools. In other words, almost all students studying in science high schools and social sciences high schools between 2006 and 2018 have basic science literacy.

The ratios of students in vocational and technical Anatolian high schools and multi-program Anatolian high schools having basic science literacy varied in PISA applications between 2006 and 2018. The ratio of students with basic science literacy among the students studying in vocational and technical Anatolian high schools was calculated as 38.3% in 2006, increasing and decreasing over the years, reaching 57.6% in 2018. In multi-program Anatolian high schools, the ratio of students with basic science literacy was calculated as 29.9% in 2006 and reached 43.1% in 2018 after changes in different directions.

Table 4. z-Test Results Regarding the Ratio of Students with Basic Science Literacy in PISA Applications by School Types*

<i>School Type</i>	<i>2009-2006</i>	<i>2012-2009</i>	<i>2015-2012</i>	<i>2018-2015</i>
Anatolian High School	10.738*	-0.217	-2.917*	9.381*
Anatolian İmam Hatip High School	-	-	-	8.073*
Anatolian Fine Arts High School	-	-	-	0.884
Multi Program Anatolian High School	5.574*	2.595*	-6.807*	2.491*
Science High School	-0.594	0.594	-0.942	1.650
Vocational and Technical Anatolian High School	13.365*	2.026*	-17.293*	15.063*
Social Sciences High School	-	-	0.944	-0.485

* $p < 0.05$

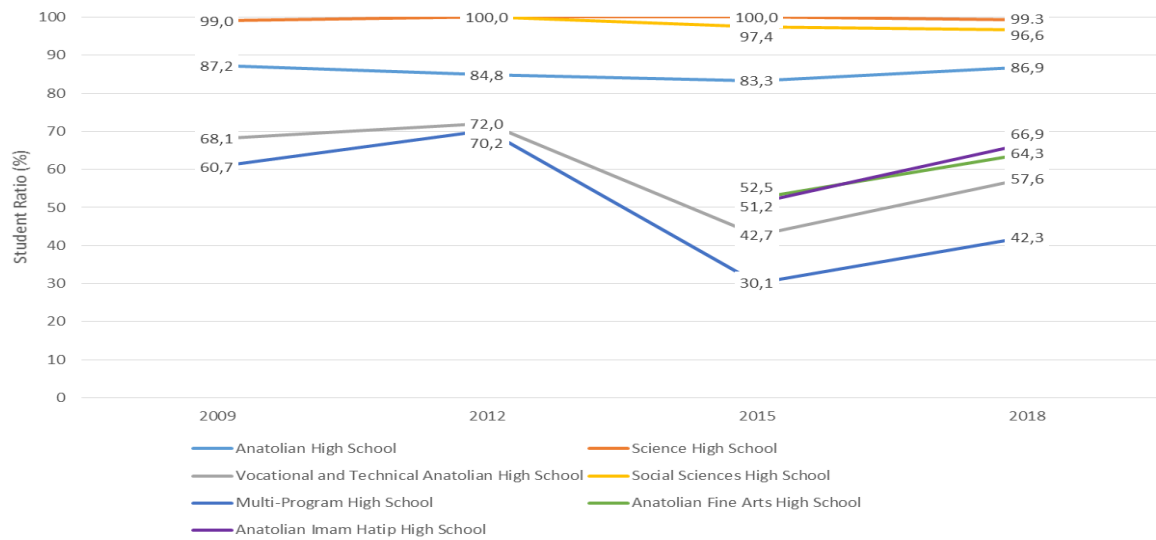
-: The school type was not represented in the PISA sample.

Lastly, findings related to the sub-question of reading literacy are presented below. The distribution of the students having basic reading proficiency in Turkey based on years and school types between 2009 and 2018 is given in Graph 3. Table 5 shows the results of the z test regarding the significance of the difference between the ratios given in Graph 3.

As can be seen in Chart 3, the ratio of students having basic reading literacy by school types shows significant differences from one PISA application to another. It is the school type science high school with the highest ratio of students with basic science literacy in all four PISA applications between 2009 and 2018. Multi-program Anatolian high school is the type of school with the lowest ratio of students reaching basic science literacy level in all applications.

The ratio of students studying at the Anatolian imam hatip high schools tends to increase over the years. The ratio of students with basic reading literacy in this school type was calculated as 51.2% in 2015 and 66.9% in 2018. While 52.5% of Anatolian fine arts high school students had basic literacy in 2015, this ratio reached 64.3% in 2018; however, it is found that this increase was not significant.

Graph 3. The Distribution of Turkish Students with Basic Reading Literacy in PISA Applications by Years and School Types



The ratio of students studying in science and social sciences high schools having basic reading literacy between 2003 and 2018 varies between 96.6% and 100%. In other words, almost all students in science high schools between 2003 and 2018 and social science high schools between 2012 and 2018 have basic reading literacy.

The ratio of having basic reading literacy among the students in vocational and technical Anatolian high schools and multi-program Anatolian high schools has been increasing and decreasing over the years. In PISA 2009, the ratio of vocational and technical Anatolian high school students with basic reading literacy has been calculated as 68.1%, this ratio has decreased to 42.7% in 2015 and reached 57.6% in 2018. While the ratio of students with basic reading literacy among multi-program Anatolian high school students was 60.7% in 2009, this ratio was calculated as 42.3% in 2018. The ratios of multi-program Anatolian high school students with basic reading literacy in this time interval varied considerably, between 30.1% and 70.2%.

Unlike other fields, the ratio of having basic reading literacy among Anatolian high school students did not increase significantly and remained close to 87.2% calculated in PISA 2009.

Table 5. z-Test Results Regarding the Ratio of Students with Basic Reading Literacy in PISA Applications by School Types

School Type	2012-2009	2015-2012	2018-2015
Anatolian High School	-2.255*	-2.332*	3.585*
Anatolian İmam Hatip High School	-	-	5.779*
Anatolian Fine Arts High School	-	-	1.083
Multi Program Anatolian High School	2.111*	-8.264*	2.236*
Science High School	0.594	x	0.492
Vocational and Technical Anatolian High School	2.332*	-18.119*	9.878*
Social Sciences High School	-	-0.944	-0.485

* $p < 0.05$.

-: School type not represented in PISA sample

x: Significance test is not performed since there is no ratio change between years.

