AN ANALYSIS OF TEACHER BACKGROUND INDICES AND THEIR RELATION TO THE EIGHTH GRADE TURKISH STUDENTS' MATHEMATICS ACHIEVEMENT IN TIMSS 2007

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ABSTRACT

AN ANALYSIS OF TEACHER BACKGROUND INDICES AND THEIR RELATION TO THE EIGHTH GRADE TURKISH STUDENTS' MATHEMATICS ACHIEVEMENT IN TIMSS 2007

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The purpose of this study is to investigate teacher background indices and their relation to mathematics achievement. For this purpose, the data collected from 146 Turkish mathematics teachers and 4498 8^{th} grade Turkish students with the instruments - mathematics teacher background questionnaire and mathematics achievement test in the Trends in International Mathematics and Science Study (TIMSS 2007) were analyzed by using the Pearson's Product Moment Correlation. The teacher background indices, constructed by TIMSS, were The Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations, The Index of Teachers' Emphasis on Mathematics Homework, The Index of Teachers' Perception of School Climate, The Index of Teachers' Adequate Working Conditions and The Index of Teachers' Perception of Safety in School.

The results of the correlation analysis yielded significant relationships except for the emphasis on homework. Students whose teachers characterized their school climate positive and their working conditions adequate got significantly higher scores. Moreover, for limitation to teach index variable, students having teachers who commented the related factors do not limit their instruction were found to be more successful than the other students. However, it is concluded that teachers in this study considered their school climate and working conditions as negative and thought there were lots of limitations to teach. On the other hand, although majority of the teachers reported that they feel safe in their schools, there were teachers who disagreed with the idea. This study includes some suggestions for further researchers to investigate the results of this study in detail and some implications to develop teachers' perceptions positively.

Key Words: Teacher Characteristics, Mathematics Achievement, TIMSS-2007.

ÖZ

ULUSLARARASI MATEMATİK VE FEN EĞİLİMLERİ ARAŞTIRMASI(2007) TARAFINDAN BELİRLENEN ÖĞRETMEN ENDEKSLERİNİN İNCELENMESİ VE BU DEĞİŞENLERİN SEKİZİNCİ SINIF TÜRK ÖĞRENCİLERİNİN BAŞARISI İLE İLİŞKİSİNİN ANALİZİ

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Bu çalışmanın amacı, öğretmen endekslerinin incelenmesi ve endeks değişkenlerinin matematik başarısı ile ilişkilerinin araştırılmasıdır. Bu amaç doğrultusunda, Uluslararası Matematik ve Fen Eğilimleri Araştırması öğretmen anketi ve matematik başarı testi ile 146 matematik öğretmeni ve 4498 sekizinci sınıf öğrencisinden toplanan veriler Pearson'ın çarpım-moment korelasyonu kullanılarak analiz edilmiştir. Öğretmenlerin bazı sınıf içi faktörlerin matematik öğretimini sınırlandırması ile ilgili raporları, Öğretmenlerin matematik ödevlerine verdikleri önem, Öğretmenlerin okul iklimine ilişkin algıları, Öğretmenlerin çalışma koşulları ile ilgili düşünceleri ve Öğretmenlerin okul güvenliğine ilişkin algıları Uluslararası Matematik ve Fen Eğilimleri Araştırması tarafından belirlenen endekslerdir.

Korelasyon sonuçlarına göre, matematik ödevlerine verilen önem endeksi hariç, endeks değişkenleri ve matematik başarısı arasında anlamlı ilişkiler bulunmuştur. Okul iklimini pozitif, çalışma koşullarını ise yeterli olarak nitelendiren öğretmenlerin öğrencileri anlamlı derecede yüksek puanlar elde ettiler. Ayrıca, matematik öğretiminin sınırlanması endeks değişkeni için, ilgili faktörlerin öğretimi etkilemeyeceğini yorumlayan öğretmenlerin öğrencileri de diğer öğrencilere göre daha başarılı bulundu. Ancak, bu çalışmadaki birçok öğretmen matematik öğretiminde birçok sınırlılık bulunduğunu düşünmekte, okul iklimi ve çalışma koşullarını zayıf olarak algılamaktadır. Öte yandan, öğretmenlerin çoğunun okullarında kendilerini güvenli hissetmelerine rağmen, bu fikre katılmayan öğretmenlerde bulunmaktadır. Öğretmen algılarını olumlu yönde geliştirebilmek ve bu araştırmanın sonuçlarını daha detaylı inceleyebilmek için çalışmanın sonunda bazı öneriler sunulmuştur.

