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GENDER AND STUDENT ACHIEVEMENT IN TURKEY: SCHOOL TYPES AND REGIONAL DIFFERENCES BASED ON PISA 2012 DATA

A MASTER'S THESIS

BY

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THE PROGRAM OF CURRICULUM AND INSTRUCTION
İHSAN DOĞRAMACI BILKENT UNIVERSITY
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To my beloved family…

GENDER AND STUDENT ACHIEVEMENT IN TURKEY: SCHOOL TYPES AND REGIONAL DIFFERENCES BASED ON PISA 2012 DATA

The Graduate School of Education

of

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Bora Arga

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I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Curriculum and Instruction.

Asst. Prof. Dr. İlker Kalender (Supervisor)

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ABSTRACT

GENDER AND STUDENT ACHIEVEMENT IN TURKEY: SCHOOL TYPES AND REGIONAL DIFFERENCES BASED ON PISA 2012 DATA

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M.A., Program of Curriculum and Instruction

Supervisor: Asst. Prof. Dr. İlker Kalender

May 2017

Gender inequality has always been a major global issue in all fields. Unfortunately, we are living in a world that is still dealing with this persistent problem, the core of which is primarily education. According to global indexes and surveys, Turkey is almost always well below the world average in ensuring gender equality. In this sense, this study uses PISA 2012 data to explore whether the student achievement differs in Turkey between female and male students. The relationship between student achievement and several variables i.e. Teacher Student Relations, Attitude Towards School: Learning Outcomes, Attitude Towards School: Learning Activities, and Sense of Belonging to School was also examined. Two control variables were included in the analyses conducted: geographical regions and school types, in addition to the above-mentioned school related variables. The results indicate that there are no major gaps between genders; yet, school types equally affect both genders dramatically. Geographical regions only contribute to the between-schools differences; while school related variables, make no difference in Turkish students' achievement levels. The results also show that higher level of variables should be considered as evidenced by the variation between school types before focusing on teaching-level variables. In this context, Turkish educational system should shift its focus from gender as the primary issue to the immense variances between schools in order to ensure a better education that will result in higher averages.

Keywords: Gender, Achievement, PISA, Student Background Variables

ÖZET

Türkiye’de Cinsiyet ve Öğrenci Başarısı: PISA 2012 Verisine Göre Okul Türleri ve Bölgeler Arası Farklılıklar

Bora Arga

Yüksek Lisans, Eğitim Programları ve Öğretim

Tez Yöneticisi: Yrd. Doç. Dr. İlker Kalender

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Cinsiyet eşitsizliği her alanda her zaman küresel bir sorun olmuştur. Ne yazık ki, temeli eğitime dayanan bu sorunla hala mücadele eden bir dünyada yaşamaktayız. Küresel endekslere ve anketlere göre Türkiye cinsiyet eşitliğini sağlamak konusunda neredeyse her zaman dünya ortalamasının oldukça altında kalmıştır. Bu bağlamda, bu çalışma PISA 2012 verisini kullanarak Türkiye'de öğrenci başarısının kız ve erkekler için farklılık gösterip göstermediğini araştırmaktadır. Çalışma aynı zamanda öğrenci başarısı ile Öğrenci-Öğretmen İlişkileri, Okula Karşı Yaklaşım: Öğrenim Çıktıları, Okula Karşı Yaklaşım: Öğrenim Etkinlikleri, Okula Bağlılık gibi bazı değişkenlerin ilişkisini de incelemektedir. Yukarıda bahsedilen okulla ilgili bazı değişkenlere ilaveten coğrafi bölgeler ve okul türleri olmak üzere iki kontrol değişkeni de analizlere dahil edilmiştir: Elde edilen sonuçlara göre cinsiyetler arasında büyük bir fark yoktur; fakat, okul türü farklılıkları her iki cinsiyeti de eşit olarak ciddi bir biçimde etkilemektedir. Coğrafi bölge farklılıkları sadece okul türleri arasındaki farklılıkları artırırken okulla ilgili değişkenler Türkiye’deki öğrencilerin başarı farklılıklarına katkıda bulunmamaktadır. Bu hususta, daha yüksek ortalamaların elde edilmesini sağlayacak daha iyi bir eğitim için Türk eğitim sistemi okul türleri arasındaki ciddi farklılıkları azaltma yoluna gitmelidir. Sonuçların aynı zamanda gösterdiği üzere öğretimle ilgili değişkenler üzerine yoğunlaşmak yerine daha üst seviye değişkenler dikkate alınmalıdır. Bu hususta, daha yüksek ortalamaların elde edilmesini sağlayacak daha iyi bir eğitim için Türk eğitim sistemi esas sorun olarak cinsiyet eşitsizliğine yoğunlaşmaktan ziyade okul türleri arasındaki ciddi farklılıklara yönelmelidir.

Anahtar Kelimeler: Cinsiyet, Başarı, PISA, Öğrenci Arkaplan Değişkenler

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CHAPTER 1: INTRODUCTION

Introduction

Gender inequality has always been a major issue in the world, dramatically affecting the lives of people in all fields; primarily because it is significantly different from, while intersecting with, other types of inequalities present in our lives (Dorius & Firebaugh, 2010). Although women's position in an average country has improved relative to men's, a gap still exists (Schneeweis & Zweimüller, 2011; Shen, 2013). The World Economic Forum's Global Gender Gap Report 2015 covers 145 countries, and shows that 96% of the gap in health outcomes between women and men and 95% of the gap in educational attainment has almost been abolished. Yet, there is still a major gap between women and men, in terms of economic participation and political empowerment: the same countries merely managed to close the 59% of the economic outcomes gap and 23% of the political outcomes gap (World Economic Forum, 2015).

Background

Almost in all science, mathematics, engineering and technology-related disciplines, women do fall behind (Beede et al., 2011), as well as in various types of exams (Bae & Smith, 1997). It is the case even today: Even in top executive jobs, women earn less than men (Bell, 2005; Ilkkaracan & Selim, 2007; Oostendorp, 2009; Kara, 2006; Tansel, 2005). The limitation of the rights of women still remains as the primary factor that forces females to drop their decision of receiving education, and take different paths to their goals (Klasen, 2002; Tembon & Fort, 2008). Although more and more women start a professional career, or aim to pursue a degree in higher education, “in 2006, women earned only 28% of PhDs in physical sciences, 25% in mathematics and computer science, and 20% in engineering in the United States” (as cited in Miyake et al., 2010, p. 1234). Furthermore, the gender difference peaks at the highest levels of scientific achievement; the number of women Nobel laureates in science is less than 3% while no women ever managed to receive any of the most prestigious awards in mathematics, i.e. the Fields Medal, the Abel Prize, and the Wolf Prize (Stoet & Geary, 2013).

While the common belief is that the gender gap is mostly in favour of males, there have been significant global improvements in the education of female students over the last half of the century (Harker, 2000; Sheykhjan, Rajeswari & Jabari, 2014), making drastic unexpected reverse effects: Goldin, Katz and Kuziemko (2006) show that female high school students now perform better than males not only in reading, but also in science and math courses. Similarly, a significant number of other research highlight the same fact; female students do perform better verbally than male students (Chiu & McBride-Chang, 2006; Engin & Ortaçtepe, 2014; Kasapoğlu, 2014; Smith et al., 2012), while male students perform better in mathematics (Gonzales de San Roman & de La Rica, 2016; Gürsakal, 2012). As Guiso, Monte, Sapienza and Zingales (2008) conclude, biologically based explanations are in line with the results of the research conducted, but fail to show a significant difference between the two genders. Thus, one might argue that the core problem causing the gender gap in education is a direct consequence of social conditioning and gender-biased environments.

Furthermore, also contrary to the common belief, some researchers argue that “boys’ notorious underperformance in school and their tendency to disrupt the learning process in classrooms has sparked intense academic and public debates” (Legewie &

DiPrete, 2012, p. 463). Yet, regardless of their theories, researchers take a similar stance when it comes to the identification of the cause of the problem: Gender differences during childhood form the basis of gender inequality that adolescents face in each culture. Inevitably, the culture that students live in affects how they see their school, whether they take it seriously, and their efforts to be successful. (Legewie & DiPrete, 2012).

In Turkey, the gender gap in education, the cause of which is mostly the same with the rest of the world, is considerably higher (Duman, 2010; Gumus & Chudgar, 2016), especially in the conservative parts of Turkey where patriarchy affects the culture far more significantly; parents simply hold the view that educating males is of utmost importance, while educating females is not necessarily essential. In this case, one might also argue that the reliability of the data provided by any consensus or similar type of survey in general, are in jeopardy thus barely reflect the reality, since mothers or students themselves may be prone to give false answers because of the presence of a patriarchal father figure at home, who inevitably, either directly or indirectly affects the responses they give. This also explains why some research show that fathers' education status is an important predictor of student achievement (Anıl, 2009). Despite the 1997 education reform which merges the first two levels of education, i.e. 5 years of primary and 3 years of middle schooling, thus bringing the school leaving age up from 11 to 14, Turkish female students still have a significantly lower level of enrolment when compared to European Union average (Akşit, 2007; Çelen, Çelik & Seferoğlu, 2011; Dinçer, Kaushal & Grossman, 2013). School attainment levels of Turkish students, despite being widely believed to be mainly affected by cultural perspectives, are also dramatically influenced by the economic factors (Özdemir & Gelbal, 2014), which can be consequences of parental education, and thus, occupation.

Consequently, although enrolment rates are acceptable at primary school level, only half of the primary school graduates can make their way to middle school in Eastern regions of Turkey (Tansel, 2000). Moreover, this issue becomes even more serious when the attainment levels are examined in terms of the gap between males and females. While the perspective of uneducated parents prevents females from going to school, their employment status and business are also significant determinants; and the income of the family affects females more than males (Tansel, 2000). More recent data show that the gap still persists despite some reforms, and as one might argue, they indicate that it will remain the same as long as factors directly related to the issue are not dealt with (Dinçer, 2013): Compared to 2% of the males, 7% of the females between ages 8 and 12 never see the school; furthermore, by the age of 15, the 5% enrolment gap between the two genders reaches up to almost 20%, according to 2010 UNESCO data (Caner et al., 2015). Consequently, as almost all the research and data available show, male and female students in Turkey at all levels of education, despite all the efforts, still do not have equal opportunities (Rankin & Aytaç, 2006), posing an immense barrier to the full EU membership of Turkey. Despite doing well in Health and Survival indexes, Turkey comes last in the World Economic Forum's Gender Gap Index in the Europe and Central Asia Region with a score of 0.624, which indicates that there is still an enormous 38% of gender gap overall, primarily because of the persisting gender gap as highlighted in the Educational Attainment Report (World Economic Forum, 2015).

One might hold the view that the inequalities that emerge in education may not necessarily be a direct consequence of gender (Acar & Öğretmen, 2012). It is also the school type that affect student achievement, as well as other variables related to it (Lloyd, Mete & Sathar, 2005; Lubienski, Lubienski & Crane, 2008; Ministry of National Education [MoNE], 2009; Newhouse & Beegle, 2006; Savaş, Taş & Duru, 2010; Schagen & Schagen, 2005). Accordingly, Alacacı and Erbaş (2010) argue that characteristics of schools almost equally influence the performance of the Turkish students, and to underpin this claim, they use PISA 2006 data, while using family background and demographic characteristics as independent variables. They introduce the issue by highlighting the constant educational reform that is required by the rapid growth of young population and economic changes. After reviewing the literature to underline the fact that previous studies claim family background and socio-economic status (SES) play more important role in predicting student performance than school type, and discussing the applicability of the Coleman effect (see Equality of educational opportunity: summary report by Coleman, 1966 for details of Coleman effect) in their introduction, Alacacı and Erbaş (2010) continue with explaining the Social Capital Theory in detail, on which they ground their research. Using different hierarchical models, they conclude that school type plays an important role in explaining student performance in mathematics. As their findings show, even in public school system, students with similar SES seem to attend similar schools. Alacacı and Erbaş (2010) list gender among the variables that play a role in student performance; yet, they do not hold the view that the effect it has is not significant.

Parallel to that, Gumus and Atalmis (2012) compare PISA 2003 and 2009 data and also underline the importance of the SES of the students in terms of explaining their academic achievement as Turkey is one of many countries that indicate a strong link in between. Similarly, they hold the view that school type also affect student achievement significantly, while also highlighting some geographical regions, namely Marmara, Aegean and Central Anatolia as the ones with the highest average.

Berberoğlu and Kalender (2005), in line with Eraslan (2009), also hold the view that school type is one of the key predictor of student achievement in both PISA and national university admission examinations, as they underline the fact that geographical regions do not make a major change. Furthermore, Baysal and Şahenk Erkan (2012) take the idea further and similarly claim that school types, rather than geographical regions are the important student achievement predictors to look at, also using PISA data. They support their findings by quoting from Berberoğlu and Kalender (2005), and Eraslan (2009), stating that the results of PISA 2006 and 2009 data are parallel to PISA 2003 findings of the previous research conducted in that variation between different school types is a predictor of achievement. Those views are in contrast with the findings of Demir and Depren (2009), who argue that even same school types differ in terms of achievement, depending on their region.