Findings of The Second Research Question

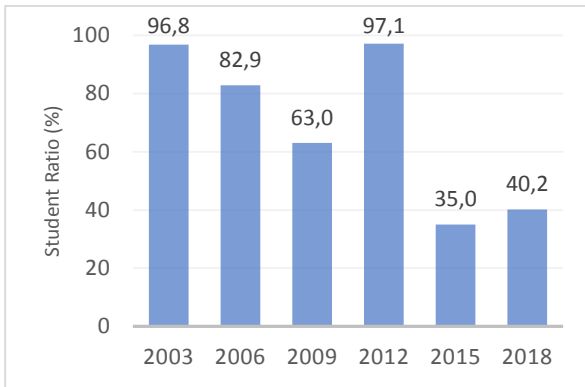
Is there any significant difference between students with advanced proficiency ratios by type of school in Turkey in PISA applications between 2003 and 2018?

Firstly, findings related to sub-question of mathematics literacy are presented below.

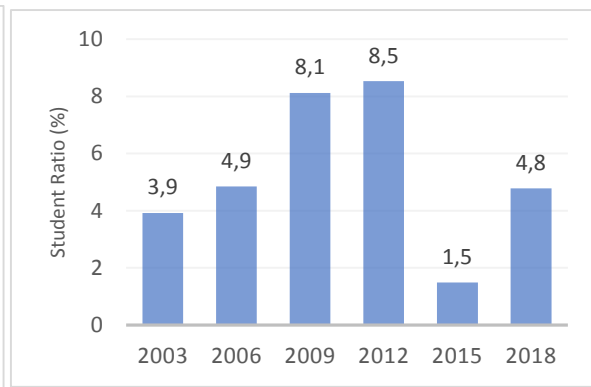
In Graph 4, the distribution of students with advanced maths proficiency by years and school types in Turkey sample between 2003 and 2018 PISA applications is given. Table 6 shows the z-test results regarding the significance of the difference between the ratios given in Graph 4.

Graph 4. The Distribution of Turkish Students with Advanced Mathematical literacy in PISA Applications by Years and School Types

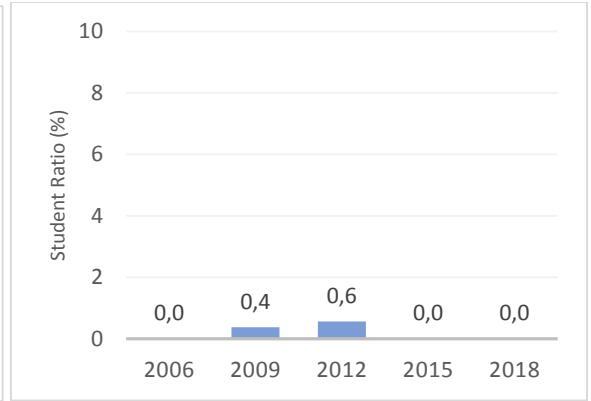
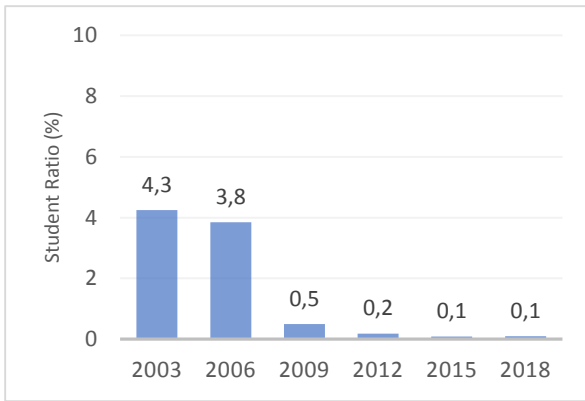
a. Science High Schools



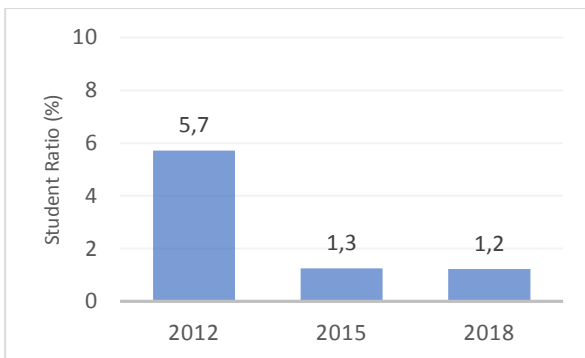
b. Anatolian High Schools



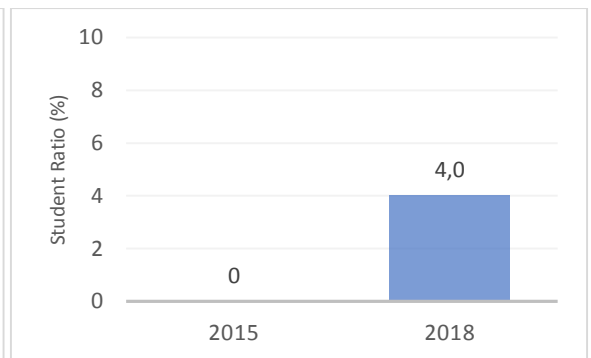
c. Vocational and Technical Anatolian High Schools d. Multiple Programs High Schools



e. Social Sciences High Schools



f. Anatolian İmam Hatip High Schools



As seen in Graph 4, there are significant differences between school types in terms of student ratios with advanced mathematical literacy. In addition, it has been determined that school types have significant time-dependent changes in terms of student ratios with advanced mathematical literacy.

Anatolian fine arts high school and multi-program Anatolian high schools constitute the types of schools in which the ratio of students with advanced mathematics literacy is below 1% in all PISA applications. In PISA 2015 and 2018, the proficiency levels of the students in Anatolian fine arts high schools in mathematics literacy range from the sixth level to the fourth level. As a result, it was determined that students in Anatolian fine arts high schools could not reach advanced mathematics literacy proficiency levels. It was determined that 0.4% of multi-program Anatolian high school students in PISA 2009 had advanced mathematics literacy in PISA 2012 and 0.6% in PISA 2012. In PISA 2006, PISA 2015 and PISA 2018, it is seen that students in this high school type do not reach advanced mathematics literacy levels.

According to Graph 4, the ratio of students with advanced mathematics literacy in vocational and technical Anatolian high schools tends to decrease over time. In vocational and technical Anatolian high schools, the relevant ratio was calculated as 4.3% in 2003, and this ratio decreased to 0.1% in 2015 and 2018 applications. While the ratio of students with advanced literacy in mathematics literacy was 5.7% in social sciences high schools in 2012, this ratio was calculated as 1.2% in 2015 and 2018, but it is seen through Table 6 that this decrease is not significant.