Anahtar Kelimeler: Öğretmen özellikleri, Matematik Başarısı, TIMSS-2007.

To My Family

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I am also thankful to my friends who always motivate and cheer me up during the compulsive stages of this thesis. Lastly, I would like to express my gratitude to Mert Çelikdemir for unwavering faith that I could succeed. Writing this dissertation would not be possible without his supports.

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LIST OF ABBREVIATIONS

ABBREVIATIONS

ANOVA: Analysis of Variance

DPS: Data Processing and Research Center

EARGED: Eğitim Araştırma ve Geliştirme Derneği

EMH: The Index of Teachers' Emphasis on Mathematics Homework

IEA: International Association for the Evaluation of Education Achievement

ISCED: International Standard Classification of Education

MCFL: The Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations

MTBQ: Mathematics Teacher Background Questionnaire

NAEP: National Assessment of Educational Progress

NRC: National Research Coordinators

PASW: Predictive Analytics SoftWare

PIRLS: Progress in International Reading Literacy Study

PISA: Program for International Students Achievement

SLEQ: School-Level Environment Questionnaire

TIMSS: Trends in Mathematics and Science Study

TALIS: Teaching and Learning International Survey

TAWC: The Index of Teachers' Adequate Working Conditions

TPSC: The Index of Teachers' Perception of School Climate

TPSS: The Index of Teachers' Perception of Safety in School

CHAPTER 1

INTRODUCTION

1.1 Background

In retrospect, because of the human curiosity about having better living conditions environment and the desires, mathematics, geometry, astronomy and medicine were considered to be the most important branches of science. Attempts to understand the events that seem ordinary in daily life revealed the world is a place with full of mysterious. This situation necessitates resolving the mysterious of the world. With this purpose, mathematics becomes the mother of all the other disciplines. 400 years ago, Galileo explained the importance of mathematics as “Mathematics is the language in which God has written the Universe”. Most of scientists see mathematics is still the language of space due to the technological developments and the usage of mathematics in technology (McSweeney, 2010).

Since the importance of mathematics is growing while the time is going on, significant amount of researches has been making to maintain and improve teacher effectiveness in education. Countries change their education policies and curriculums to adapt their systems to the developments and trends in mathematics education all over the world. Turkey is one of the countries that revised the elementary education curriculum in 2004.

Low scores in the international standards exams such as; Trends in Mathematics and Science Study (TIMSS) and Program for International Students Achievement (PISA), pushed the program developers to reform the elementary education especially in disciplines, mathematics and science. In this reform, not only the content domains, but also the role of teachers and students were revised. Especially the roles of teachers have been expanded since teachers are considered to be stakeholders between the new curriculum and teaching (İşler, 2009).

Teacher related factors effect in students' achievement has been widely investigated. Teachers' content knowledge, pedagogical knowledge and pedagogical content knowledge, teacher's beliefs and attitudes, and teachers' quality and their impacts on academic development were the hot topics in education and they still protect the importance in these areas because of the unanswered questions. Therefore, there is need to conduct more researches about teacher efficacy in education.

Present study examines some characteristics and beliefs of mathematics teachers and their relations to the students' achievement in TIMSS 2007. Therefore, it contributes to the studies in the fields of teacher importance in education and specifically in mathematics education.

1.2 Purpose of the Study

The main purpose of the TIMSS is to explain the educational context behind achievement results (Martin & Preuschoff, 2008). For this purpose various information is collected from students, teachers, school administrations and curriculum experts. In

general, information about students, teachers, school administrators and curriculum experts are collected and they are indexed to make the further analyses possible.

As it is frequently spelled out by the major research studies about teachers, the major source of the success in any educational system depends on the characteristics and the qualifications of the teachers (Akyüz 2006; Goe & Stickler, 2008; Philippou & Christou, 1999; Xin, Xu & Tatsuoka, 2004; Rockoff, 2004; Yayan & Berberoğlu, 2004). Thus, the TIMSS, 2007 provides information about teachers' characteristics and their qualifications in the dimensions of Limitations to Teach, Emphasis on Homework, School Climate, Adequate Working Conditions, and School Safety.