Another perspective on school types and gender variables is brought by Park, Behrman and Choi (2013), who conduct their research in South Korea to examine the achievement differences between the single-sex and coeducational schools. They conclude that students from both genders attending single-sex schools achieve substantially better than their counterparts in coeducational schools, regardless of their being public or private.

As mentioned above, inequalities that emerge from variations in between-school types, gender or geographical regions cause issues in the field all around the world, as well as Turkey. One reliable and major source of data that helps researchers identify those education related problems present in different economies all around the world and design solutions is Programme for International Student Assessment (PISA) conducted by Organisation for Economic Cooperation and Development (OECD) (Aydın, Erdağ & Taş, 2011; OECD, 2015). In order to represent 28 million 15-year-old students from 65 countries and economies, around 510.000 students between the ages of 15 years 3 months and 16 years 2 months took the fifth and most recently published one of the surveys, PISA 2012, which aims at measuring their competence in mathematics, reading and science, and in some countries, problem solving and financial literacy, "to enable review and, potentially, replication of the implemented procedures and technical solutions to problems" (OECD, 2013a, p. 26). PISA 2012 tests were a paper-based mixture of multiple-choice items and open-ended questions, and aimed at assessing reproduction, interpretation and application skills of the students in a total of two hours for each student (OECD, 2013a, p. 25).

Problem

Turkey is well-behind in ensuring gender equality in education by decades when compared to the U.S. and EU countries (Kılıç, Çene & Demir, 2012). Figures show that scoring .957, which is even worse than Syria, Turkey is among the last 50 countries in the world out of 145 economies, according to World Economic Forum's Global Gender Gap Index (2015). In UNESCO's "Education for All 2000-2015: Achievements and Challenges" Global Monitoring Report, Turkey is the 65th country on the list, while Palestine is the 53rd, in making a progress in closing the gender gap (UNESCO, 2015).

Although there are parents who think that the gender gap is closing, thanks to the increase in the school enrolment rates of female students and consequently, the number of working women, some argue the opposite; they believe that the increase in the number of working women negatively affect the unity of family members, resulting in an increase in divorcement rates (Eğitimde Toplumsal Cinsiyet Eşitsizliğinin Geliştirilmesi Projesi [ETCEP], 2016).

In this study, the usage of the term gender is not limited to biological differences. It also refers to certain roles defined by Ellis, such as identity, reasoning and spatial skills, raised within the social construct (As cited in Engin, 2012).

Despite years of research and study, no major improvement is still possible to observe, suggesting that there has not been sufficient research providing adequate results to solve the problem: According to the findings of the research conducted by Maya (2006), “Turkey is still well behind the EU countries in terms of girls’ gross schooling rates and gender parity index at all stages of education and expected number of years of girls’ formal schooling from primary school to higher education” (p. 70). According to the PISA 2012 national preliminary report published by the Ministry of National Education (MoNE, 2013), the results of males and females “shows similarity”: Despite being a positive statement, it tells a lot about the persisting problem. The “similar” results can be differently explained by between-schools and between-regions variations. Furthermore, the association between geographical regions and/or school types and student achievement may be clear; however, this relationship should be further examined for males and females separately in order to depict the current situation. It is important to examine these variables since they constitute significant control variables that should be considered before the main predictors of achievement are focused.

Purpose

This study aims to discover the effects of school types and geographical regions in explaining student achievement with respect to gender. Furthermore, some school- and teacher-related variables (Teacher Student Relations, Attitude towards School: Learning Outcomes, Attitude towards School: Learning Activities, and Sense of Belonging to School) will also be taken into consideration to see whether they influence student achievement as well as school types and geographical regions.

To this end, two separate regression analyses will be conducted on PISA 2012 dataset. School type and geographical region will be included as control variables while the above-mentioned four variables will be examined as main predictors.

Research questions

1. What are the factors explaining 15 years-old Turkish male and female students' achievement in PISA 2012 data set?
    a. Does variation in geographical region explain student achievement?
    b. Does variation in school type explain student achievement?
    c. Do several school and teacher-related variables explain student achievement?

Significance

Gender discrimination is a major problem that requires attention not only in Turkey but in all parts of the world. Especially in Turkey, there is a need for studies in this area explaining factors and differences that determine the achievement levels of the students in school, in relation to their genders. Such studies are especially important in that social norms and dynamics may assign different roles and expectations to male and female students. Considering that what school type students attend to and regions students in live is a result of SES, different pictures should be depicted for male and female students. Ministry of National Education, school managements, students and people working in the field may eventually benefit from this study.

CHAPTER 2: REVIEW OF RELATED LITERATURE

Introduction

As various surveys and research conducted over the years highlight, gender inequality has always been a major issue not only in developing countries like Turkey, but also virtually in all developed countries. Furthermore, the inequality still is a primary issue in school, affecting the achievement levels of mainly females, as well as males. Unfortunately, when compared to the U.S. and EU countries, Turkey is well-behind in ensuring gender equality in education (Shafiq, 2013).

Therefore, this study will be using the data on Turkey to discover how two background variables, i.e. geographical regions and school types, and variables related to school have a relationship with student achievement. In this sense, this chapter reviews the related literature in the field that underpins the data that comes from PISA.

Gender and gender inequality

In most research articles, gender is used as a synonym for sex without any consideration of it as broader term, as exampled by the Journal for Research in Mathematics Education. Damarin and Erchick (2010) examine the articles published in that particular journal and discover that only a limited number of articles recognize the term as standing for beyond-sexual differences; however, they do not provide a clear definition. As put forward by World Health Organization (WHO), the term sex stands for biological differences, while gender refers to social roles (as cited in Damarin & Erchick, 2010). Yet, making a clear distinction on how those terms operate as WHO does is not practically possible as it is still widely controversial.

One major opportunity of discovering the historical background and the current status of the gender inequality is analysing the PISA surveys. PISA is applied to 15 year-old students to measure their competence in mathematics, reading and science, and in some countries, problem solving and financial literacy, “to enable review and, potentially, replication of the implemented procedures and technical solutions to problems” (OECD, 2013a, p. 26). In this sense, PISA surveys provide an invaluable opportunity of making a comparison between the past and present: Some key findings of the surveys between 2000 and 2012 can be given as examples, the gender gap in reading widened in eleven countries in favour of females, while males still perform significantly better in maths and sciences as of 2012 (OECD, 2014).

However, to interpret the data and understand the logic of the surveys conducted, it is crucial to examine the technical reports: As this study will draw the data from the PISA 2012, one might argue that examining PISA 2012 Technical Report, which helps readers understand how the test is designed, developed, managed and implemented, as well as explore more about the methodology, is a crucial step to see how PISA works as a reliable data source.

One example that shows how PISA works can be the comprehensive research on the gender and student achievement relationship by Stoet and Geary (2013), “Sex Differences in Mathematics and Reading Achievement Are Inversely Related: Within- and Across- Nation Assessment of 10 Years of PISA Data”. As its self-explanatory title suggest, the study offers a broad analysis of PISA surveys conducted over the last decade. Their research includes all of the data from all 74 OECD and OECD-partner countries, without any further sampling. In order to calculate the gender gap, they subtracted the male and female students' scores; and to decide whether the findings are statistically significant, they "calculated the standard errors of the difference in accordance with the prescribed procedure of the PISA manual" (Stoet & Geary, 2013, p. 8).

Although the title expresses the view that the mathematics and reading achievement levels are inversely related, it is not precisely the case; across-nations, males scored consistently lower reading scores than females in all four PISA surveys, while there are countries in which female students perform better in mathematics, or there is no gap between the two genders. Other perplexing findings of the research indicate that not every country is successful in closing the gender gap in both mathematics and reading simultaneously; "countries with a smaller sex difference in mathematics had a larger sex difference in reading" (Stoet & Geary, 2013, p. 1).

Although OECD puts the emphasis on PISA to improve education all around the world, they have additional publications based on PISA surveys, which are useful in fully understanding the gender issue. One recently published document is *the ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence*. It mainly deals with the traditional approach to gender and achievement relationship, i.e. at the age of 15, why males cannot be reasonably proficient in reading, mathematics and science when compared to females, and why high-achieving females fail to be on the same level with high-achieving males in certain areas that include mathematics, science and problem solving (OECD, 2015). The ultimate aim of the document is to help 64 countries, where the PISA surveys are carried out, close the gender gap.

In line with the above-mentioned main research questions, the compilation of extensive research results present in the document shows that certain practices do not allow students from both genders to do their best at school. One example given is video gaming: While a wide majority of male students disrupt their own learning process and damage their health spending hours in front of the screen, female students do not, making them more advantageous (OECD, 2015). Furthermore, the report highlights the fact that reading of any sort means better results for both genders in terms of their school performance. However, males and females do not enjoy reading equally; if males liked reading as much as females, OECD expect the average to be 23 points higher (OECD, 2015). Thus, one might argue that the gender inequality is a primary consequence of culture, which dramatically affects the daily practices of students. In many cultures, females do not play video games because they are not supposed to, males do not go out and socialize, or read very often because they have other things to do; beyond the physical differences, culture constructs the gender gap.

However, merely focusing on the big picture, the effect of culture, does not provide satisfactory results in solving the gender inequality problem persisting in almost all societies. Therefore, Edgerton (2010) in his research titled *Habitus and 'Class' and Gender Disparities in Academic Achievement: A Structure-Disposition-Practice Model* extends the theory by basing his analysis of gender disparities in academic achievement on a model by Bourdieu, called *structure-disposition-practice*. Thus, he takes the issue to a level that will lend itself well to qualitative analyses (Edgerton, 2010), thanks to the core concept *habitus,* lying in the heart of the model.

Elaborating his core concept based on theories formulated by sociologists, Edgerton (2010) sets out to explore if "students' habitus is a formative influence on how they react to their educational environments and affects their academic achievement" (p. iii) and thus, explain the gender disparities in educational achievement, since habitus is affected by both social class and gender. Subsequently, he concludes that socio-economic status of the students dramatically affects their habitus, which directly influences their educational achievement. His findings show that the gap between the two genders is overall modest, despite the few differences evident: “the boys outscore the girls in math and science while the girls excel in reading” (Edgerton, 2010, p. iii). Furthermore, he also suggests that socio-economic status affects females more than males, while habitus does the opposite (Edgerton, 2010).

A similar view is held by Ellison and Swanson (2010), who argue that “the gender gap on math tests among high achieving students is consistently much larger” (p. 109) and draw parallels between other researches relying on SAT (Scholastic Aptitude Test) and PISA scores to support their claim. It is also stated that the existence of such a huge gap is “troubling both for reasons of gender fairness and because failures to develop the talent of any group have aggregate consequences” (Ellison & Swanson, 2010, p. 109). While presenting evidence, Ellison and Swanson use the raw data from American Mathematics Competitions (AMC), to which 225.000 students from roughly 3000 U.S. high schools participate, directly without using any sampling method.

One view, expressed at the beginning of the article by Ellison and Swanson is that (2010) at the very high end of the data, percentiles beyond the 99th, the male-female ratio exceeds 10 to 1. Ellison and Swanson take their descriptive analysis further to answer whether, and if so, how the gender gap varies across schools within the U.S. They conclude that the variation is only moderate, and estimate that a significant gender gap is present in almost every U.S. high school. Yet, the variation from school to school is enough to “suggest that the number of girls reaching high performance levels would increase substantially if all school environments could somehow be made to resemble those where girls are currently doing relatively well" (Ellison & Swanson, 2010, p. 110). Finally, they examine the backgrounds of the high-achieving students, again using the same data.

Consequently, it is underlined that high-scoring males and females are drawn from very different pools. While males come from various backgrounds, the highest achieving female students mostly come from a significantly limited number of elite schools (Ellison & Swanson, 2010). One might safely argue that this finding is in line with Edgerton's claim, i.e. females are affected by social-status more than males. It also shows the urgent necessity of examining the gender issue diligently through different lenses.

Supporting the theory that the gender inequality is a social rather than a physical problem, Miyake et al. (2010), in their study titled *Reducing the Gender Achievement Gap in College Science: A Classroom Study of Values Affirmation*, design a socio-psychological way to solve the problem which results in significant benefits: They conduct a randomized double blind study on 283 male and 116 female students to shed light on how underachieving female students can close the gender gap and achieve almost the same results with male students. One might safely argue that gender issues still have significant impact on education today, and Miyake et al. (2010) takes the idea further by claiming that the gender gap in science, technology, engineering and mathematics (STEM) disciplines "goes beyond the limited representation on women" (p. 1234) despite the efforts had been made for years to solve the issue.

As the previous research mostly focused on instructional methods, this research examines the problem through the lens of socio-psychology and use values-affirmation intervention to reduce the college-level gender achievement gap in physics. As part of the research, students write about their personally important values for fifteen minutes in class, three times during a semester. Subsequently, facilitating students to consider most and least important values resulted in a drastic change in how they perceive the stereotype that males perform better than females in physics. At the end, figures concluded from the average of four exams show that the method conducted by these researchers managed to reduce the gender gap significantly, while males still outperform females.