The ratio of students with advanced mathematics literacy in Anatolian and science high schools varied between 2003 and 2018. While the ratio of having advanced mathematics literacy among Anatolian high school students in PISA 2013 was 3.9%, this ratio increased up to 8.5% in PISA 2012. The ratio of having advanced mathematics literacy among Anatolian high school students decreased sharply to 1.5% in PISA 2015 and reached 4.8% in PISA 2018 with a significant increase. The ratio of advanced mathematics literacy among students studying in science high schools varies greatly between 35% and 97.1% in different PISA applications. The change is particularly noticeable in PISA applications between 2012 and 2018. While 97.1% of science high school students had advanced mathematics literacy in PISA 2012, this ratio decreased to 35% in 2015 and reached 40.2% in 2018.

In the Anatolian imam hatip high schools, which were included in the sample as a school type for the first time in PISA 2015, students could not reach advanced mathematics literacy levels. However, the ratio of having advanced mathematics literacy among Anatolian imam hatip high school students reached 2.3%, with a significant increase in PISA 2018.

Table 6. z-Test Results Regarding the Ratio of Students with Advanced Mathematics Literacy in PISA Applications by School Types

<i>School Type</i>	<i>2006-2003</i>	<i>2009-2006</i>	<i>2012-2009</i>	<i>2015-2012</i>	<i>2018-2015</i>
Anatolian High School	1.768	4.934*	0.543	-10.796*	6.438*
Anatolian İmam Hatip High School	-	-	-	-	6.105*
Anatolian Fine Arts High School	-	-	-	-	x
Multi Program Anatolian High School	-	1.019	0.292	-1.267	x
Science High School	-2.420*	-2.170*	3.866*	-5.594*	0.631
Vocational and Technical Anatolian High School	-0.57	-6.860*	-1.63	-0.781	0.057
Social Sciences High School	-	-	-	-1.382	0.015

* $p < 0.05$

-: School type not represented in PISA sample

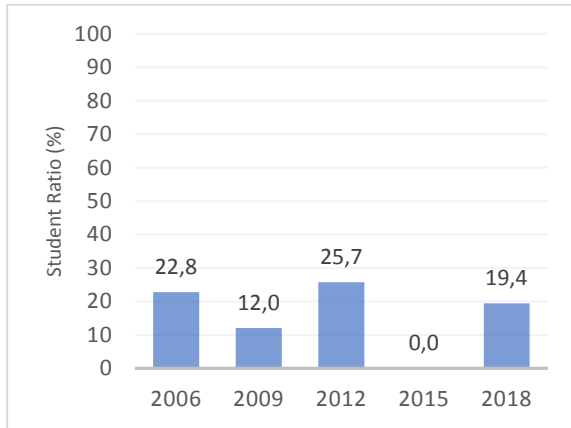
x: Significance test is not performed since there is no ratio change between years.

Secondly, findings related to the sub-question of *science literacy* are presented below.

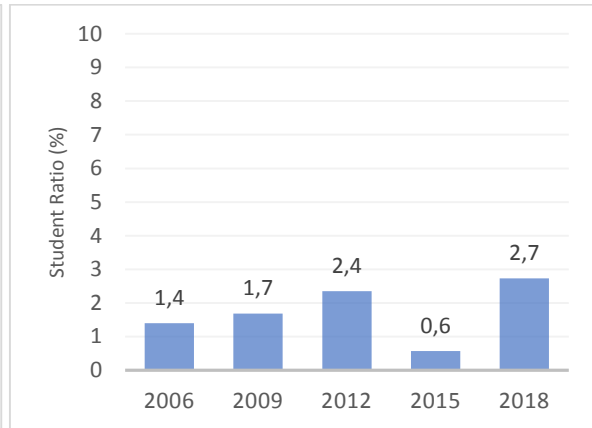
In Graph 5, the distribution of students with advanced science proficiency by years and school types in Turkey between 2006 and 2018 PISA applications is given. Table 7 shows the z-test results of the significance of the difference between the ratios given in Graph 5.

Graph 5. The Distribution of Turkish Students with Advanced Science Literacy in PISA Applications by Years and School Types

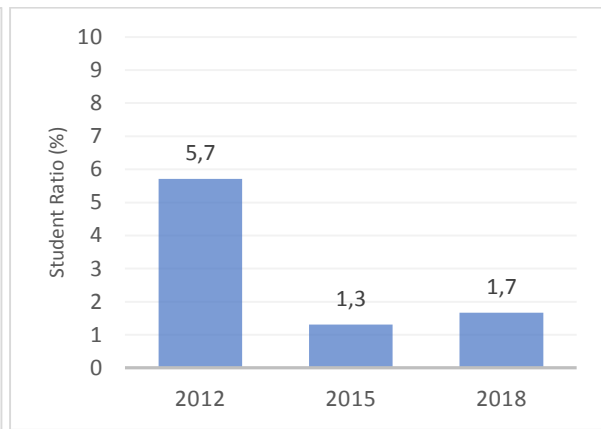
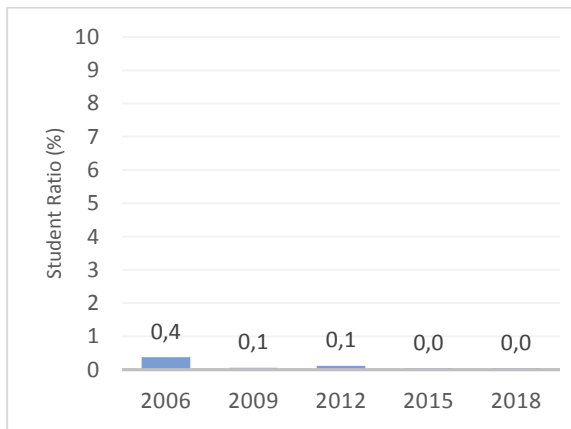
a. Science High Schools



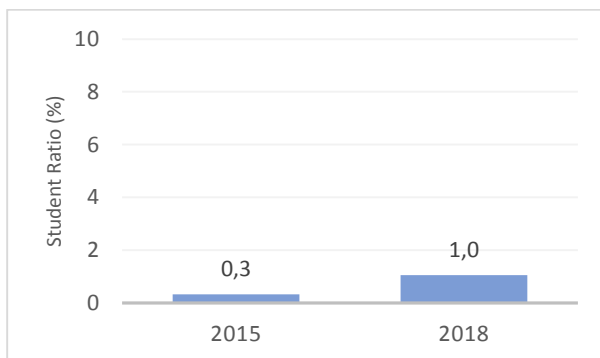
b. Anatolian High Schools



c. Vocational and Technical Anatolian High Schools d. Social Sciences High Schools



e. Anatolian Imam Hatip High Schools



As can be seen in Graph 5, there are significant differences between the types of schools in terms of the ratio of students with advanced science literacy. It is determined that the ratio of students with advanced science literacy over the years within the school types changed significantly.