The purpose of the present study is to further analyze (1) Turkish mathematics teachers' background characteristics such as age, gender and teaching experience, (2) relate background characteristics with the background index variables such as The Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations (MCFL), The Index of Teachers' Emphasis on Mathematics Homework (EMH), The Index of Teachers' Perception of School Climate (TPSC), The Index of Teachers' Adequate Working Conditions (TAWC) and The Index of Teachers' Perception of Safety in School (TPSS), and (3) relate these background indices to student achievement in mathematics in TIMSS 2007.

1.3 Research Questions

In the light of the purpose stated above, the following research questions were determined:

1) How the teacher background characteristics and teacher background indices are vary for Turkish mathematics teachers?
2) How the teacher background characteristics are related to the teacher background indices?
    a) Is there a statistically significant difference between the male and female teachers' perceptions regarding for each teacher background index variable?
    b) Is there a statistically significant difference among the teachers who belong to the different age intervals groups regarding for each teacher background index variable?
    c) Is there a statistically significant difference among the teachers who have different years of teaching experience regarding for each teacher background index variable?
3) What teacher background variables are significantly related to the mathematics achievement at the 8^{th} grade level in Turkey? For the significant relationships, how the relationship is changing considering the level of teachers (high, medium low)?

1.4 TIMSS

Trends in Mathematics and Science Study – TIMSS, is a screening study organized by International Association for the Evaluation of Education Achievement (IEA) for four years periods. TIMSS creates a foundation for the education experts, program developers and administrators to understand the functioning of their own education systems with a multi-faced assessment. In addition to the evaluation of mathematics and science achievement with a fixed scale, it is also designed to measure and evaluate the

differences among the national curriculums and to determine how the fields of education and trainings in schools were carried out. General purpose of the study is to provide comparative data to improve the countries' educational systems in the areas of mathematics and science education. For this purpose, it collects information about educational systems, teaching programs, characteristics of students, teachers and schools, and students' performance in mathematics and science (Martin, Mullis, & Foy, 2008).

Within the scope of TIMSS, assessment was conducted in the areas of mathematics and science for the 4^{th} and 8^{th} grade level with four years periods, 1995, 1999, 2003, 2007 and 2011. Since the 4^{th} grades in one application will be the 8^{th} grades in the next application period, it provides a long-term and longitudinal comparison of achievements between the groups of students. Thus, it provides the relative development between the classes (Martin, Mullis, & Foy, 2008).

TIMSS 2007

TIMSS 2007 involved widespread participation, involving approximately 425,000 students from 59 countries all over the world, 37 counties and 7 benchmarking participants at the fourth grade and 50 countries and 7 benchmarking participants at the eighth grade. Table 1.1 shows the participated counties to TIMSS 2007 at the eighth grade (Olson, Martin, & Mullis, 2008).

Table 1.1 Countries Participating in TIMSS 2007

Participated Countries at the 8th Grade Level				
Algeria	Czech Republic	Israel	Mongolia	Serbia
Armenia	Egypt	Italy	Morocco	Singapore
Australia	El Salvador	Japan	Norway	Slovenia
Bahrain	England	Jordan	Oman	Sweden
Bosnia and Herzegovina	Georgia	Korea	Palestinian Nat'l Auth.	Syria Arab Republic
Botswana	Ghana	Kuwait	Qatar	Thailand
Bulgaria	Hong Kong	Lebanon	Romania	Tunisia
Chinese Taipei	Hungary	Lithuania	Russia	Turkey
Colombia	Indonesia	Malaysia	Saudi Arabia	Ukraine
Cyprus	Iran	Malta	Scotland	United

Table1.2 shows the group of countries sorted by 8th grade mathematics scores. While the five countries that have mathematics scores between 598 and 570 indicate high level of success, the following seven countries having mathematics scores between 517 and 501 indicate the medium level. The other 39 countries, including Turkey, in the range of 499 and 307 points represent the group of countries with low level of success. Turkey's average mathematics achievement score (432) is under the TIMSS scale average (500). The other countries that show similar results are Lebanon, Thailand, Jordan and Tunisia.