Gender inequality in Turkey

Aiming at drawing attention to the gender inequality in Turkish education system, which is significantly more serious when compared to the U.S. and EU countries, Maya (2013) seeks to explore the gross schooling index and gender parity index in all stages of education, and the duration of formal education on the basis of gender, by comparing Turkey and the EU countries to come up with solid evidence in her study titled *A Comparison of Gender Inequality in Turkish Education System with That of EU Countries*. She uses document analysis method for her research, focusing on the data of Turkey and 27 EU countries taken from OECD, UIS, EURYDICE, and the Ministry of Education, without any sampling method. She, in order to analyse data, examines the percentage and the arithmetic mean of EU countries' values "on the coherent aspects and makes a comparison with the values of Turkey.

Consequently, she takes the stance that "Turkey is still well behind the EU countries in terms of girls' gross schooling rates and gender parity index at all stages of education and expected number of years of girls' formal schooling from primary school to higher education" (Maya, 2013, p. 70). As she argues, an increasing gender inequality does exist at every stage of Turkish education system, and it should be ruled out completely for Turkey to excel in all fields and truly become a member of the EU. She makes some suggestions, such as founding a unit within the Ministry of Education to ensure the equality between males and females - especially at primary and secondary school stages, facilitating transportation services for countryside students to improve schooling, founding pre-school institutions near primary schools, involving parents in the decision-making process within school commissions to make sure that females receive primary and secondary education, and so forth.

On the other hand, different from the other articles focusing on the gender gap in the education system of Turkey, Caner, Guven, Okten and Sakalli (2015) also examine the effect of the 1997 education reform, i.e. the extension of compulsory schooling from 5 to 8 years, by using it as a "natural experiment" in their study called *Gender Roles and the Education Gap in Turkey*. They carry out their analysis in two sets. In the first set, they test two hypotheses, "a female child has a lower educational attainment than a male child, on average" and "the effect of a mother's views related to gender roles on the educational attainment of her child varies by the gender of the child", respectively (Caner et al., 2015, p. 1). In the second set, the hypotheses tested are the following: In 1997, with a law change that extends the duration of compulsory schooling narrowed the effects of traditional views of mothers, which results in the gender gap (Caner et al., 2015). Ordinary least squares technique is used for both sets to estimate the equations, while the data is taken solely from Turkish Demographic and Health Surveys, carried out in 1998 and 2003.

Caner et al. (2015) take the research further by looking at mothers' response to the reform and the change in their traditional views, and express the view that the reform contributed to the reduction of school dropout rates throughout Turkey. However, they conclude that, as opposed to popular belief, the reductions in school dropout rates equally affective for male and female students, therefore the gender gap remained the same (Caner et al., 2015).

One other research that depicts the condition of Turkey and its insubstantial development over the last years is by Özmusul and Kaya (2014). Titled “A Comparative Analysis of the Results of Turkey’s PISA 2009 and 2012”, the study aims at discovering the place of Turkey at the international context in reading, math and science skills: While Turkey is still well behind most countries and well below OECD average in all fields, ranking 31st in 2009 and 27th 2012 with an insignificant improvement, has managed to achieve the European Education and Training 2020 benchmark, which is set at 15% in terms of decreasing the share of low achieving females, with 12%. However, Turkey has still not been able to lower the excessive number of low achievers overall and meet the standards of the same benchmark when both genders are taken into consideration.

These researchers also argue that Turkey is consistently among the countries that have serious problems in terms of learning outcomes, despite having certain improvements. Different from other research, they highlight the fact that GDP of a country do not actually play an important role in the achievement levels of the students, since it can only explain the 6% of the variance. As this finding suggests, the rest of the variance can only be explained by policies of the Ministry of National Education and related institutions.

Özmusul and Kaya (2014) also compare PISA 2009 and 2012 findings in terms of average points difference between the genders, and highlight a minor improvement in favour of females in mathematics: They conclude that the gap decreased from 11 points in 2009 to 8 points in 2012. It is relatively the same in science, Özmusul and

Kaya indicate a minor improvement in favour of females; the gap reduced to 10 from 12 between the years 2009 and 2012. However, the gap in literacy levels increased from 43 points in 2009 to 46 points in 2012, again, in favour of females, indicating a persisting gap against males.

Another gender-related comparison conducted by Özmusul and Kaya covers the difference in the status of the low-achieving males and females between the years 2009 and 2012, and it is underlined that results only indicate a 1% of improvement in favour of females in terms of mathematics. When it comes to literacy levels of males, no significant improvement can be concluded either; the findings indicate a mere 2% decrease in their number (Özmusul & Kaya, 2014).

The research in the field taking gender into consideration is not limited to past five years: Dincer and Uysal (2010), in their study titled "The determinants of student achievement in Turkey", draw data from the PISA 2006 survey. The first variable they examine, holding the view that it may have a significant effect on student achievement, is the gap in the enrolment rates of the students. It is estimated that low achieving students are more likely to drop school, inevitably causing the remaining group of students to perform better in tests. Furthermore, as females are more likely to drop school due to their socioeconomic status, or the culture of the society they live in, they may affect the test scores in terms of gender effect, causing an upward bias. Although they estimate the gender gap as a major factor, they only conclude that gender does not significantly affect science literacy results, while making no remarks on the other two domains, i.e. literacy and mathematics.

Gür, Çelik and Özoğlu (2012), different from Dincer and Uysal (2010), also include the PISA 2003 results in their study called "Policy options for Turkey: a critique of the interpretation and utilization of PISA results in Turkey", in addition to PISA 2006 data. A link between the educational reform and PISA 2003 findings is also established in the study; hold the view that Ministry of National Education had already decided to redesign the educational system long before PISA 2003 findings were published (2011).

In order to explain the logic behind using the PISA data and its effect on the Ministry of National Education, Gür et al. (2012) talk about the OECD: Highlighting the fact that the organization does not have a political or economic power over its members, they hold the view that the organization merely is influential with their extensive research. This inevitably creates an unbiased atmosphere, and results allegedly have a huge impact when released on media, from which the Ministry of National Education is affected. However, Gür et al. (2012) also state that PISA 2003 results do not reflect the reality, as claimed by other researchers: Although males outperform females in mathematics in Turkey according to PISA 2003 data, TIMSS 1999 and 2007 results show that there is no statistically significant mean difference between females' and males' achievement levels in mathematics. This indicates that more recent PISA questionnaires may not be in line with the other research done in the field and may not reflect the reality as well.

"Inequality of Opportunity for Education: The case of Turkey" is another crucial document that focuses on the gender issue. Published cooperatively by Turkish State Planning Organization and World Bank, the document uses TDHS of 2003 and 2004, and PISA 2006 data to handle the educational problems in Turkey in terms of attainment and achievement, while also taking the economic growth of the country into account.

These quantitative and qualitative aspects of education are affected by various factors such as regions and family backgrounds, but the primary determinant is gender. According to Ferreira and Gignoux (2010), gender explains the gap in enrolment but not in achievement, since females perform as well as, or even better than males once they make their ways to school. They also hold the view that regional differences are not statistically significant, despite being large. Instead, they underline the fact that differences in family background are crucial for children, primarily father's occupation or income, especially for females (Ferreira & Gignoux, 2010).

Similar to other documents, publications and essays, Ferreira and Gignoux (2010) also identify the core of the problem as attainment, by providing numerical data from the above mentioned sources. As they conclude, the number starts to drop significantly at the age of 13 and continues until 16, when the drop rate peaks. In order to support their thesis, they highlight the fact that female enrolment is 20% lower than male enrolment at the age of 15, which shows the severity of the problem.

As well as many academics, the Turkish Ministry of National Education (MoNE) is also aware of the severity of the problem, and they initiated a programme called ETCEP, a Turkish acronym standing for *Programme for Social Gender Equality in Education*. After a comprehensive research funded by both the Turkish Government and the EU, the committee published a report which provides information on almost all variables that have direct consequences on the issue.

One particular section of the report, in which professionals working at MoNE interviewed, is highly striking. A female administrator states that gender is not a serious issue, but some children are forced to look after the elderly, or go and work in the field; therefore, females such as child brides are sometimes ignored. On the other hand, another administrator also working at MoNE, this time male, thinks that there is not much difference between males and females; yet, families may not want their daughters to take the same school bus with males (ETCEP, 2016). While it is also disturbing to see that administrators working at MoNE cannot make the distinction between the words lady and madam, the same people underline the fact that gender inequality is also present in the structure of MoNE: 97% of the people taking the exams for inspector positions are male, because rules and regulations of being an inspector are designed for males (ETCEP, 2016). Furthermore, the views of the participants related with the projects that MoNE design to eliminate gender inequality are also included in the report: Some think that gender inequality either does not exist at all but depicted as if it does, or exaggerated for no apparent reason; thus, no projects or additional policies are needed (ETCEP, 2016).

Geographical regions, school types and school related variables

A work by Jones (2002), titled *Education participation and outcomes by geographic location*, is one of the Longitudinal Surveys of Australian Youth research reports. Published in 2002 in cooperation with Australian Council for Educational Research, the report aims to explore the relationship between geographical locations, other school-related variables and their influence on educational participation.

LSAY uses two different samples both of which equally represent the Australian nation and consist of over 13.000 Year 9 students, selected in 1995 and 1998. This provided the researcher a detailed data as it examined the students from Year 9 to the end of their secondary education. Geographical locations were divided into three: ‘Metropolitan Zone’ if the population is over 100.000, ‘Provincial Zone’ if the population is between 10.000 and 99.999, and ‘Remote Zone’, a group used for the remainder. Students from the sample were assigned to each geographical category based on their postcodes and the ratio is 55 per cent, 25 per cent and 20 per cent, respectively (Jones, 2002).

Jones (2002) explicitly concludes that achievement inequalities caused by regional differences is weaker than those caused by school related variables. He also holds the view that seemingly regional differences can be explained by the population differences between regions. Although location differences have a statistically significant effect on Year 9 students' reading and numeracy scores, it is not as strong as those associated with background characteristics (Jones, 2002).

Another study emphasizing the importance of school type in achievement was conducted by Opyene-Eluk and Opolot-Okurut (1995), titled *Gender and school type differences in mathematics achievement of senior three pupils in central Uganda: an exploratory study*. The aim of their study was to explore the relationship between gender and school type.

Sample of these two researchers' study consists of 383 15-year old males and females in central Uganda, studying in four single-sex (two for each sex) and two mixed-sex, six boarding schools in total with similar backgrounds and qualities. They conducted a multiple-choice achievement test consisting of 160 questions in total, measuring students' skills in arithmetic (50 questions), algebra (40 questions), geometry (20 questions), statistics and probability (20 questions) and word problems (30 questions). The fact that there are various number of questions for each subject represents the weight of the particular subject in the curriculum (Opyene-Eluk & Opolot-Okurut, 1995). A pilot study also conducted to test the reliability and validity of the study.

Opyene-Eluk and Opolot-Okurut (1995) conclude that although males perform better in Mathematics, there is no statistically significant difference between the achievement levels of males and females. However, students from each gender studying in single-sex schools performed significantly better compared to their counterparts studying in mixed-sex schools. One might argue that findings of their study underline the fact that school type matters for both genders.

In line with the idea that school types make the most difference in terms of explaining achievement differences rather than geographical regions, Fan and Chen (1998), in order to discover whether locations of the schools have an effect on student achievement, conducted a study, about which they express their views in their paper titled “Academic Achievement of Rural School Students: A Multi-Year Comparison with Their Peers in Suburban and Urban Schools.”

In order to conduct their analyses on the performance of 24.500 8th, 10th and 12th grade students from the Northeast, Midwest, South and West of the United States in reading, maths, science and social studies, Fan and Chen use the National Education Longitudinal Survey of 1988 data, while classifying the locations as rural, suburban, urban based on 1980 U.S. census. Analyses were conducted separately for each major ethnic group, namely, Whites, Blacks, Hispanics, Asian Americans and Pacific Islanders. Another division also made to separate public and private school students to strengthen the validity of the study (Fan & Chen, 1998).

Fan and Chen (1998) conclude that there are hardly any differences between rural and metropolitan students, claiming that rural students performed as well as their metropolitan peers while this being the case for the four geographical regions of the U.S. included in the study. They also underline the fact that their findings go hand in hand with previous studies that found no difference between rural, suburban and urban differences.

However, there are studies with findings that are in contrast with the common belief. Portela and Thanassoulis (2001) conduct a Data Envelopment Analysis (DEA) to explore under-attainment at three different levels. A pupil-level analysis is followed by another two, which are essentially school-level comparisons that examines the differences between schools based on their type and funding. They conduct their study in the United Kingdom using three broad categories which are Comprehensive schools, Grant Maintained schools and Independent schools, respectively. Portela and Thanassoulis (2001) extend their analyses by further decomposing school-related components into “school-within-school-type-efficiency and school-type-within-all-schools-efficiency”.

As a result of their study conducted with a highly complex method, Portela and Thanassoulis (2001) conclude that inefficiencies emerge only at pupil-level, affecting performances of schools negatively. Better schools have a better efficiency and academic success, and it is merely because they have better students, since there is no effect deriving from school-related factors.