Students in multi-program Anatolian high schools and Anatolian fine arts high schools could not reach advanced science proficiency levels in PISA applications between 2006 and 2018. The ratio of students with advanced science proficiency among vocational and technical Anatolian high school students varies between 0.1% and 0.4% in 2006 and 2012 applications. It was determined that the ratio of students with advanced science proficiency among the students in Anatolian imam hatip high schools was 0.3% in 2015 and 1.0% in 2018.

It was determined that the ratio of social science high school students having advanced science proficiency tends to decrease, but the decrease in Graph 5 is not significant.

Anatolian high schools and science high schools are the types of schools where the ratio of students with advanced science literacy differs significantly in different directions. The ratio of students with advanced science literacy among Anatolian high school students varied between 0.6% and 2.7% in 2006 and 2018. Significant changes have also been observed in science high schools in terms of the ratio of students with advanced science literacy. In 2015, science high school students could not reach advanced proficiency in the field of science, and in 2018, 19.4% of the students reached their advanced proficiency levels.

Table 7. z-Test Results Regarding the Ratio of Students with Advanced Science Literacy in PISA Applications by School Types

<i>School Type</i>	<i>2009-2006</i>	<i>2012-2009</i>	<i>2015-2012</i>	<i>2018-2015</i>
Anatolian High School	1.388	2.714*	-5.743*	5.290*
Anatolian İmam Hatip High School	-	-	-	3.508*
Anatolian Fine Arts High School	-	-	-	x
Multi Program Anatolian High School	x	x	x	x
Science High School	-1.221	1.587	-3.419*	2.912*
Vocational and Technical Anatolian High School	-3.173*	1.037	-1.268	0.040
Social Sciences High School	-	-	-1.382	0.034

* $p < 0.05$

-: School type not represented in PISA sample

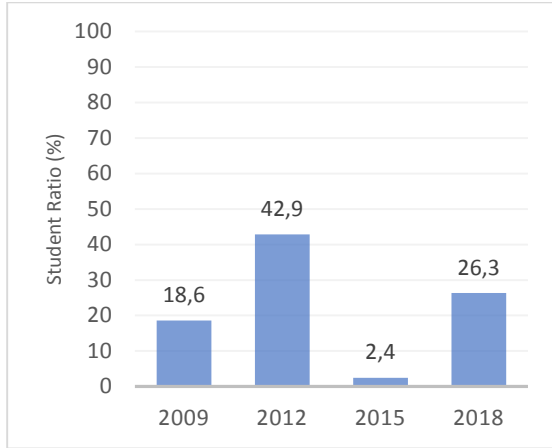
x: Significance test is not performed since there is no ratio change between years.

Lastly, findings related to the sub-question of reading literacy are presented below.

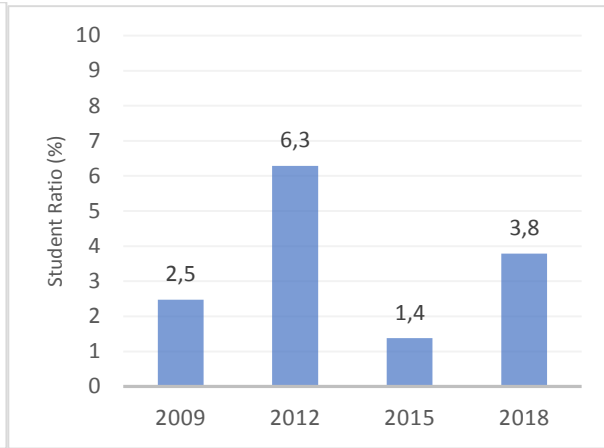
In Graph 6, the distribution of students with advanced reading literacy by years and school types in Turkey between 2009 and 2018 PISA applications is given. Table 8 shows the z-test results regarding the significance of the difference between the ratios given in Graph 6.

Graph 6. The Distribution of Turkish Students with Advanced Reading Literacy in PISA Applications by Years and School Types

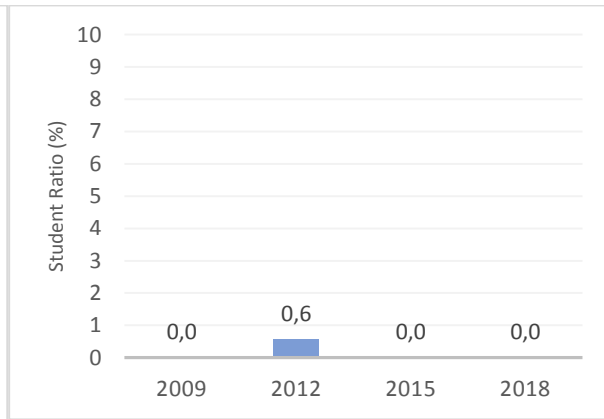
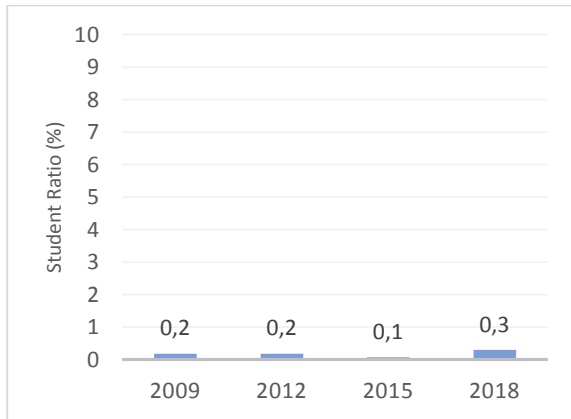
a. Science High Schools