Table 1.2 Distribution of Mathematics Achievement in TIMSS 2007

Levels	Countries	Average Scores
High	Chinese Taipei	598 (4.5)
	Korea, Rep. of	597 (2.7)
	Singapore	593 (3.8)
	Hong Kong SAR	572 (5.8)
	Japan	570 (2.4)
Medium	Hungary	517 (3.5)
	England	513 (4.8)
	Russian Federation	512 (4.1)
	United States	508 (2.8)
	Lithuania	506 (2.3)
	Czech Republic	504 (2.4)
	Slovenia	501 (2.1)
Low	Armenia	499 (3.5)
	Australia	496 (3.9)
	Sweden	491 (2.3)
	Malta	488 (1.2)
	Scotland	487 (3.7)
	Serbia	486 (3.3)
	Italy	480 (3.0)
	Malaysia	474 (5.0)
	Norway	469 (2.0)
	Cyprus	465 (1.6)
	Bulgaria	464 (5.0)
	Israel	463 (3.9)
	Ukraine	462 (3.6)
	Romania	461 (4.1)
	Bosnia and Herzegovina	456 (2.7)
	Lebanon	449 (4.0)
	Thailand	441 (5.0)
	Turkey	432 (4.8)
	Jordan	427 (4.1)
	Tunisia	420 (2.4)
	and last 19 countries	

1.5 Significance of the Study

Ackerman, Heafner and Bartz (2006) noticed that "Research identifies many factors affecting students' achievement, however, the greatest determinants of students' achievement is the influence of teachers" (p.6). Although Marzano (2001) asserted that teacher level factors account for only 13 % of the variance in students' achievement, they agree in the idea that teacher had an extremely important role in students' performance. Therefore, identifying the impacts of specific teacher characteristics on students' achievement is important. From this aspect, the present study contributes the related literature and provides support for policy initiatives designed to improve students' mathematics achievement by improving teachers' quality (Hill, Rowan, & Ball, 2005)

One of the reasons in the reform of the elementary education in Turkey in 2004 was linked on students' failure on TIMSS 1999, PIRLS 2001 (Progress in International Reading Literacy Study) and the PISA 2003. Uzun, Bütüner and Yiğit (2010) compared some of the characteristics of students and teachers by using the TIMSS 1999 and TIMSS 2007 data to have reflection for the new elementary curriculum on the subjects; science and mathematics. Therefore, since the present study used TIMSS 2007 data, it can provide significant reflections of the new mathematics curriculum in Turkey.

TIMSS 2007 International Mathematics Report includes teachers' reports on students having been thought the TIMSS mathematics topic either prior to or during the year of assessment (Exhibit 5.5, p.205). For Turkey, the percentage of the topics that mathematics teachers reported is 78%. It is higher than the TIMSS average percentage-

72 %. However, mathematics achievement of Turkish 8th grade students is significantly lower than the international average achievement. Therefore, secondary analyses of the data get high importance to understand the reasons behind these results. Present study contributes this purpose by relating the teacher background indices to students' achievement.

In this study, Turkish mathematics teachers' perceptions in the dimensions of limitation to teach, emphasis on homework, school climate, working conditions and school safety are examined. For limitation to teach, school climate, working conditions and school safety dimensions, there is considerable need to make researches in Turkey since they have not been studied by using TIMSS 2007 data. In contrast, homework has been widely investigated by researchers (Akyüz, 2006; Uzun, Bütüner & Yiğit, 2010; Yaman; 2004; Yayan & Berberoğlu, 2009). However, there are still questions needed to be explained in the related literature. Therefore, present study intends to find answers and fill the gap in these dimensions.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter covers the existing literature relevant to the purpose of the present study. It consists of three sections. In the first section, studies related to mathematics teachers' quality is handled. Then, Turkish researchers' secondary analyses of TIMSS and PISA data are summarized. In the third and last section, related researches regarding the factors of the presents study (limitation to teach, homework, school climate, adequate working conditions and school safety) are presented.

2.1 Studies about Mathematics Teachers

The relationships among teacher characteristics, teacher qualification and mathematics achievement have been explored since 1960s. Each study contributes the literature by addressing different research questions. Although there were some contradictory results for some variables, all of them agree that teacher play an important role in students' mathematics achievement. In this part of the present study, the studies about mathematics teacher will be summarized.