Another article that focuses on school types is by Houtte (2006), the primary concern of which is however not directly student achievement, unlike the majority of other studies: Titled “School type and academic culture: evidence for the differentiation-polarization theory”, Houtte’s study analyses anti-school and pro-school cultures amongst students based on school types they attend.

Houtte (2006) bases the quantitative part of his study on case studies conducted, while the qualitative part is based on the attitude of students towards school and their behaviour, in Belgium. Each part is individual, although the qualitative part can be used in explaining factors related to achievement. Thus, he aims to conceptualize polarization. His findings show that the culture in technical and vocational schools is less study-oriented when compared to general, i.e. grammar schools. Furthermore, these findings are not limited to students: It is the same story for the academic staff, the attitude of whom towards students is significantly differs accordingly as well. Houtte claims the fact that general schools and their students are more academically-oriented is not a surprise. However, he also underlines the importance of SES of students and its inevitable relation with the school types (Houtte, 2006).

In addition to geographical regions and school types, school related variables should also be taken into consideration, to predict student achievement in all subject areas. In this sense, Uysal (2016), in her study titled “Factors affecting the mathematics achievement of Turkish students in PISA 2012” explores about the issue. Using exactly the same data with our study, she finds out that an interest directly in mathematics has a medium and positive effect on student achievement. On the other hand, mathematics anxiety has the exact opposite effect on students, causing them to achieve less. While one might hold the view that these are the expected results, the rather unexpected part of the study shows that there is no significant relationship between school related variables, i.e. sense of belonging, teacher-student relations and classroom management. Although the study does not take the other two subject areas into account, it can be argued that some parallels can be drawn in between, in terms of the school related variables.

CHAPTER 3: METHOD

Introduction

Providing details about firstly the research design and the context, this chapter will present the methodology. Subsequently, participants and the instrumentation of PISA 2012 survey, on which the study is solely based on, will be mentioned. Finally, the method of instrumentation and data analysis of this study will be analysed.

Research design

Exploratory research will be conducted since the study aims at solving a problem that has not been clarified yet. It will help other researchers determine the best research design, data collection method and variables to take into consideration. According to Zikmund (1984), it is the degree of uncertainty that determines the research design, and since which variables play a key role in gender gap is unknown, it is possible to argue that this study lends itself well to exploratory research design. However, for the same reason, outcomes of this study may fail to provide definite answers, or solutions, for the issue.

Correlational research design compares two continuous variables, rather than groups, to examine the association in between. In this design, a regression analysis can be conducted, or the researcher can benefit from correlation. In order to examine the amount of variance shared by the two variables, or to make a prediction about one variable while knowing the other, regression is used. Only the differentiation of dependent and independent variable in regression marks the difference between correlation and the regression, both of which are concerned with the amount of variance that variables share (Fraenkel & Wallen, 2008).

Context

Turkey is a socioeconomically diverse country. In Turkey, the gender gap in education, the cause of which is mostly the same with the rest of the world, is considerably higher. Despite the 1997 education reform which merges the first two levels of education, i.e. 5 years of primary and 3 years of middle schooling, thus bringing the school leaving age up from 11 to 14, Turkish female students still have a significantly lower level of enrolment when compared to European Union average (Akşit, 2007). Compared to 2% of the males, 7% of the females between ages 8 and 12 never see the school; furthermore, by the age of 15, the 5% enrolment gap between the two genders reaches up to almost 20%, according to 2010 UNESCO data (Caner et al., 2015). This situation shows itself in regional differences, as Eastern regions of Turkey suffer more from such negative context.

Another contextual variable which is of utmost importance in this study is school type. In Turkey, general schools are open to all students, while public schools of other types require students to take a placement exam. High achieving students often prefer Science high schools. Students which are above average, but not as high-achieving as the top-end prefer either Social or Anatolian high schools. Technical and Vocational schools on the other hand mostly have students from the bottom line.

Participants

In order to represent the 15-year-olds in Turkey, a total of 4848 (2478 male and 2370 female) students between the ages of 15 years 3 months and 16 years 2 months took the fifth PISA survey, PISA 2012 (OECD, 2013). PISA aims at measuring students' competence in mathematics, reading and science, and in some countries, problem solving and financial literacy, "to enable review and, potentially, replication of the implemented procedures and technical solutions to problems" (OECD, 2013a, p. 26).

Two-stage stratified sample design was used in Turkey, as done in other countries, except the Russian Federation. The first stage involved sampling of the schools that have 15-year-old students, while the second stage was the selection of the students within the sampled schools (OECD, 2013a). Geographical regions, some parts of which are excluded either because of inaccessibility or the language spoken, are rearranged based on their characteristics. Since a significantly small sample will not represent the geographical nation, thus the entire population, exclusions are limited based on the technical standards of the survey. As a result, selected students of 170 schools, from 57 out of 81 cities, were surveyed. Schools were included in the sampling based on their weight in the Ministry of National Education system, therefore the actual statuses of the students in the national education were equally thus realistically reflected in the survey.

Instrumentation

PISA 2012 data, which will act as a path to discover how backgrounds, school types, families, geographical regions and student-teacher relations affect student achievement, will be used to respond to research questions. PISA surveys are conducted by the OECD with large samples, while being publicly available. It offers a wide variety of tests to collect data, some of which are optional and not taken by every country that participate in PISA.

PISA instrumentation can be grouped under two main titles, as paper-based and computer-based assessment designs. Clusters for paper-based assessment consisted of thirteen items in total, seven for mathematics and three each for reading and science. Each cluster stood for 30 minutes of testing. Those clusters offered to students within thirteen booklets, each containing four clusters. Thus, each booklet took two hours to complete. A system called balanced incomplete design was applied: Students could see each cluster in four of four-cluster booklets, within which there were four possible positions. Therefore, students saw only a portion of the total question pool, consisting of more than 110 mathematics questions. This made it possible to construct a single scale to measure mathematics proficiency. Each question had a particular point on the scale indicating its difficulty, thus students' proficiency. In order to determine proficiency levels, a metric scale of 500 was used, with a standard deviation of 100. There were six levels, one being the lowest and six being the highest, representing the most challenging questions (OECD, 2013c).

In addition to two-hour booklets, there was a special one-hour booklet called Une Heure (UH), designed to be used in schools with students in special needs. Furthermore, there was a relatively easy version of the booklets available offered to some countries while the primary framework of clusters was kept. Another option internationally available was the financial literacy, consisting of four additional booklets, each consisting two financial literacy clusters in addition to one cluster each for mathematics and reading.

Computer-based module was a part of the core assessment in PISA 2012, used by two-thirds of the participating countries. It had three components offered, computer-based mathematics (CBAM), reading in a digital environment (DRA) and problem solving, while the first two were offered together as a pack called computer-based literacies (CBAL). Countries were not permitted to leave out the problem solving component if they wished to implement the CBAL testing. However, problem solving assessment was used as the only computer-based component by many countries. It came in the form of four item clusters with each cluster designed to take twenty minutes to complete. However, four countries using the problem solving component only, the test was modified: It was made available for students in eight test forms, with each form consisting of two clusters. Each student done forty minutes of testing as they randomly assigned to one of the eight forms. CBAM and DRA items, on the other hand, populated four and two clusters respectively, while each cluster taking up twenty minutes to complete. Each participating student was assigned to one of the twenty four components, thus taking forty minutes of testing (OECD, 2013c).

There were two types of indices in PISA 2012 concluding responses from participating students, representatives of the schools that they attend, and parents, to questions from their individual sections: Simple indices were created by either arithmetic transformations or by recoding items in different numbers, to make calculations about meaningful variables. Scale indices, on the other hand, were generated by the scaling of multiple items, using weighted likelihood estimate with a one-parameter item response model. This was conducted in three stages: They started by estimating item parameters from equal-sized student subsamples from all participating countries and economies. Secondly, they computed the estimates for all students and schools anchoring the results from the previous stage. Finally, they standardized in order to make sure that the mean of index value of OECD student population was zero, while the standard deviation was one (OECD, 2013c).

PISA 2012 questionnaires aimed to explore about students, their families and backgrounds from certain points, including their economic status, social and cultural aspects, while also dwelling on their attitude towards school, learning habits, school and home life (Thomson, Bortoli & Buckley, 2013). Furthermore, schools were examined from various aspects, in terms of resources, management, funding, curricular and extra-curricular activities, instruction and techniques implemented to foster students' interest and motivation (OECD, 2013b).

PISA 2012 mathematics framework consisted of various units with visual items, such as charts, graphs and schemes. Certain differences were allowed to be made by participating countries so that the questions could fit into their local context. Similarly illustrative are the science framework items, with units from various contexts. Aspects of the units were divided into three as personal, social and global, respectively. Here, the main assessment perspective was competencies in terms of knowledge and attitudes, not the context itself. Reading framework, which includes achievement indicator for the present study, similar to mathematics, had visuals presented as digital reading items. Here, the aim was to make students read, interpret, respond and reflect.

Method of instrumentation

As the data will be solely taken from the PISA 2012 survey, data collection methods of the OECD is applicable. Students took a 2-hour pen and paper test consisting of open-ended and multiple-choice questions that are specially grouped to reflect the real life, for PISA 2012. All of the test items took nearly 390 minutes. Students took different tests in different combinations, in addition to questionnaires which provided information about their backgrounds, learning environments and experiences, the schools they attend and their systems. School principals also answered their own questionnaires (OECD, 2013a). Since PISA 2012 survey was conducted in collaboration with, and under the permission of Ministry of National Education, the ethical considerations are taken care of by the ministry as well.

Method of data analysis

PISA 2012 data of Turkey was edited, so that the analyses can be conducted. Yet, the unique criteria of PISA were kept and used for the division of geographical regions, in which the number is twelve, rather than the official number, seven. Geographical regions that were defined in PISA 2012 were Western Marmara, Eastern Marmara, Middle Anatolia, Aegean, Western Anatolia, İstanbul, Mediterranean, Eastern Black Sea, North Eastern Anatolia, Western Black Sea, South Eastern Anatolia and Middle Eastern Anatolia. Secondly, school types have been reorganized. The number of school types in PISA 2012 data sets was 12. However, Police High Schools were excluded from the data since they no longer exist.

As a result, we ended up with twelve geographical regions and eleven school types. Due to the fact that above-mentioned variable types are categorical, the two types were separately dummy-coded following the n-1 rule, by creating eleven additional variables for geographical regions and ten for the school types, in order for the regression analysis to be done. Istanbul was chosen as the reference category for geographical regions, while it was General High School in İstanbul for the school types. As a result, 10 additional columns were created for school types (see Table 1), whereas the number is 11 for geographical regions (see Table 2). The four independent variables which were related to teacher or school, were taken as continuous variables. Descriptive of these four variables were given in Table 4.

Table 1
Distribution of students in terms of school types

	Female		Male	
	Frequency	Percent	Frequency	Percent
Primary	56	2.4	64	2.7
General	712	30.0	750	31.1
Anatolian	593	25.0	457	19.0

Table 1 (cont'd)
Distribution of students in terms of school types

Science	22	.9	13	.5
Social	20	.8	15	.6
Anatolian Teacher	117	4.9	90	3.7
Vocational	564	23.8	652	27.1
Anatolian Vocational	175	7.4	104	4.3
Technical	9	.4	66	2.7
Anatolian Technical	21	.9	102	4.2
Multi Programme	81	3.4	97	4.0
Total	2370	100.0	2410	100.0

Table 2
Distribution of students in terms of geographical regions

	Female		Male	
	Frequency	Percent	Frequency	Percent
Western Anatolia	241	10.2	241	10.0
Western Black Sea	146	6.2	114	4.7
Western Marmara	85	3.6	109	4.5
Eastern Black Sea	134	5.7	78	3.2
Eastern Marmara	174	7.3	285	11.8
Aegean	300	12.7	285	11.8
South-eastern Anatolia	203	8.6	289	12.0
Istanbul	431	18.2	360	14.9
North-eastern Anatolia	96	4.1	75	3.1
Middle Anatolia	140	5.9	121	5.0
Middle-eastern Anatolia	140	5.9	103	4.3
Total	2370	100.0	2410	100.0

Student achievement was defined in reading, mathematics, and science literacy scores of scores. One of the plausible variables, PV1READ, PV1MATH and PV1SCIENCE was selected for each respective domain. Mean of the PV1READ is 495.94 (SD=76.43) and 451.75 (SD=84.24) for females and males, respectively. On the other hand, the mean of the PV1MATH turned out to be 441.97 (SD=86.84) for females and 452.58 (SD=92.18). As for PV1SCIENCE, the mean for females is

467.47 (SD=75.10) while it is 457.78 (SD=81.59) for males. A series of independent-samples t-test indicated that there was a statistically significant mean difference between boys and girls in terms of PV1READ: t(4773.32)=-3.22, p < .01; t(4755.65)=19.49, p < .01; t(4754.87)= 4.83, p < .01 for mathematics, reading, and science, respectively.