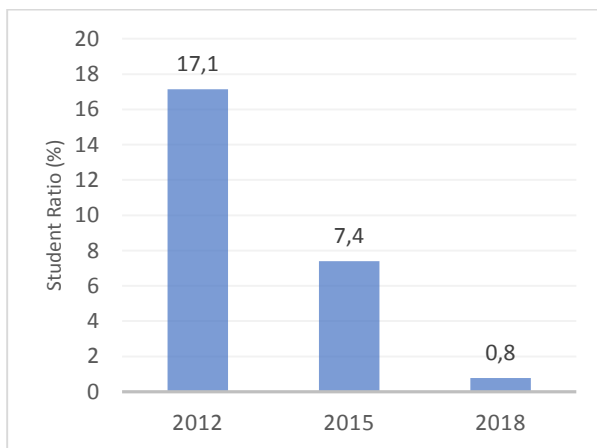
b. Anatolian High Schools



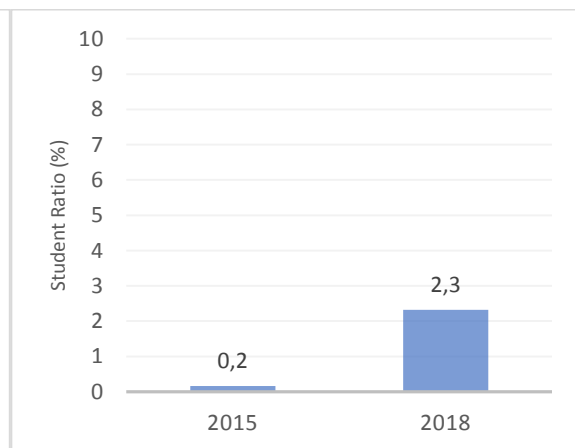
c. Vocational and Technical Anatolian High Schools d. Multi-program High Schools



e. Social Sciences High Schools



f. Anatolian Imam Hatip High Schools



According to Graph 6, student ratios of advanced proficiency in PISA reading literacy change significantly between PISA applications by school types. Similarly, there are significant changes of ratios within school types between the PISA applications. School types are categorized into four groups as those who do not show any significant difference from one application to another in terms of the ratio of students with advanced proficiency in reading literacy, those with an increasing trend, those with a decreasing trend and those with multiple changes.

As can be seen in Graph 6, students in Anatolian fine arts high schools could not reach advanced proficiency in reading literacy between 2009 and 2018. In multi-program Anatolian high schools, only 0.6% of students have advanced reading literacy in PISA 2012.

The ratio of students with advanced proficiency in reading literacy among the students in the Anatolian imam hatip high school was calculated as 0.2% in PISA 2015, this ratio increased significantly and reached 2.3% in PISA 2018. In the vocational and technical Anatolian high schools, the ratio of students with advanced reading literacy changed between 0.1% and 0.3% in four PISA applications, and the increase in PISA 2018 was found to be significant.

There was a significant decrease in the ratio of students with advanced reading literacy in the social sciences high schools between PISA 2012 and PISA 2018. The ratio of students having advanced proficiency in reading has decreased from 17.1% to 7.4% in PISA 2015, and from 7.4% to 0.8% in PISA 2018.

Anatolian high schools and science high schools are the types of schools in which there are two-way changes between PISA applications in terms of student ratios with advanced reading literacy. The ratio of those who have advanced reading literacy among Anatolian high school students varies between 1.4% and 6.3%. The ratio of science high school students with advanced reading literacy ranged from 2.4% to 42.9%.

Table 8. z-Test Results Regarding the Ratio of Students with Advanced Reading Literacy in PISA Applications by School Types

<i>School Type</i>	<i>2012-2009</i>	<i>2015-2012</i>	<i>2018-2015</i>
Anatolian High School	6.720*	-8.948*	5.249*
Anatolian İmam Hatip High School	-	-	5.863*
Anatolian Fine Arts High School	-	-	x
Multi Program Anatolian High School	1.228	-1.267	x
Science High School	2.799*	-4.256*	3.013*
Vocational and Technical Anatolian High School	0.075	-1.305	2.204*
Social Sciences High School	-	-1.556	-3.016*

* $p < 0.05$

-: School type not represented in PISA sample

x: Significance test is not performed since there is no ratio change between applications.

DISCUSSION and CONCLUSION

Turkey participates in the PISA studies regularly since the year of 2003. It is emphasized in both national and international reports that the performance of Turkey is on an increasing trend between PISA 2003 and PISA 2012 (MEB, 2010; MEB, 2013; MEB, 2019a, OECD, 2019a). However, the performance of Turkey decreased dramatically in PISA 2015 in all literacy fields. It is reasonable to infer that possible reasons for this decrease are low-representatives of PISA 2015 sample in terms of school type distribution which can be seen in Table 1, and computer-based application of PISA in Turkey for the first time in PISA 2015. On the other side, Turkey is one of the three country which increases its performance significantly in all literacy fields. Also, the mean scores of Turkey reached their maximum

levels in science and mathematics since PISA 2003. It is emphasized by OECD that the increasing trend of performance of Turkey continues in PISA 2018, and the decrease in PISA 2015 is considered as an “anomaly” (OECD, 2019a). Therefore, Turkey continues to improve literacy performance in PISA despite the growing population of 15-years-olds (OECD, 2019a).

Between-school and within-school academic achievement differences are important elements evaluated in the framework of equal opportunities in education. Regardless of the type of school in which they are, providing the students with the necessary opportunities to gain the expected cognitive skills is an important step taken to ensure equal opportunities in education systems (Önder and Güçlü, 2014; Turan, Açıkalin and Şişman, 2007). Huge achievement differences among schools lead to decrease in homogeneity within schools, and thus, low-performing students cannot have academic support which they need (Lavy, Paserman and Schlosser, 2011; Mendolia, Paloyo and Walker, 2018). So it is the ideal that there are no huge differences between schools and students with diverse academic performance levels take education within schools together. Educating the students with heterogenic academic performance levels within schools also increases the contribution of peer-education to academic achievement (Brunello, 2004; Hanushek and Woessmann, 2006; Ozer and Perc, 2020). In this case, students can choose the type of school they will continue their education in line with their interests and abilities rather than a career path or employment opportunities. Also, in this case, the pressure of the examinations and methods used in determining the schools in which students will continue their education have a low level on education systems. In the 2023 Education Vision announced in 2018, the Ministry of National Education has determined to reduce the differences in success among schools as one of the main goals (MEB, 2018b).