Schmidt, McKnight, Cogan, Jakwerth and Houang (1999) noticed that teachers' subject matter beliefs and their pedagogical approaches affect what they teach and how they teach. Therefore, they decided to categorize teachers with their subject matter knowledge and pedagogical approaches by using the survey questions in TIMSS 1995. The categories of teachers were discipline oriented, process oriented, procedure oriented and eclectic. *Discipline oriented mathematics teachers*, with a formal view, thought that formulas, computations and algorithms were more important than the real-world use of mathematics. They saw the successful students as a natural talented. In contrast, *process-oriented mathematics teacher* did not agree the idea that doing well in mathematics was a matter of natural talent. They indicated the importance of real-world use of mathematics, conceptual thinking and creativity. Moreover, mathematics was not a formal discipline with a full of formulas and computations. The third group of teachers, procedure oriented teachers, were the combination of first two groups. More specifically, they saw mathematics as abstract and gave importance to algorithms like the first group of teachers and they also underlined the importance of daily life examples and conceptual thinking. The last group was lack of internal consistency in their approaches. They emphasized everything and nothing. The authors see this types of teachers as genuine since they did not seen not to be prone to over marking. That is why the name of the last group is *eclectic*.

As the second step Schmidt's et. al. research, teachers from 21 countries sorted to the groups and made comparison according to the percentages of teachers for each group. With reference to the results of this research, while Asian teachers (Hon Kong, Japan, Korea and Singapore), whose students were the most successful ones in TIMSS 1995,

belong to either discipline oriented or eclectic groups, US teachers, whose students had significantly lower score than the average score in TIMSS 1995, did not belong to any specific groups. Author attributed this result to the lots of different education systems in US, so the teachers do not have enough commonalities to characterize them by a small number of categories. They concluded the weaknesses are not related to the teachers and students individually, it is because of the unsystematic teacher education programs in US.

Another study that compares pedagogical content knowledge of teachers in US and China was conducted by An, Kulm and Wu in 2004. They explain pedagogical content knowledge as the balance and integration between content knowledge and pedagogy. The purpose of the study is to find out how pedagogical content knowledge is used by US and Chinese teachers to understand students' thinking and to develop mathematical thinking. The subjects of the study were 28 mathematics teachers from Texas and 33 mathematics teachers from Jiangsu. They collect data by the author constructed questionnaires - Mathematics Teacher Questionnaire, Teachers' Beliefs about Mathematics Teaching Learning Questionnaire – interviews and observations. They conclude that while Chinese teachers emphasize the correctness of conceptual knowledge by reliance on the rigit development of procedures, teachers in US emphasize variety of activities to make their students more creative. However, when they doing it, they sometimes forget emphasizing the connection between related topics and it causes not to develop students' understanding and procedural development at the same time.

One year after An et. al.' study, Hill, Rowan and Ball (2005) investigated the relationships between teacher's mathematical knowledge for teaching and first and third grade students' achievement. They explain mathematical knowledge for teaching as

> "By mathematical knowledge for teaching, we mean the mathematical knowledge used to carry out the work of teaching mathematics. Examples of this 'work of teaching' include explaining terms and concepts to students, interpreting students' statements and solutions, judging and correcting textbook treatments of particular topics, using representations accurately in the classroom, and effects of teachers' mathematical knowledge on student achievement providing students with examples of mathematical concepts, algorithms, or proofs" (p. 373).

Result of their study revealed that mathematical knowledge for teaching was significantly related to students' achievement. This result is consisted with the studies in the literature (An et. al, 2004; Mullens, Murnane, & Willett, 1996; Rowan, Chiang & Miller, 1997).

In a different perspective, Marzano, Pickering and Pollock (2001) discussed teacher effect that mathematics teachers can be more effective if they use research based instructional strategies. Summarizing and note taking, reinforcing effort and providing recognition, using representation and cooperative learning, settings goals, providing feedbacks, generating and testing hypothesis, and activating prior knowledge are some of the strategies that teachers should integrate into their classroom practices. This will be possible if schools implement coherent, meaningful professional development programs, to put their understanding into practice (Miller, 2003)

Like all the studies above, Goe and Stickler (2008) agree that some teachers contribute more to their students' mathematics achievement. However, most of the researches were

not clear in explaining which specific teacher quality affects more on students' mathematics achievement. This is because of the different definitions and measuring methods for teacher quality. Therefore, they decided to make a meta-analyses of researches tied their findings to teacher quality.