Table 3
Descriptives of the four school-related variables

Gender		Attitude towards School: Learning Outcomes	Attitude towards School: Learning Activities	Sense of Belonging to School	Teacher Student Relations
Female	Mean	0.27	0.31	0.25	0.24
	Std. Deviation	1.04	0.96	1.09	1.05
	Skewness	0.46	-0.71	0.36	0.07
	Kurtosis	-0.29	-0.51	-0.09	-0.46
	Minimum	-2.99	-3.38	-3.69	-3.11
	Maximum	2.35	1.21	2.63	2.16
Male	Mean	-0.10	0.11	0.00	0.14
	Std. Deviation	1.03	1.05	1.06	1.10
	Skewness	0.57	-0.59	0.72	0.09
	Kurtosis	0.21	-0.56	0.18	-0.32
	Minimum	-2.99	-3.38	-2.67	-3.11
	Maximum	2.35	1.21	2.63	2.16

Subsequently, we divided the data into two by gender, allowing us to conduct individual regressions for each gender. Multiple linear regressions, which were replicated for reading, science and mathematics, were designed to have three blocks: school types, geographical regions and four school-related variables based on students' perceptions, respectively. For geographical region and school type variables, unstandardized regression coefficients (B) were reported. These coefficients indicate expected change in dependent variable changes as compared to reference condition, while all other variables are held constant. On the other hand, for four continuous variables both unstandardized and standardized regressions coefficients were reported. The input value of Probability of F was 0.05 while the output was 0.10, for all tests.

CHAPTER 4: RESULTS

Introduction

In this chapter, results of analyses conducted will be presented. As explained in the previous chapter, reading, mathematics and science achievement were the dependent variables, while the independent variables were geographical regions and school types. The criteria for geographical regions used by PISA which consists of twelve regions, rather than the official number seven, were kept. In addition, we omitted Police High Schools to reorganize the school types. All of the changes made resulted in twelve geographical regions and eleven school types. However, since the independent variable types were categorical, they were separately dummy-coded following the n-1 rule, so that we could conduct the analyses. This created eleven additional variables for geographical regions and ten for the school types. All variables had their additional individual columns in our modified data. Istanbul was the reference category for geographical regions while it was General High Schools in İstanbul for the school types. Subsequently, the data was split by gender, allowing us to conduct separate multiple linear regressions, which were replicated for reading, science and mathematics. We designed the regressions to have three blocks: school types, geographical regions and four school-related variables based on students' perceptions, respectively.

Findings

Achievement levels of female students

Reading

This section presents evidence on how female students' reading achievement is affected throughout the three models. In the below-given Table 4, the geographical regions that we recoded as explained above, fail to make a major contribution to the variance despite being statistically significant in Model 1 (Adjusted R^2=.07, $p < .05$). In other words, geographical regions alone only provide a minor chance of predicting reading achievement levels of the female students. However, with the school types taken into consideration in Model 2 along with Model 1 variables, the explained variance increases significantly by 0.40, taking the number up to Adjusted R^2=.47 ($p < .05$). Adding teacher and student related variables makes absolutely no practical difference in the explained variance (R^2 change=0.00, $p < 0.05$) despite being statistically significant, as proven by Model 3 (Adjusted R^2=.47). Thus, school types seemed to be the strongest predictor of reading achievement scores of females.

Table 4
R squares of female students' reading literacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.28	.08	.07	73.57	.08	12.17*	11	1539
2	.69	.47	.47	55.79	.39	114.63*	10	1529
3	.69	.48	.47	55.69	.00	2.48*	4	1525

*p < .05

However, when we look at the ANOVA table (Table 5), all of the three models turn out to be statistically significant in terms of explaining female students' achievement in reading. In other words, all of the models predict reading literacy of females well in terms of statistical significance, but not for practical significance.

Table 5
ANOVA results of regression analysis based on female data for reading

Model		Sum of Squares	df	Mean Square	F
1	Regression	724405.05	11	65855.01	12.17*
	Residual	8329835.44	1539	5412.50	
	Total	9054240.49	1550		
2	Regression	4293655.39	21	204459.78	65.67*
	Residual	4760585.10	1529	3113.53	
	Total	9054240.49	1550		
3	Regression	4324455.73	25	172978.23	55.77*
	Residual	4729784.76	1525	3101.50	
	Total	9054240.49	1550		

*p < .05

The below-given Table 6 explains the reading achievement differences between geographical regions in relation to İstanbul, which is our reference category. Unstandardized regression coefficient (B) of regions indicated how reading achievement changes when each particular region differs from İstanbul, while all other variables held constant for female students. It also gives us the opportunity to see the effects of the additional variables included in the analysis in the latter two stages, conducted individually as Model 2 and Model 3, respectively.

Table 6
Regression coefficients of reading literacy of female students

Variables	Model 1		Model 2		Model 3	
	B	t	B	t	B/Beta	t
Intercept	509.78	116.98	486.08	123.70	485.10	122.45
Aegean	-10.07	-1.49	-23.55	-4.49*	-24.36	-4.65*
Middle Anatolian	8.77	0.98	-14.92	-2.17*	-15.39	-2.24*
Middle-Eastern Anatolian	-36.35	-4.10*	-27.71	-4.08*	-28.38	-4.18*
Eastern Black Sea	-33.88	-3.74*	-32.71	-4.40*	-34.53	-4.63*
Eastern Marmara	17.58	2.17*	10.77	1.75*	10.64	1.72*

Table 6 (cont'd)

Regression coefficients of reading literacy of female students

Western Black Sea	-38.97	-4.47*	-38.45	-5.78*	-39.74	-5.98*
South Eastern Anatolian	-61.59	-8.05*	-43.68	-7.40*	-44.20	-7.49*
North-Eastern Anatolian	-29.88	-2.86*	-39.82	-4.97*	-42.42	-5.28*
Western Marmara	7.27	0.68	-12.90	-1.55	-14.36	-1.73*
West Anatolian	-8.34	-1.14	-11.76	-2.09*	-11.73	-2.09*
Mediterranean	-6.80	-0.97	-13.61	-2.48*	-13.92	-2.54*
Primary			-72.78	-7.60*	-71.34	-7.43*
Anatolian			91.62	23.05*	92.34	23.22*
Science			148.17	8.49*	149.64	8.58*
Social			121.10	7.09*	122.97	7.20*
Anatolian Teacher			97.77	13.59*	99.34	13.74*
Vocational			-12.56	-3.10*	-12.22	-3.01*
Anatolian Vocational			39.63	6.63*	39.79	6.65*
Technical			-13.12	-0.61	-12.03	-0.56
Anatolian Technical			9.81	0.62	10.31	0.65
Multi-programme			-22.22	-2.59*	-23.35	-2.72*
Teacher Student Relations					-1.02/ -0.01	-0.64
Attitude towards School: Learning Outcomes					3.69/ 0.05	2.19*
Attitude towards School: Learning Activities					2.54/ 0.03	1.46
Sense of Belonging to School					1.33/ -0.02	-0.85

*p < .05

In Model 1, which only takes geographical regions into consideration as independent variables, the worst achieving region turns out to be South-Eastern Anatolia since its B value turns out to be the biggest in number with a negative sign, where reading achievement deviates almost 62 points for worse when compared to İstanbul. Student achievement in Eastern Marmara, on the other hand, positively deviates nearly 18 points from the reference category, İstanbul. Deviations are mostly negative for almost all geographical regions, indicating average reading achievement is lower than İstanbul in many regions. Although there are two more regions with positive B values, the results are not statistically significant, thus not taken into consideration. In Model 2, the step in which school types are included, the negative gap for the worst achieving region drops by a near eighteen points, underlining the importance of the school types to explain differences in reading achievement levels of females. This is also the biggest deviation brought by school types. However, North-Eastern Anatolia achieves 10 points less in Model 2, unlike South-Eastern Anatolia. Similarly, the gap in deviation in favour of Eastern Marmara drops by two points, bringing the score of the region closer to İstanbul.

Furthermore, with the introduction of Model 2, all geographical regions become statistically significant except for Western Marmara region. Although all B values of geographical regions change in Model 2, we cannot argue that those changes are systematic. Science High Schools is the best achieving school type when compared to our reference category, General High Schools in İstanbul, with the B value of 148 points. It is followed by Social Sciences High Schools and Anatolian Teacher Training High Schools, with respective B values of 121 and 98. Only Vocational and Multi-Programme High Schools achieve worse than the reference category, which reflects the reality by being in line with high school placement exam results. There are observable changes in regression coefficients as the analysis moves from Model 1 to Model 2. In this case, it seems that there is an interaction between geographical regions and school types.

While the differences made by school types in Model 2 are observable in almost all geographical regions, there is barely any difference between Model 2 and Model 3: A mere deviation of two points emerges only in Eastern Black Sea and North-Eastern Anatolia region, whereas the rest of the regions differ with a maximum of only one point. Similarly, the influence of school related variables is equally minor on most of the school types, with only one variable being statistically significant. Thus, one might argue that school related variables are not necessarily useful in explaining reading achievement levels of females, while holding the view that geographical region is the most important predictor of reading achievement levels of female students. Yet, we must also appreciate the fact that B values of geographical regions are considerably smaller when compared to school types. This, in line with the results of the previous studies and our assumptions, shows that it is the school types that bring the difference in terms of achievement.

Mathematics

In explaining mathematics achievement of female students, as was the case for reading, geographical regions do not necessarily make a major contribution to the explained variance (Adjusted R^2=.07, $p < .05$), despite being statistically significant. This allows us to argue that geographical regions are not exactly useful in predicting female students' mathematics achievement. Yet, in the Model 2, the explained variance increases to a significant value (Adjusted R^2=.56, $p < .05$) while the Model 3 makes almost no change in the explained variance (R^2 Change=.00, $p < .05$). Thus, we can conclude that school types are the strongest predictor of mathematics scores of female students as Table 7 shows:

Table 7
R squares of female students' mathematics literacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.27	.07	.07	83.90	.07	11.03*	11	1539
2	.75	.56	.56	57.90	.49	170.34*	10	1529
3	.75	.56	.56	57.90	.00	.95*	4	1525

*p < .05

All three models are statistically significant according to Table 8 given below, similar with the case for reading.

Table 8

ANOVA results of regression analysis based on female data on mathematics

Model		Sum of Squares	df	Mean Square	F
1	Regression	854407.98	11	77673.45	11.03*
	Residual	10834754.91	1539	7040.13	
	Total	11689162.89	1550		
2	Regression	6564010.72	21	312571.94	93.25*
	Residual	5125152.17	1529	3351.96	
	Total	11689162.89	1550		
3	Regression	6576722.92	25	263068.92	78.47*
	Residual	5112439.97	1525	3352.42	
	Total	11689162.89	1550		

*p < .05

The below-given Table 9 serves for the same purpose with Table 6: Achievement differences between geographical regions are examined in relation to the reference category, İstanbul. Considering that all variables are held constant, the B values stand for the difference of each particular region from İstanbul, since being in terms of standard deviations. Three respective models allow our analysis to operate on three levels, as was the case with Table 6. In Model 1, in which we only take geographical regions into consideration, the worst achieving region turns out to be South-Eastern Anatolia again, as was the case for reading achievement: A near 62 points difference separates the region from İstanbul. Different from the reading values, the number of regions achieving considerably worse from İstanbul increases for mathematics, as South-Eastern Anatolia is followed by Middle-Eastern Anatolia, Eastern Black Sea and Western Black Sea regions, respectively. On the other hand, in Model 2, some regions which are not statistically significant in Model 1 become significant in Model 2, with major changes in their B values, namely the Aegean, North-Eastern Anatolia and Mediterranean regions. These findings indicate that school types are crucial in explaining student achievement in mathematics as well. Science High Schools perform considerably better than the reference school category, General High Schools in İstanbul, with the massive B value of 258 points. This is followed by Anatolian Teacher Training High Schools and Social Sciences High Schools, with respective B values of 139 and 137. However, a gap of almost 120 points between those second and third best achieving schools and Science High Schools exist, in line with the idea that school types do matter.