Differences in academic achievement between-schools and within-schools has long been a controversial issue in Turkey (Alacacı and Erbaş, 2010; Albayrak, 2009; Ataş and Karadağ, 2017; Berberoğlu and Kalender, 2005; Çiftçi, 2006; Erdoğan, 2018; Köse, 1999; Özdemir, 2016; Yalçın and Tavşancıl, 2014). In Turkey, by increasing the diversity and number of students in secondary schools, it has been tried many different models in the transition to secondary school. Despite the diverse cross-level transition systems applied, academic achievement differences between school types continue to exist significantly. In the studies conducted, it is seen that the differences in academic achievement between school types begin to occur at the secondary school level, and these differences continue to increase in secondary education (MEB 2016; MEB, 2018a; ÖSYM, 2018). Therefore, academic achievement differences between school types are the result of a cumulative process, not a single educational level.

In this study, changes in student performance by school types in Turkey on PISA study is examined. In order to examine the differences in performance among school types in more detail, the distribution of students to proficiency levels, one of the most important outputs of PISA study, was used. In this context, the change in the PISA applications of student ratios with basic literacy level (the ratio of students in the second and higher level of proficiency) and advanced literacy level (the ratio of the students in the fifth and sixth level of proficiency) in each school type is examined.

The results of this study showed that in all of the applications between 2003 and 2018 when Turkey attended PISA, there are significant differences between types of school in terms of student proficiency levels. In all three fields, almost all science high school and social science high school students have reached basic proficiency levels. Even in PISA 2015, where the performance decrease was observed in other school types, there was no significant decrease in the ratio of students with basic literacy among science high school students. Findings related to science high schools and social sciences high schools show that almost all students in these high schools have basic literacy in all three fields, regardless of the structure of the transition systems.

The ratio of students with basic proficiency among Anatolian high school students showed a significant increase in mathematics and science among PISA applications and remained close to reading literacy in 2009. The findings show that after PISA 2015, when Anatolian imam hatip high school and Anatolian fine arts high school students were included in the sample, school types were collected in two groups.

The first group includes science high school, social sciences high school, and Anatolian high school with more than 70% of students having basic proficiency in all three fields in PISA 2015 implementation and afterwards. In the second group, there are vocational and technical Anatolian high schools and multi-program high schools, where the ratio of students with basic proficiency is lower. The access of students to basic literacy from these two school types showed significant and remarkable changes in both directions.

Between PISA 2015 and PISA 2018 applications, of which they are included in the sample, there has been a tendency to increase the access to the basic proficiency level of students in Anatolian imam hatip high schools and Anatolian fine arts high schools. The increase in ratios of students with basic literacy proficiency in mathematics and science in Anatolian imam hatip schools is remarkable (14% and 19.8%, respectively). Additionally, it is found that the ratio of students in Anatolian imam hatip high schools with advanced proficiency increased significantly in all literacy fields in PISA 2018. Therefore, the ratio of students in Anatolian imam hatip high schools with both basic- and advance proficiency increased significantly in all literacy fields in PISA 2018.

On the other hand, the increases in Anatolian fine arts high schools have not reached a significant level yet. In the future PISA applications, the longitudinal evaluations about the performance of students in these school types will be made after the new PISA applications.

Academic achievement differences between school types become clearer when the ratio of students at an advanced level in terms of literacy is examined. Science high schools perform considerably higher than other school types in terms of student ratios with advanced literacy. Although social sciences high schools and science high schools are similar in terms of students with basic literacy proficiency, they differ greatly in terms of students with advanced literacy proficiency. In PISA 2018, the ratio of students with advanced literacy proficiency in Anatolian high schools is higher in all three areas compared to social science high schools.

Among the students who are in multi-program Anatolian high school and vocational and technical Anatolian high schools, the ratio of students with advanced proficiency is below 1% in all three fields. It is noteworthy that the ratio of students who have advanced mathematics literacy among vocational and technical Anatolian high school students decreased from 3.8% to 0.5% in PISA 2009 application and then showed a downward trend. Among the types of schools which participated in the sampling of PISA 2015, it was observed that Anatolian fine arts high school students could not reach advanced literacy proficiency in all three areas. Another important finding is that the ratio of students with advanced literacy proficiency among Anatolian Imam High School students increased significantly in all three areas in PISA 2018.

It is an important finding that the ratio of students with basic proficiency in all three literacy fields is lower than 60% in vocational and technical Anatolian high schools and multi-program Anatolian high schools. Among the most important indicators of the achievement difference among the school types are the fact that the student ratios at advanced proficiency levels in these school types are below 1% and even in some PISA applications, no student can reach the advanced proficiency levels.

The huge achievement differences between science high schools, social sciences high schools, and other high school types strengthen the opinion that these differences are directly related to student input. With school tracking at an early age in Turkey, students are involved in a process which is quite decisive for life and career training. In this process, students tend to be grouped in school types according to their academic achievement levels and indirectly their socioeconomic levels (Özdemir, 2016; Ozer and Perc, 2020). As a result of this situation, there is a very heterogeneous distribution among school types in terms of academic achievement and student behavior. For example, high school dropout and high absenteeism ratios in vocational and technical Anatolian high schools compared to other school types affect student performance (Ozer, 2018; Ozer, 2019a).

In order to reduce the achievement differences between school types, it is necessary to support low performing school types academically, socially and financially. In the current situation, it is observed

that the opportunities transferred to schools with higher academic achievement such as science high school and social sciences high school are higher (Özdemir, 2016). In this sense, it is important to support schools with lower achievements in terms of teacher quality and financial resources, and to make positive discrimination when necessary (Ozer, 2020). Thus, the areas of development of students can be determined in low-achieving school types and intervention can be carried out in a short time.

In the context of Turkey's Education Vision 2023, numerous projects such as Turkish-Mathematics-Science Student Monitoring Study (TMF-ÖBA) (MEB, 2019b), Supporting Program in Elementary Schools (İYEP), and the steps to strengthen vocational and technical education (VET) in Turkey are conducted to minimize the academic achievement differences between school types. Within the scope of VET, increasing the collaboration between MoNE and sectors, establishing the balance of supply-demand chain on a rational base, increasing accessibility of VET via recently established online platforms, selecting high performing students (at 1% of achievement level) to VET institutions are some of the examples for steps to strengthen VET by MoNE (Ozer, 2019b; Ozer and Suna, 2019; Ozer and Suna, 2020). It is suggested to take steps that increase the academic heterogeneity within the schools and to begin these implementations with schools with high performing students. With increasing heterogeneity within schools, disadvantaged students can have the academic support they need, and peer-education can increase its positive effect on these students' learning process.