After examining dozens of researches, conducted between the years of 2000 and 2007, they focuses four categories of teacher quality indicators – teacher qualifications, teacher characteristics, teacher practices and teacher effectiveness. They defined *teacher qualifications* as the credentials, knowledge and experiences that teacher bring with them when they enter the classroom such as teacher subject matter knowledge, degrees, test scores, certifications, professional development and experience. All of them affects students' achievement positively or negatively. For example, having major (Frome, Lasater & Cooney, 2005; Wenglinsky, 2000) or master degree in mathematics (Betts, Zau & Rice, 2003) contributes students' mathematic achievement.

The *teacher characteristics* were explained as a teachers' attitudes and attributes such as expectations from students, cooperation to other colleagues, race and gender (Goe & Stickler, 2008). The studies were consisted in that teacher collaboration (Leana & Pil, 2006; Kannapel & Clements, 2005) and teacher expectation for students were positively associated with students' mathematics achievement. The third category of teacher quality indicators is *teacher practices* that teacher actually do in classroom. Goe and Stickler (2008) defined teacher practices as the process view of teacher quality since it includes the teacher-student relationships and teaching methods and strategies to accomplish specific tasks. The studies that found positive relation among clear learning objectives and performance expectations (Matsumura et. al, 2006; Schacter & Thum,

2004) and formative assessment (Schacter & Thum, 2004) and mathematics achievement illustrates the process of teacher quality. *Teacher effectiveness* is the last category of teacher quality indicators. Related literacy lacks evidences that what in particular makes teacher effective. The authors designate teacher effectiveness as unobservable. Therefore, the factors of teacher effectiveness should be explored.

In the research brief, Buddin and Zamarro (2010) agree the above idea that past studies have been unable to account which factors makes teachers more effective. For policy makers and educators, this situation obstructs their attempt to enhance teacher quality (Goe and Stickler, 2008). Therefore, there is need to conduct exploratory studies to find answer to the questions about teacher quality in mathematics.

2.2 Secondary Analyses of TIMSS and PISA

The general approach of Turkish researchers (Akyüz 2006; Dinçer & Uysal, 2010; İş, 2003; Özdemir, 2003; Yaman 2004; Yayan & Berberoğlu, 2004), that made further analyses of TIMSS and PISA data, was modeling the relationships between student-related, teacher-related and school-related factors and students' science and mathematics achievement or literacy.

İş (2003) investigated the factors affecting mathematical literacy of 15-year old students in PISA 2000 in three countries: Japan, Norway and Brazil. They represented the high, medium and low performing country respectively. The structural equation modeling was used for the data analyses. The latent variables of the study were attitudes toward

reading and mathematics, reading literacy, student-teacher relations, climate, communication with parents and usage of technology and facilities. For all three countries, she found that reading literacy, attitudes toward mathematics and communication with parents significantly and positively influences the mathematical literacy. Moreover, mathematical literacy positively influences attitudes toward mathematics.

Özdemir (2003) and Yaman (2004) analyzed the factors affecting Turkish students' science achievement in TIMSS-1999. While Özdemir (2003) used student related factors, Yaman (2004) used teacher-related factors. They found that science achievement is affected positively by students' socioeconomic status and perception of success and teachers' instructional decisions; working on problem, analyzing relationships, using real world applications and explaining reasoning. Moreover, negative relationships between the teachers' perceptions of limitation for effective teaching and science achievement were found (Yaman, 2004).

Like Yaman (2004), Akyüz (2006) investigated the teacher related factors but this time for mathematics achievement and for Turkey, European Union countries (Belgium, Czech Republic, Cyprus, Lithuania, Netherlands, Slovenia, Slovakia, Hungary and Italy) and other candidate countries (Bulgaria and Romania) - at the time of study were conducted. She took home education resources as a covariate in the explanatory model; Hierarchical Linear Models. As a result, the students of male teachers were more successful and there were significant and positive effects of the factors; teaching experience, time spent on test and quizzes, use of textbooks disciplined class climate on Turkish' students mathematics achievement. She noticed that while there were

similarities between the Turkey and European Union countries, the results were completely different for candidate countries.

Similarly, Dinçer and Uysal (2010) conducted secondary analyses of PISA 2006 science literacy results to measure the determinants of students' achievement in Turkey. They looked at the effects on students and family variables, school related variables and regional variables. They found that the major determinants of science achievement are program types and family background characteristics. The results are not unexpected when the findings of related studies are considered (Berberoğlu & Kalender, 2005; Ferreira & Gignoux, 2010; Yayan & Berberoğlu, 2004).