As similar in the coefficients table of reading achievement, Model 3 variables, none of which are statistically significant, make no difference in B values, thus, fail to predict female students' achievement in Mathematics according to Table 9:

Table 9
Regression coefficients of mathematics literacy of female students

Variables	Model 1		Model 2		Model 3	
	B	t	B	t	B/Beta	t
Intercept	452.49	4.97	423.04	4.08	423.05	4.12
Aegean	-6.79	-0.879	-25.01	-4.596*	-24.65	-4.524*
Middle Anatolian	11.33	1.107	-19.20	-2.694	-18.71	-2.622
Middle-Eastern Anatolian	-37.63	-3.725*	-31.67	-4.489*	-31.29	-4.430*
Eastern Black Sea	-36.12	-3.499*	-33.39	-4.324*	-32.66	-4.215*
Eastern Marmara	25.24	2.732	15.48	2.420	15.27	2.382
Western Black Sea	-32.21	-3.240*	-30.40	-4.407*	-29.75	-4.303*
South Eastern Anatolian	-61.57	-7.058*	-44.24	-7.226*	-44.04	-7.183*
North-Eastern Anatolian	-25.32	-2.125	-38.50	-4.634*	-37.27	-4.460*
Western Marmara	22.88	1.879	-6.47	-0.751	-5.95	-0.688
West Anatolian	1.41	0.169	-6.41	-1.099	-6.24	-1.069
Mediterranean	-4.82	-0.602	-16.75	-2.942*	-16.28	-2.856*

Table 9 (cont'd)
Regression coefficients of mathematics literacy of female students

Primary	-28.47	-2.865*	-28.19	-2.824
Anatolian	113.96	27.632*	113.79	27.525*
Science	257.53	14.218*	257.67	14.209*
Social	137.71	7.770*	137.84	7.758*
Anatolian Teacher	139.55	18.692*	139.35	18.545*
Vocational	-21.69	-5.156*	-21.45	-5.084*
Anatolian Vocational	43.54	7.022*	44.03	7.080*
Technical	-2.69	-0.121	-3.25	-0.146
Anatolian Technical	28.16	1.711	27.62	1.677
Multi-programme	-5.62	-0.632	-4.55	-0.510
Teacher Student Relations			-0.20/ -0.002	-0.122
Attitude towards School: Learning Outcomes			-1.26/ -0.015	-0.720
Attitude towards School: Learning Activities			-2.08/ -0.023	-1.152
Sense of Belonging to School			2.52/ 0.032	1.542

*p < .05

Science

According to Table 10 given below, geographical regions do not make a considerable contribution to the variance, which was the case for both of the two other subject areas (Adjusted R^2=.08, $p < .05$). School types, on the other hand, make a major change, when compared to Model 2 (Adjusted R^2=.47, $p < .05$). There is no change contributed by Model 3 variables, which are school related (R^2 change=.00, $p > .05$). This enables us to conclude that school type, as a variable, is the strongest predictor of student achievement in science literacy as well.

Table 10
R squares of female students' science literacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.29	.09	.08	72.09	.09	13.04*	11.00	1539.00
2	.69	.48	.47	54.60	.39	115.35*	10.00	1529.00
3	.69	.48	.47	54.58	.00	1.33	4.00	1525.00

*p < .05

According to Table 11 provided below, all of the three models turn out to be statistically significant for female students' science achievement. However, Model 3, as indicated in Table 10, did not produce a significant change in estimating female students' science achievement scores.

Table 11
ANOVA results of regression analysis based on female data on science

Model		Sum of Squares	df	Mean Square	F
1	Regression	745470.56	11.00	67770.05	13.04*
	Residual	7997228.32	1539.00	5196.38	
	Total	8742698.87	1550.00		
2	Regression	4184273.97	21.00	199251.14	66.83*
	Residual	4558424.91	1529.00	2981.31	
	Total	8742698.87	1550.00		
3	Regression	4200111.91	25.00	168004.48	56.40*
	Residual	4542586.97	1525.00	2978.75	
	Total	8742698.87	1550.00		

*p < .05

In Table 12, we see the decreasing influence of the geographical regions as the predictor of female students' achievement: In terms of science literacy, this variable provides statistically significant results for only Eastern Marmara and South-Eastern Anatolia. While female students in Eastern Marmara do considerably better than İstanbul, the reference category, with their B value of 33 points, South-Eastern Anatolia falls far behind İstanbul due to its 59 points with a negative sign.

In Model 2, the gap closes for both regions: School type variables bring East Marmara nearer to İstanbul by 6 points, and South-eastern Anatolia by 15 points. Except for three, namely Technical, Anatolian Technical and Multi-Programme Schools, all school types provide statistically significant results, thus can be taken into consideration. Furthermore, as was the case in the previous Coefficients tables, they have considerably higher B values when compared to geographical regions, underlining the fact that they are strong predictors of student achievement in science as well. Science High Schools achieve best in science when compared to the reference school category, General High Schools in İstanbul, as they do in other subject areas. Science High Schools are followed by Social Sciences and Anatolian Teacher Training High Schools, with identical B values, 109. Vocational, Technical and Multi-Programme High Schools fall behind the reference type again, yet the result of only Vocational High Schools is statistically significant.

Predictably from the previous tables, Model 3 makes no contribution to the analysis by making minor changes in Model 1 and 2 variables, while school related variables themselves have no statistically significant value to be taken into consideration.

Table 12
Regression coefficients of science literacy of female students

Variables	Model 1		Model 2		Model 3	
	B	t	B	t	B/Beta	t
Intercept	471.11	110.33	477.73	116.44	447.63	115.29
Aegean	0.31	0.047	-13.42	-2.615	-13.96	-2.719
Middle Anatolian	6.04	0.687	-18.05	-2.685	-18.38	-2.732
Middle-Eastern Anatolian	-23.40	-2.696	-17.01	-2.557	-17.33	-2.604
Eastern Black Sea	-15.97	-1.801	-13.04	-1.791	-14.00	-1.918
Eastern Marmara	33.49	4.218*	26.11	4.326*	25.96	4.296*
Western Black Sea	-12.95	-1.516	-11.68	-1.796	-12.38	-1.899
South Eastern Anatolian	-58.97	-7.869*	-43.65	-7.559*	-44.19	-7.645*

Table 12 (cont'd)
Regression coefficients of science literacy of female students

North-Eastern Anatolian	-15.47	-1.511	-25.30	-3.229*	-26.62	-3.380*
Western Marmara	24.32	2.325	2.13	0.261	1.16	0.142
West Anatolian	11.01	1.534	5.56	1.009	5.27	0.957
Mediterranean	2.92	0.425	-3.20	-0.595	-3.56	-0.662
Primary			-42.02	-4.484*	-41.52	-4.413*
Anatolian			90.00	23.139*	90.29	23.171*
Science			148.26	8.679*	148.74	8.701*
Social			108.97	6.519*	108.88	6.501*
Anatolian Teacher			108.93	15.470*	109.59	15.471*
Vocational			-15.83	-3.989*	-15.96	-4.012*
Anatolian Vocational			36.52	6.245*	36.42	6.214*
Technical			-12.39	-0.591	-12.51	-0.597
Anatolian Technical			4.05	0.261	5.18	0.333
Multi-programme			-8.31	-0.991	-8.81	-1.046
Teacher Student Relations					-1.57/ -0.022	-1.003
Attitude towards School: Learning Outcomes					1.06/ 0.015	0.643
Attitude towards School: Learning Activities					3.07/ 0.039	1.807
Sense of Belonging to School					-1.60/ -0.023	-1.040

*p < .05

Achievement levels of male students

Reading

Reading achievement figures of male students are presented in this section. As shown in the below-given Table 13, according to Model 1, recoded geographical regions fail to make a major contribution to the variance despite being statistically significant (Adjusted R^2=.07 $p < .05$) and thus, similarly for males, geographical regions alone are not necessarily enough to predict reading achievement levels of the students. Yet, with the school types taken into consideration in Model 2, the explained variance increases significantly again, to (Adjusted R^2=.47 $p < .05$). Unlike females, adding teacher and student related variables make no difference in the explained variance for males, as shown by Model 3 (Adjusted R^2=.47 $p < .05$).

Table 13
R squares of male students' reading literacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.28	.08	.07	80.95	.08	12.81*	11	1557
2	.69	.47	.47	61.63	.39	113.90*	10	1547
3	.69	.48	.47	61.22	.00	6.24*	4	1543

*p < .05

In terms of ANOVA figures (Table 14), there is statistically no difference between males and females. Again, unlike the summary table provided above, all of the three models turn out to be statistically significant in terms of explaining reading achievement.

Table 14
ANOVA results of regression analysis based on male data on reading

Model		Sum of Squares	df	Mean Square	F
1	Regression	923674.32	11	83970.39	12.81*
	Residual	10203669.44	1557	6553.42	
	Total	11127343.76	1568		
2	Regression	5250708.51	21	250033.74	65.82*
	Residual	5876635.25	1547	3798.73	
	Total	11127343.76	1568		
3	Regression	5344351.02	25	213774.04	57.04*
	Residual	5782992.74	1543	3747.89	
	Total	11127343.76	1568		

*p < .05

Provided below is Table 15, explaining the reading achievement differences of male students between geographical regions in relation to İstanbul, as does Table 3 for females. Again, B values indicated how Reading literacy changes in terms of standard deviations, thus how each geographical region differs from İstanbul, when all other variables held constant. It enables us the opportunity to see the effects of the additional variables included in the analysis in the latter two individual stages, namely Model 2 and Model 3. In Model 1, which only focuses on geographical regions, the worst achieving region is Middle-Eastern Anatolia, achieving 57 points less than the reference region. It is followed by South-Eastern Anatolia, which is 48 points below the reference value. It can be argued that these findings underline the gender gap in the South-Eastern part of Turkey: Female students in South-Eastern Anatolia achieve almost 14 points worse than their counterparts from the opposite gender in the same region. Unlike the case of female students, a statistically significant difference between the reference region and other regions is rare for males, also indicating a gender gap: Only Middle Anatolia, Middle-Eastern Anatolia and South-Eastern Anatolia are significantly different from İstanbul in Model 1. However, the characteristics of the results become equally unsystematic yet differ in Model 2. While more geographical regions become statistically different from the reference category, their B values differ considerably as well, as was the case for female students. Except for two, namely Technical and Multi-Programme schools, all school types make a statistically significant difference in student achievement. In terms of geographical regions, major differences are observable, from 7 to 8 points. Although other considerable differences exist, they are ignored for not being statistically significant. Despite being mathematics and science oriented, Science High Schools perform considerably better than General High Schools in İstanbul, which is our reference school type. Science High Schools are followed by Social Sciences and Anatolian Teacher Training High Schools, with the rest following. Only Vocational and Multi-Programme High Schools perform worse than the schools within the reference category, with respective B values of 29 and 16 with a negative sign. Model 3, on the other hand, shows that barely any difference emerges with school related variables taken into consideration: One or two-point differences occur between Model 2 and Model 3. Furthermore, none of the school related variables are statistically significant alone.

Table 15
Regression coefficients of reading literacy of male students

	Model 1		Model 2		Model 3	
Variables	B	t	B	t	B/Beta	t
Intercept	454.00	85.79	443.63	97.32	442.81	97.51
Aegean	20.96	2.624	-4.02	-0.647	-3.27	-0.529
Middle Anatolian	35.15	3.321*	-4.94	-0.600	-5.63	-0.687
Middle-Eastern Anatolian	-57.28	-5.046*	-39.67	-4.555*	-36.87	-4.250*
Eastern Black Sea	7.33	0.586	-31.58	-3.016*	-30.43	-2.916*
Eastern Marmara	13.48	1.693	7.81	1.269	8.52	1.393
Western Black Sea	-4.09	-0.382	-22.91	-2.789	-23.96	-2.935*
South Eastern Anatolian	-48.27	-6.105*	-40.28	-6.586*	-38.64	-6.351*
North-Eastern Anatolian	-28.68	-2.293	-36.84	-3.826*	-35.19	-3.661*
Western Marmara	9.39	0.842	-7.15	-0.827	-6.82	-0.794
West Anatolian	8.94	1.076	-1.63	-0.257	0.61	0.096
Mediterranean	-1.65	-0.220	-13.22	-2.257	-12.02	-2.060
Primary			-63.80	-6.127*	-61.14	-5.898*
Anatolian			101.37	21.509*	102.44	21.753*
Science			173.59	9.782*	174.92	9.891*
Social			161.22	7.374*	160.25	7.368*
Anatolian Teacher			111.62	12.746*	112.42	12.875*
Vocational			-28.70	-6.793*	-27.79	-6.591*
Anatolian Vocational			37.81	4.515*	38.09	4.577*

Table 15 (cont'd)
Regression coefficients of reading literacy of male students

Technical	16.35	1.594	14.54	1.423
Anatolian Technical	48.03	5.838*	47.19	5.759*
Multi-programme	-15.50	-1.873	-15.96	-1.940
Teacher Student Relations			-3.94/ -0.051	-2.429
Attitude towards School: Learning Outcomes			4.36/ 0.053	2.358
Attitude towards School: Learning Activities			4.01/ 0.050	2.288
Sense of Belonging to School			2.16/ 0.027	1.201

*p < .05

Mathematics

Given below is Table 16, according to which, predictable from Table 13 on reading, geographical regions are not necessarily helpful in explaining the variance in mathematics achievement of male students (Adjusted R^2=.08 p < .05), although Model 1 is statistically significant. Similar to our findings on reading, it is the Model 2 that increases the explained variance, to Adjusted R^2=.56 (p < .05). Again, there is no difference to observe in the explained variance in Model 3, leaving the value exactly the same with Model 2 (Adjusted R^2=.56 p < .05). Thus, it is possible to argue that school related variables are not useful in explaining the variance, while school types remain to be crucial.

Table 16
R squares of male students' mathematics literacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.30	.09	.08	88.21	.09	14.12*	11.00	1557.00
2	.75	.56	.56	61.28	.47	167.90*	10.00	1547.00
3	.75	.57	.56	61.12	.00	3.03*	4.00	1543.00

*p < .05

According to Table 17 provided below, all three models are also statistically significant in terms of mathematics achievement of male students, as was the case for the females.