REFERENCES

- Australian Council for Educational Research (2014). *Australian students' readiness for study, work and life in the digital age: ICILS 2013*. Australia: ACER Publishing.
- Alacacı, C., & Erbaş, A. K. (2010). Unpacking the inequality among Turkish schools: Findings from PISA 2006. *International Journal of Educational Development*, 30, 182-192.
- Albayrak, A. (2009). *PISA 2006 sınavı sonuçlarına göre Türkiye'deki öğrencilerin fen başarılarını etkileyen bazı faktörler*. (Yayımlanmamış Yüksek Lisans Tezi. Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü).
- Ataş, D., & Karadağ, Ö. (2017). An analysis of Turkey's PISA 2015 results using two-level hierarchical linear modelling. *Journal of Language and Linguistic Studies*, 13(2), 720-727.
- Berberoğlu, G., & Kalender, İ. (2005). Öğrenci başarısının yıllara, okul türlerine, bölgelere göre incelenmesi: ÖSS ve PISA analizi. *Eğitim Bilimleri ve Uygulama*, 4(7), 21-35.
- Bourdieu, P. (1986) The forms of capital. In J. Richardson (Ed.) *Handbook of theory and research for the sociology of education* (New York, Greenwood), 241-258.
- Bourdieu, P., & Passeron, J. C. (2010). *Reproduction in education, society and culture*. London: Sage Publications.
- Brunello, G. (2004). *Stratified or comprehensive? Some economic considerations on the design of secondary education*. CESifo DICE Rep 4:7-10.
- Coleman, J. et al. (1966). *Equality of educational opportunity*. Washington D. C.: U. S. Government Printing Office.
- Coleman, J., Hoffer, T., & Kilgore, S. (1982). Cognitive outcomes in public and private schools. *Sociology of Education*, 55(2-3), 65-76.
- Coleman, J., & Hoffer, T. (1987). *Public and private high schools: The impact of communities*. New York: Basic Books.
- Çiftçi, A. (2006). *PISA 2003 sınavı matematik alt testi sonuçlarına göre Türkiye'deki öğrencilerin başarılarını etkileyen bazı faktörlerin incelenmesi*. (Yayımlanmamış Yüksek lisans tezi. Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü).
- Darling-Hammond, L. (2014). What can PISA tell us about US education policy?. *New England Journal of Public Policy*, 26, 1. Erişim adresi: <http://scholarworks.umb.edu/nejpp/vol26/iss1/4>.
- Erdoğan, E. (2018). *Uluslararası öğrenci değerlendirme programında öğrencilerin sosyoekonomik özellikleri ile okuma becerileri arasındaki ilişki*. (Yayımlanmamış Yüksek Lisans Tezi. Trakya Üniversitesi Sosyal Bilimler Enstitüsü).
- Eğitimde Reform Girişimi (2009). *Eğitimde eşitlik: Politika analizi ve öneriler*. ERG Raporları. Retrieved from www.egitimreformugirisimi.org/wp-content/uploads/2017/03/Egitimde_Esitlik_Politika_Analizi_ve_Oneriler_1.pdf.
- Ferreira, F. H. G., Gignoux, J., & Aran, M. (2010). *Measuring inequality of opportunity with imperfect data the case of Turkey*. The World Bank Policy Research Working Paper 5204.
-

- Greenwald, R., Hedges, L. V., & Lane, R. D. (1996). The effects of school resources on student achievement. *Review of Educational Research, 66*, 361-396.
- Gür, B.S., Çelik, Z., & Özöglu, M. (2012). Policy options for Turkey: A critique of the interpretation and utilization of PISA results in Turkey. *Journal of Education Policy, 27*(1), 1-21.
- Hanushek, E.A., & Woessmann, L. (2006). Does educational tracking affect performance and equality? Differences-in-differences evidence across countries. *Economic Journal, 116*, 63-76.
- Hanushek, E.A., & Woessmann, L. (2007). *The role of education quality in economic growth*. World Bank Policy Research Working Paper. 4122.
- Hopfenbeck, T.N., Lenkeit, J., El Masri, Y., Cantrell, K., Ryan, J., & Baird, J.A. (2018). Lessons learned from PISA: A systematic review of peer-reviewed articles on the Programme for International Student Assessment. *Scandinavian Journal of Educational Research, 62*(3), 333-353.
- Inter-American Development Bank (2012). *Assessing educational equality and equity with large-scale assessment data: Brazil as a case study*. IDB Technical Notes No. IDB-TN-389. Retrieved from <https://publications.iadb.org/publications/english/document/Assesing-Educational-Equality-and-Equity-with-Large-Scale-Assessment-Data-Brazil-as-a-Case-Study.pdf>
- International Association for the Evaluation of Educational Achievement (2010). *ICCS 2009 international report: Civic knowledge, attitudes, and engagement among lower secondary school students in 38 countries*. Amsterdam: IEA Publishings.
- Karasar, N. (2005). *Bilimsel araştırma yöntemi*. Ankara: Nobel Yayın Dağıtım.
- Köse, M. R. (1999). Üniversiteye giriş ve liselerimiz. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 15*, 51-60.
- Lavy, V., Paserman, M., & Schlosser, A. (2011). Inside the black box of ability peer effects: Evidence from variation in the proportion of low achievers in the classroom. *The Economic Journal, 122*(559), 208-237.
- Levin, B. (2003). *Approaches to equity in policy for lifelong learning*. OECD Equity in Education Thematic Review Paper. Retrieved from <https://www.oecd.org/education/school/38692676.pdf>.
- Malik, R. S. (2018). Educational challenges in 21st century and sustainable development. *Journal of Sustainable Development Education and Research, 2*(1), 9-20.
- Milli Eğitim Bakanlığı (2010). *PISA 2006 projesi: Ulusal nihai rapor*. Ankara: MEB Yayınları.
- Milli Eğitim Bakanlığı (2013). *PISA 2012 ulusal ön raporu*. Ankara: MEB Yayınları.
- Milli Eğitim Bakanlığı (2016). *Akademik becerilerin izlenmesi değerlendirilmesi (ABİDE) 2016: 8. sınıf raporu*. Ankara: MEB Yayınları.
- Milli Eğitim Bakanlığı (2018a). *2018 Liselere geçiş sistemi (LGS): Merkezi sınavla yerleşen öğrencilerin performansı*. Eğitim Analiz ve Değerlendirme Raporları Serisi No:3. Ankara: MEB Yayınları.
- Milli Eğitim Bakanlığı (2018b). *2023 eğitim vizyonu*. Ankara: MEB Yayınları.
- Milli Eğitim Bakanlığı (2019a). *PISA 2018 Türkiye raporu*. Ankara: MEB Yayınları.
- Milli Eğitim Bakanlığı (2019b). *Türkçe-Matematik-Fen Bilimleri Öğrenci Başarı İzleme Araştırması (TMF-ÖBA)- I: 2019 4. sınıf seviyesi*. Eğitim Analiz ve Değerlendirme Raporları Serisi No:9. Ankara: MEB Yayınları.
- Mendolia, S., Paloyo, A., & Walker, I. (2018). *Heterogeneous effects of high school peers on educational outcomes*. Oxford Economic Papers. Retrieved from <http://dx.doi.org/10.1093/oenp/gpy008>.
- Mortimore, P., Sammons, P., Stoll, L., Lewis, D., & Ecob, R. (1988). *School matters*. Berkeley, CA: University of California Press.
- National Economic & Social Council (2012). *Understanding PISA and what it tells us about educational standards in Ireland*. NECS Secretariat Papers No:2. Retrieved from <https://www.nesc.ie/publications/nesc-secretariat-paper-02-2012-understanding-pisa-and-what-it-tells-us-about-educational-standards-in-ireland/>.
- Organisation for Economic Cooperation and Development (2007). *Reviews of national policies for education: Basic education in Turkey*. Paris: OECD Publishing.
- Organisation for Economic Cooperation and Development (2014). *Learning for tomorrow's world: First results from PISA 2003*. Paris: OECD Publishing.
- Organisation for Economic Cooperation and Development (2016). *PISA 2015 results: Excellence and equity in education – Volume I*. Paris: OECD Publishing.
- Organisation for Economic Cooperation and Development (2017). *PISA 2015 technical report*. Paris: OECD Publishing.
- Organisation for Economic Cooperation and Development (2019a). *PISA 2018 results: What student know and can do - Volume I*. Paris: OECD Publishing.
- Organisation for Economic Cooperation and Development (2019b). *PISA 2018 results: Where all students can succeed – Volume II*. Paris: OECD Publishing.
-