Table 17
ANOVA results of regression analysis based on male data on mathematics

Model		Sum of Squares	df	Mean Square	F
1	Regression	1208828.40	11	109893.49	14.12*
	Residual	12113875.15	1557	7780.27	
	Total	13322703.55	1568		
2	Regression	7513668.88	21	357793.76	95.28*
	Residual	5809034.68	1547	3755.03	
	Total	13322703.55	1568		
3	Regression	7558956.36	25	302358.25	80.94*
	Residual	5763747.19	1543	3735.42	
	Total	13322703.55	1568		

*p < .05

Given below is Table 18, which has exactly the same purpose and structure with the previous Coefficients tables. In Model 1, different from the other Coefficient tables provided above, the gap between the Middle Anatolian region and our reference region, İstanbul, is the highest, with the B value of almost 78 points with a negative sign, indicating that students in Middle Anatolia achieves considerably less when compared to their counterparts in İstanbul. This major negative gap is followed by South-Eastern Anatolia, the B value of which is 54 points with a negative sign. However, Middle Anatolian region performs relatively better than the reference category, with the B value of 34 points. In Model 2, the gap between Middle Anatolia and İstanbul, which is in favour of the latter, drops to 58 points, highlighting the importance of school types in explaining student achievement.

Furthermore, the number of statistically significant geographical regions doubles in Model 2, from 3 to 6, also in line with this view. As was the case with the previous Coefficient tables, school type variables have the biggest B values, showing that they play a more important role in explaining male students' achievement differences in mathematics, when compared to geographical regions. With the B value of 258, Science High Schools, where students almost always have to do with numbers, is the most important predictor. Social Sciences High Schools perform considerably better than Anatolian High Schools, as the gap of B values in between is more than 40 points. School related variables, on the other hand, make no contribution with Model 3: There is barely any difference in the B values of Model 1 and 2 variables, and there is no statistically significant school related variable.

Table 18
Regression coefficients of mathematics literacy of male students

	Model 1		Model 2		Model 3	
Variables	B	t	B	t	B/Beta	t
Intercept	457.67	5.77	444.18	4.53	443.28	4.53
Aegean	22.60	2.597	-6.81	-1.101	-6.35	-1.028
Middle Anatolian	34.09	2.956*	-17.13	-2.089	-17.27	-2.111
Middle-Eastern Anatolian	-77.81	-6.292*	-57.97	-6.696*	-56.24	-6.493*
Eastern Black Sea	6.31	0.463	-35.14	-3.376*	-34.38	-3.300*
Eastern Marmara	12.56	1.447	5.36	0.876	5.71	0.935
Western Black Sea	-10.44	-0.897	-31.75	-3.888*	-32.21	-3.952*
South Eastern Anatolian	-54.06	-6.276*	-48.66	-8.004*	-47.54	-7.827*
North-Eastern Anatolian	-21.35	-1.566	-36.10	-3.771*	-35.20	-3.669*
Western Marmara	20.80	1.712	-0.70	-0.082	-0.29	-0.034
West Anatolian	3.81	0.421	-7.96	-1.260	-6.35	-1.006
Mediterranean	-9.86	-1.201	-25.09	-4.308*	-24.09	-4.136*
Primary			-21.23	-2.050	-19.82	-1.916
Anatolian			121.31	25.890*	121.49	25.841*
Science			258.31	14.641*	257.27	14.571*

Table 18 (cont’d)
Regression coefficients of mathematics literacy of male students

Social	164.96	7.589*	164.45	7.573*
Anatolian Teacher	156.87	18.017*	156.68	17.972*
Vocational	-32.24	-7.676*	-31.48	-7.480*
Anatolian Vocational	27.43	3.295*	27.82	3.349*
Technical	24.33	2.386	23.06	2.262
Anatolian Technical	48.41	5.918*	48.32	5.906*
Multi-programme	-22.88	-2.780	-22.70	-2.763
Teacher Student Relations			-2.39/ -0.028	-1.480
Attitude towards School: Learning Outcomes			0.43/ 0.005	0.235
Attitude towards School: Learning Activities			3.46/ 0.040	1.980
Sense of Belonging to School			3.16/ 0.036	1.758

*p < .05

Science

As Table 19 shows, the fact that geographical regions do not make a major contribution to the variance does not change, in terms of male students’ science achievement levels (Adjusted R^2=.08 $p < .05$). School types, on the other hand, remain to be a strong predictor of student achievement, making a considerable contribution to the variance (Adjusted R^2=.50 $p < .05$). Barely any contribution by Model 3 variables is made (Adjusted R^2=.51 $p < .05$).

Table 19
R squares of male students’ science literacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.29	.09	.08	78.28	.09	13.30*	11.00	1557.00
2	.71	.50	.50	57.97	.42	129.16*	10.00	1547.00
3	.72	.51	.51	57.34	.01	9.61*	4.00	1543.00

*p < .05

As shown by Table 20, all three models for science achievement of male students provide statistically significant results.

Table 20
ANOVA results of regression analysis based on male data on science

	Model	Sum of Squares	df	Mean Square	F
1	Regression	896611.60	11.00	81510.15	13.30*
	Residual	9540777.33	1557.00	6127.67	
	Total	10437388.93	1568.00		
2	Regression	5237859.21	21.00	249421.87	74.21*
	Residual	5199529.72	1547.00	3361.04	
	Total	10437388.93	1568.00		
3	Regression	5364246.83	25.00	214569.87	65.26*
	Residual	5073142.11	1543.00	3287.84	
	Total	10437388.93	1568.00		

*p < .05

In Table 21 given below, we see geographical regions struggling to predict male students' achievement in science, as was the case for female students: Only Middle-Eastern Anatolia and South-Eastern Anatolia have statistically significant results. Different from the previous Coefficients tables, Middle-Eastern Anatolia turns out to be the worst achieving region this time, B value of which is 60 points with a negative sign, when compared to İstanbul, the reference category. Middle-Eastern Anatolia is followed by the second-to-last South-Eastern Anatolia, which is 8 points ahead. School types, when taken into analysis in Model 2, double the number of the statistically significant regions: Eastern Black Sea region, with a massive change in its B value from positive 1 to 33 with a negative sign, and North-Eastern Anatolia, with an 8-point change become worthy of being taken into consideration. Except for Technical and Multi-Programme Schools, all school types are statistically significant with their relatively high B values, in line with the previous idea that they are strong predictors of student achievement in almost all subject areas for both genders. Science High Schools perform massively better than the reference category, General High Schools in İstanbul, thanks to its B value of 165 points. Social Sciences High Schools follow Science High Schools with a B value of 144: Despite being verbal-oriented, those schools turn out to be performing better than Anatolian Teacher Training and Anatolian High Schools, both of which are mixed-subject-area schools, thus having mathematics and science students. While Vocational and Multi-Programme Schools are the two types that achieve less than the reference category in terms of their male students, only results of the former is statistically significant: A 30-points gap separates General High Schools in İstanbul and Vocational High Schools. Different from the previous Coefficients tables, 3 out of 4 variables introduced with Model 3 this time are statistically significant, with Sense of Belonging to School as the mere exception. Yet, their B values are too low.

Table 21
Regression coefficients of science literacy of male students

	Model 1		Model 2		Model 3	
Variables	B	t	B	t	B/Beta	t
Intercept	462.13	90.31	452.06	105.44	451.37	106.13
Aegean	16.06	2.079	-8.76	-1.499	-7.63	-1.318
Middle Anatolian	20.70	2.022	-20.65	-2.663	-21.33	-2.778
Middle-Eastern Anatolian	-60.14	-5.479*	-42.56	-5.196*	-39.14	-4.816*
Eastern Black Sea	1.87	0.154	-33.56	-3.407*	-32.10	-3.285*
Eastern Marmara	14.77	1.917	9.10	1.572	9.97	1.740
Western Black Sea	-0.68	-0.066	-19.14	-2.477	-20.49	-2.679
South Eastern Anatolian	-52.11	-6.817*	-45.01	-7.824*	-43.20	-7.582*
North-Eastern Anatolian	-25.19	-2.082	-33.81	-3.733*	-31.66	-3.517*
Western Marmara	15.65	1.451	-1.21	-0.148	-0.84	-0.105
West Anatolian	4.00	0.498	-6.20	-1.037	-3.70	-0.624
Mediterranean	-3.32	-0.455	-13.67	-2.481	-12.07	-2.208

Table 21 (cont'd)
Regression coefficients of science literacy of male students

Primary	-55.96	-5.713*	-52.56	-5.414*
Anatolian	101.18	22.823*	102.36	23.208*
Science	165.36	9.907*	167.49	10.111*
Social	143.69	6.987*	142.66	7.003*
Anatolian Teacher	120.96	14.685*	121.83	14.896*
Vocational	-30.42	-7.656*	-29.67	-7.514*
Anatolian Vocational	32.18	4.086*	32.54	4.175*
Technical	18.04	1.870	15.47	1.617
Anatolian Technical	42.03	5.431*	40.46	5.272*
Multi-programme	-13.07	-1.679	-13.61	-1.765
Teacher Student Relations			-5.78/ -0.078	-3.804*
Attitude towards School: Learning Outcomes			5.51/ 0.069	3.179*
Attitude towards School: Learning Activities			4.74/ 0.061	2.888*
Sense of Belonging to School			1.53/ 0.020	0.909

*p < .05

To summarize findings, Table 22 is presented below. According to the results of the regression analyses, the 2nd models (regions + school types) seem to have the highest explanation rates for all domains, as evidenced by the adjusted R^2 values. Since the adjusted values for explained variances are close to each other, the difference between males and females in terms relationship between regions and school types seem to be minor.

Table 22
Explained variances for three domains between genders

Domain	Model	Adjusted R Square	
		Female	Male
Reading	1	.07	.07
	2	.47	.47
	3	.47	.47

Table 22 (cont'd)
Explained variances for three domains between genders

Mathematics	1	.07	.08
	2	.56	.56
	3	.56	.56
Science	1	.08	.08
	2	.47	.50
	3	.47	.51

The Table 23 shows the unstandardized regression coefficients of the 2nd models for males and females across three domains. The pattern which is presented by the table indicates that beta values of both genders are similar. South-eastern regions of Turkey achieve the lowest, while the Western regions are considerably less disadvantaged when compared to the reference region, İstanbul. A limited number of regions provide statistically significant results, thus enabling us to make a comparison. When we look at North and South-eastern Anatolia, which are the only regions that have statistically significant results across all three domains for both genders, we see that there is almost nothing practical to separate between the two genders.

It is a similar case for the school types, among which there are massive gaps, especially between the four top achieving types and the remainder. However, despite being a major predictor of student achievement in Turkey, school types similarly affect both genders. All in all, we can conclude that there is no major gender gap in Turkey since the differences are primarily caused by school types and geographical regions.

Table 23
Unstandardized regression coefficients of 2nd models

Variables	Female			Male		
	Reading	Mathematics	Science	Reading	Mathematics	Science
Intercept	486.08	423.04	477.73	443.63	444.18	452.06
Aegean	-23.55*	-25.01*	-13.42	-4.02	-6.81	-8.76
Middle Anatolian	-14.92*	-19.20	-18.05	-4.94	-17.13	-20.65
Middle-Eastern Anatolian	-27.71	-31.67*	-17.01	-39.67*	-57.97*	-42.56*
Eastern Black Sea	-32.71*	-33.39*	-13.04	-31.58*	-35.14*	-33.56*
Eastern Marmara	10.77*	15.48	26.11*	7.81	5.36	9.10
Western Black Sea	-38.45*	-30.40*	-11.68	-22.91	-31.75*	-19.14
South-eastern Anatolian	-43.68*	-44.24*	-43.65*	-40.28*	-48.66*	-45.01*
North-eastern Anatolian	-39.82*	-38.50*	-25.30*	-36.84*	-36.10*	-33.81*
Western Marmara	-12.90	-6.47	2.13	-7.15	-0.70	-1.21
West Anatolian	-11.76*	-6.41	5.56	-1.63	-7.96	-6.20
Mediterranean	-13.61*	-16.75*	-3.20	-13.22	-25.09*	-13.67
Primary	-72.78*	-28.47*	-42.02*	-63.80*	-21.23	-55.96*
Anatolian	91.62*	113.96*	90.00*	101.37*	121.31*	101.18*
Science	148.17*	257.53*	148.26*	173.59*	258.31*	165.36*
Social	121.10*	137.71*	108.97*	161.22*	164.96*	143.69*
Anatolian Teacher	97.77*	139.55*	108.93*	111.62*	156.87*	120.96*
Vocational	-12.56*	-21.69*	-15.83*	-28.70*	-32.24*	-30.42*
Anatolian Vocational	39.63*	43.54*	36.52*	37.81*	27.43*	32.18*
Technical	-13.12	-2.69	-12.39	16.35	24.33	18.04
Anatolian Technical	9.81	28.16	4.05	48.03*	48.41*	42.03*
Multi-programme	-22.22*	-5.62	-8.31	-15.50	-22.88	-13.07

*p < .05

CHAPTER 5: DISCUSSION

Introduction

In this chapter, mainly, this study will briefly be summarized, and major findings will be listed and discussed in terms of the models used in the analysis, and the effects of the variables that contain on both genders. Based on the discussion and the conclusion reached, implications for practice and further research will be suggested, which will ensure the continuity of this study through helping other researchers in taking this study further. Finally, the limitations of this study will be highlighted, in order not to mislead the intended audience.

Overview of the study

As gender gap is still an important issue, we decided to turn our attention to gender gap in Turkish education, and our literature review provided supporting evidence, as well as contrasting views. In order to discover more, we decided to conduct multiple linear regressions individually for male and female students, using PISA 2012 data of Turkey. Achievement was our dependent variable, while geographical regions, school types and four school related variables were the independent ones. We kept the unique criteria of PISA for geographical regions, which consist of twelve regions, rather than the official number, seven. In addition, we organized school types. This resulted in eleven additional variables for geographical regions, and ten for the school types. Finally, we split the data and conducted multiple linear regressions, replicated for reading, mathematics and science. Our analyses operated on three blocks, forming up Model 1, 2 and 3. Model 1 only had geographical regions. We included school types in Model 2, and four school-related variables in Model 3. As a result, we found that the primary issue in our education is the variations between school types not gender gap (Alacacı & Erbaş, 2010; Berberoğlu & Kalender, 2005; Kır, 2016; Özbay, 2015).

Major findings and conclusions

Model 1: Geographical regions only

As previously explained, the analysis consisting of three models was repeated for both genders, in terms of three subjects. As a consequence, the analysis revealed that despite being statistically significant, geographical regions fail to make a major contribution to the explained variance, therefore unable to predict female students' reading (Adjusted R^2=.07), mathematics (Adjusted R^2=.07) and science (Adjusted R^2=.08) achievement. On the other hand, results were nearly identical for male students, as geographical regions also fail to practically contribute to the explained variance, thus to predict male students' reading (Adjusted R^2=.07), mathematics (Adjusted R^2=.08) and science (Adjusted R^2=.08) achievement. Consequently, taking only Model 1 sections of R squares tables into consideration, one might safely argue that there is no difference, thus no gap between genders, in terms of geographical regions. However low explained variances indicate that the 1st models are unable to explain differences in achievement in 3 domains for neither females nor males. Similarly, when we check coefficients tables, which allow us to examine variables in each model individually, it becomes easier to make sense of why geographical regions alone fail to predict both female and male students' achievement in all three subjects: Only a limited number of regions, i.e. those located in the Eastern and Black Sea part of Turkey, turn out to be statistically significant. In almost all cases, nearly all geographical regions achieve less than our reference region, İstanbul, with some exceptions that have no statistical significance. Some regions become statistically significant only with the inclusion of school types in Model 2, allowing us to conclude that geographical regions only contribute to other factors rather than being enough to predict student achievement, regardless of gender and subject, on their own. This finding is in line with Jones (2002) and Fan and Chen (1998), who also argue that variations between geographical regions are weaker than those of school types; therefore, they are less able to predict student achievement.

Model 2: Inclusion of school types into analysis

In Model 2, with the inclusion of the school types to the analysis, the study literally takes a different lead. As shown by explained variances tables, school types make at least a 0.40 difference in the explained variances of students from both genders, in all subject areas. Furthermore, ANOVA tables similarly indicate that Model 2 is statistically significant, thus works well, regardless of gender and subject area. Since the effect of the school types is equally immense both for male and female students, one might argue that there is no gender gap emerging in Model 2 as well. Also, there seems to be an interaction between geographical regions and school types, as we see their B values changing in Model 2: More geographical regions become statistically significant with the introduction of school types while there are observable changes in their B values. However, those changes are not systematic: While the B values of some regions increase, some of the others may remain the same, or decrease. Furthermore, being dependant on the domain and gender, the number of regions becoming statistically significant in Model 2 is not consistent as well.

Although a gender gap emerges primarily in reading achievement when the Coefficients tables are considered, the case is only limited to South-Eastern Anatolia, where female students achieve 14 points worse than their counterparts from the opposite gender in the same region, in relation to the reference value. Apart from this exception, and minor differences, it is hard to hold the view that there is a major gender gap in Turkey, when geographical regions and school types as factors predicting student achievement are considered. Thus, our findings almost eliminate the gender gap and allow us to turn our attention to differences between different types of schools, which emerge as individual variables in Model 2. This goes hand in hand with what Opyene-Eluk and Opolot-Okurut (1995) argue: There is no major gender gap, and the achievement differences are caused by school types. Although having large between-school variances in the Turkish educational system exists (Berberoglu & Kalender, 2005), the fact that these differences do not function for or against one gender is a relief.

As unstandardized regression coefficients of both genders and all subjects depict, almost all school types are statistically significant, with one or two exceptions in each table. Those exceptions are mainly Technical and Multi-Programme High Schools, probably due to the fact that not many of those schools, and therefore students, were included in PISA 2012 sample. In all regions, and for both genders, the top achieving types of high schools never change: Science, Social Sciences, Anatolian Teacher Training and Anatolian High Schools are the highest achieving, therefore most desired schools in Turkey. Although this sounds perfectly normal, it should not, since the gap between the above-mentioned schools and the other types turn out to be extremely high, which is an issue. This problem of Turkish educational system is also emphasized by Alacacı and Erbaş (2010) who reported differences between school types is one of the leading factors explaining student achievement. When we look at regression coefficients in Chapter 4, regardless of gender and subject, the gap between Science and Vocational High Schools is consistently immense, sometimes reaching up to 200 points. As for the other low-achieving school types, the case is barely any different, since the gap between them and Science High Schools varies between 100 and 150 points. These large differences may correspond to changes in one or more proficiency levels defined in the PISA 2012 context. Unfortunately, this provides a supporting evidence for the lack of mınımum standard across school types ın Turkish educational system. Although Science High Schools set the benchmark in terms of B values in all subject areas and both genders, it is not the only school type that excels in terms of achievement. Similarly, the remaining 3 highest-achieving high school types, i.e. Social Sciences, Anatolian Teacher Training and Anatolian also have massive advantage over the low-achieving schools: While Social High Schools is very close to Science High Schools in terms of their B values in most cases, at least 50 to 100 points difference on average sets the difference between Anatolian Teacher and Anatolian High Schools and the low-achieving types. Although this polarization in terms of achievement enabling us the split the school types in half is thought-provoking enough, the gaps between the highest-achieving school types are even more worrying. In terms of male students' mathematics literacy, the gap between Science and Anatolian High Schools exceed 130 points, while it goes even higher for female students, exceeding even 140 points. All in all, school type emerges as an important predictor of student achievement in Model 2.

Model 3: School related variables finally added

In addition to geographical regions that we started with in Model 1, and school types added in Model 2, Model 3 also take four school-related variables into consideration, namely Teacher Student Relations, Attitude Towards School: Learning Outcomes, Attitude Towards School: Learning Activities, and Sense of Belonging to School. However, when we look at R Square tables of both genders, we see that those variables make absolutely no change, as they do not take R^2 value of Model 2 in any subject any further, regardless of gender: Science achievement of male students was the only exception, since the R^2 value (Adjusted R^2=.50) increases by a mere point (Adjusted R^2=.51).

When we examine the Coefficients tables, we see that what they depict goes hand in hand with the R Square tables: Above-mentioned school-related variables are almost totally useless in predicting student achievement, as they are not statistically significant. Even so, the variation in their B values is limited to a couple of points. Again, the only exception to this case is male students’ science achievement: Teacher Student Relations, Attitude Towards School: Learning Outcomes, Attitude Towards School: Learning Activities can predict male students’ science achievement with their highly limited practical effect, while Sense of Belonging to School make no statistically significant difference. Similarly, as there is almost nothing to separate female and male students in Model 3 as well, we can conclude that it is the school type, not gender that causes achievement differences for Turkish students, contrary to the view held by Duman (2010) and Gumus and Chudgar (2016). Similarly, Uysal (2016) also holds the view that school types, such as sense of belonging, teacher-student relations, and classroom management, have no practical effect. The very low contribution of the variables included in the 3rd models indicate that between-school differences is a principal problem before the effect of instructional practices on student achievement are considered (Berberoğlu & Kalender, 2005).

Summary

Results indicate that equal educational opportunities are not given to students as evidenced by differences between geographical regions and school types. As publications by OECD show, Turkey is one of the countries with the highest between-school differences. Considering that the counselling services do not function, earlier decisions about school types may have negative consequences in student achievement.

Contrary to popular belief supported by scoop-economic indicators, differences between geographical regions are smaller. Thus, student achievement is not determined where they live, rather, which school they attend to. However, student achievement is low in all regions. In addition to the massive polarization between the top achieving four school types, i.e. Science, Social Sciences, Anatolian Teacher Training and Anatolian High Schools, and the low achieving types, variances between the top four types are also immense. Although a couple of points sets those schools apart in entrance exams, the differences in real life are crucially significant for students. Furthermore, between-school variations are so immense in Turkey that they even exceed the negative consequences of gender gap, the effects of which are relatively minor when compared to those of school types.

Implications for practice

Although geographical regions are not enough to predict student achievement alone, they should be taken into consideration for Eastern regions, due to the fact that most skilful and knowledgeable teachers leave those regions as soon as they finish their compulsory duties. In order to eliminate this practice, promotions or housing can be offered by the Ministry of National Education, to compensate the downsides of working there.

As put forward by this study, students of certain school types, regardless of the regions they are in, achieve significantly well below the top four types, Science, Social, Anatolian Teacher and Anatolian High Schools, respectively. A set of actions can be taken to minimise the gap emerging in between. While the above-mentioned schools are preferred by top achieving students, it is not the case for the remainder of the school types. Rather, they are seen as worst case scenarios, or schools to be attended merely out of necessity, primarily because those schools are considered to be incapable of prepare students for the university entrance exams. Those schools can be made appealing to attract high achieving students, by attributing each type of school a specific advantage. Technical, Multi-programme or Vocational High Schools can guarantee jobs or positions in selected partner institutions. Furthermore, those schools apparently require some further investment: Technologically advanced tools, laboratories, and a futuristic atmosphere, all of which will ensure an education that can provide grounds for, if not be match for technical universities, should be available to students.

Another reason why certain types of schools are widely preferred by high achieving students because, as mentioned above, they are seen as the key to success in university entrance exams. Yet, the idea that each and every student should be university graduates at some point should be eliminated. This will also reduce the excessive demand for those schools, lead to an equal distribution of high achieving students, thus better teachers: A student profile consisting of significantly underachieving students is also not desired by prolific teachers. On the other hand, we should appreciate the fact that current schooling system, due to examinations, is not effective: A system in which graduates of Anatolian Teacher Training High Schools with absolutely no technical knowledge become students of engineering departments is a waste of time and money, both for the students and for the government.

Therefore, each type of school should prepare students for their respective departments in universities, which will ensure continuity. Thus, Technical High

Schools should prepare students for engineering departments, Anatolian Teacher Training High Schools for faculties of education, and so forth.

Another possible measure, as recently implemented by MoNE, is reducing the number of school types. They reduced the number of school types from 79 to 9 between 2008 and 2014: While General High Schools were turned into Anatolian High Schools, Fine Arts and Sports High Schools were separated. All types of Vocational and Technical High Schools were merged under the name of Vocational and Technical Anatolian High Schools, while Multi-programme High Schools, which had their in-house General High School divisions, were merged and renamed as Multi-programme Anatolian High Schools. Religious high schools were united as well, as Anatolian Imam Hatip High Schools. This act also unites their curriculum within each division, thus aims at better education. One might argue that this can be taken further to eliminate the achievement differences between school types.

Implications for further research

Similar to almost all research in the field, this study can also be taken further in various ways:

Further background-related research questions, thus variables, can be included in the study. In this sense,

- Fathers' and mothers' occupation can be taken into consideration as predictors of student achievement.
- In order to contribute to the breadth of the study in terms of explaining factors that predict Reading achievement of students from both genders, the number of books at home can be taken into consideration.

- Similarly, the above-mentioned suggestion can be replicated for Science or Mathematics achievement by including variables that relate those subject areas, such as the number of computers at home.

In order to contribute to the reliability of the study, or to achieve results that can more safely be generalized, the sample can be widened using the data of other surveys, such as TIMSS.

A comparison of issues emerging as a result of this study throughout the years can be made, by drawing data from the previous PISA surveys.

Limitations

As this study will rely solely on publicly available PISA data, the sample may not be representative enough to discuss all the variables intended to be covered, such as the significance of the school type; the number of general high schools included in the sample may be ten times more than the science high schools.

Another limitation can be the fact that Turkey do not participate in all PISA surveys: PISA offers a wide scope enough to cover many education-related aspects, but some tests are optional. Consequently, some data may not be available for Turkey, due to the limited number of tests in certain areas.

No fixation of any variable that might affect the results drastically, such as the performance of teachers, was applied.

PISA 2012 was the most recently published data when this study initiated. It is no longer the case.

Merely looking at the qualitative data is another limitation.

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