- Ozer, M. (2018). 2023 eğitim vizyonu ve mesleki ve teknik eğitimde yeni hedefler [The 2023 education vision and new goals in vocational and technical education]. *Yükseköğretim ve Bilim Dergisi*, 8(3), 425–435.
- Ozer, M. (2019a). Mesleki ve Teknik eğitimde sorunların arka planı ve Türkiye'nin 2023 Eğitim Vizyonunda çözüme yönelik yol haritası [Background of problems in vocational education and training and its road map to solution in Turkey's education vision 2023]. *Yükseköğretim ve Bilim Dergisi*, 9(1), 1–11.
- Ozer, M. (2019b). Reconsidering the fundamental problems of vocational education and training in Turkey and proposed solutions for restructuring. *İstanbul Üniversitesi Sosyoloji Dergisi*, 39(2), 1–19.
- Ozer, M., & Suna, H.E. (2019). Future of vocational and technical education in Turkey: Solid steps taken after Education Vision 2023. *Eğitim ve İnsani Bilimler Dergisi: Teori ve Uygulama*, 10(20), 166–192.
- Ozer, M. (2020). *What PISA tells us about performance of education systems? Bartın University Journal of Faculty of Education*, 9(2), 217-228.
- Ozer, M., & Perc, M. (2020). Dreams and realities of school tracking and vocational education. *Palgrave Communications*, 6, 34.
- Ozer, M., & Suna, H. E. (2020). The linkage between vocational education and labor market in Turkey: Employability and skill mismatch. *Kastamonu Education Journal*, 28(2), 558-569.
- Önder, E., & Güçlü, N. (2014). İlköğretimde okullar arası başarı farklılıklarını azaltmaya yönelik çözüm önerileri. *Eğitim Bilimleri Dergisi*, 40, 109-132.
- Ölçme, Seçme ve Yerleştirme Merkezi (2018). *2018 YKS değerlendirme raporu*. Değerlendirme Raporları Serisi No:9. Ankara: ÖSYM Yayınları.
- Özdemir, C. (2016). Equity in the Turkish education system: A multilevel analysis of social background influences on the mathematics performance of 15-year-old students. *European Educational Research Journal*, 15(2), 193–217.
- Rosenholtz, S. J. (1985). Effective schools: Interpreting the evidence. *American Journal of Education*, 93, 352–388.
- Rutkowski, D., Rutkowski, L., & von Davier, M. (2014). A brief introduction to modern international large-scale assessment. In Rutkowski, L., von Davier, M., & Rutkowski, D. *Handbook of international large-scale assessment: Background, technical issues, and methods of data analysis*. CRC Press, Taylor & Francis, pp 3-11.
- Scheerens, J. (1992). Evaluating non-cognitive aspects of education. In Vedder, P. (ed.) *Measuring the quality of education*. Amsterdam: Swet & Zeitlinger Inc.
- Scheerens, J., & Creemers, B. P. M. (1989). Conceptualizing school effectiveness. *International Journal of Educational Research*, 13, 691–706.
- Schumacker, R. E. (2015). *Learning statistics using R*. California: SAGE Publications.
- Thomson, S. (2019). *Assessing and understanding social and emotional skills: The OECD Study on Social and Emotional Skills*. ACER Conference Paper. Retrieved from https://research.acer.edu.au/cgi/viewcontent.cgi?article=1354&context=research_conference
- Turan, S., Açıklık, A., & Şişman, M. (2007). *Bir insan olarak müdür*. Ankara: Pegem Yayıncılık.
- Wang, M.C., Haertel, G.D., & Walberg, H.J. (1993). Toward a knowledge base for school learning. *Review of Educational Research*, 63, 249-294.
- Woessmann, L. (2016). The importance of school systems: Evidence from international differences in student achievement. *Journal of Economic Perspectives*, 30(3), 3-32.
- Yalçın, S., & Tavşancıl, E. (2014). The comparison of Turkish students' PISA achievement levels by year via data envelopment analysis. *Educational Sciences: Theory and Practice*, 14(3), 961- 968.