In addition to the results above, in Yayan and Berberoğlu's research (2004) negative relationships between student-centered classroom activities and mathematics achievement was found with the data TIMSS-1999. This result was contradictory for some studies (Lokan & Greenwood, 2000 and Bos & Cooper, 1999) and consisted to the dissertations (Özdemir; 2003 & Yaman, 2004). The authors explained the results by attributing the TIMSS student questionnaire survey. Since it measured just the frequencies of student-centered activities, it does not give a clue about the quality of the activities.

In another research report of Yayan and Berberoğlu (2009), they used TIMSS 2007 data to the purpose of finding the general linear model explains Turkish students' mathematics achievement. They observed the consisted results with their previous study. In addition, they also found the week and negative relationships between the out of

school activities and mathematics achievement and between homework and achievement.

2.3 Related Studies

Present study examines the Turkish mathematics teachers' background indices and their relation to student achievement in mathematics in 2007. In this section, studies related to index variables will be summarized.

Limitation to teach

Eres and Atanasoska (2011) summarized the factors of limitation to teach as low motivation of students (uninterested students), discipline problems (disruptive students), time managements issue, resources availability, collaboration among teachers, working conditions, and inadequate support from parents. They asserted that if a teacher feels insufficient in dealing with challenges in teaching, he/she experiences stress and this may cause lack of productivity and lack of job satisfaction. Ladd (2011) added that racial and economic mix of school students, as limitation for teachers, may also cause dissatisfaction for teachers or even cause considering leaving the school and teaching profession. This situation was linked to the school climate (Mitchell, Bradshaw & Leaf, 2010). In other words, it was stated that the more positive perception of school climate is related with the less disruptive behavior in classroom and the more job satisfaction that teacher have.

Caygill, Long and Cowles (2010) used TIMSS data to measure the teachers perceptions of limitation to teach and relate them to students' mathematics and science achievement in New Zealand. They also compared the results with some of the participated countries (Scotland, United States, England, Australia, Australia, Kazakhstan, Chinese Taipei, Hong Kong SAR, Norway, Singapore, Russian Federation, Netherlands, and Japan) in TIMSS-2007. Student with different academic abilities, students who come from a wide range of backgrounds, students with special needs, uninterested students and disruptive students were the determined factors of limitation in the teacher background questionnaire in TIMSS-2007. The possible response were given on five-point scale (not applicable, not at all, a little, some and a lot). They categorized teachers as perceiving few or no limitation, some limitation and a lot of limitation. The result shows that, including New Zealand, in most of the countries students whose teachers through the factors as few or no limitation had higher achievement in both mathematics and science. It was consisted with Yaman's study (2004) in which teachers' perceptions' of limitation affects students science achievement negatively.

Homework

In the related literature, there are contradictory ideas about homework' influences on achievement. Keith and Cool (1992) found that no matter the students ability level is, all students can get higher scores if they do their homework and the amount of times students devote to homework is related to achievement. This result is also supported by some studies in the related literature (Betts, 1996; Keys, Harris, & Fernandes, 1997;

Lokan, Ford, & Greenwood, 1996). However, it is also stated that too much homework may effect negatively on students' achievement (Hallam, 2004). Keys et. al (1997) described the relationships between homework and achievement as curvilinear that means while moderate amount of times on homework are productive, too much or very little time spend on homework are not.

Cooper, Robinson, and Patall (2006) analyzed homework studies conducted between 1987 and 2003. In the meta-analysis, they conclude that although there were studies, like the mentioned studies above, concluding that homework can improve students' scores on the class tests, in 35 correlational researches, little and no relationships were found for elementary school students in the different states of United States.

There are also related researches in Turkey. CITO Turkey carries out monitoring and evaluation system for the students in preschool through secondary school. The purpose of this system is stated, in the website of CITO International, as "how is pupil developing during the course of his/her education by measuring many different aspects of pupil's development". One of the aspects that has been searched is the relationships between homework and achievement. According to the research results (İş-Güzel, Berberoğlu, Demirtaşlı, Arıkan & Tuncer, 2009) from 62000 Turkish elementary students, homework does not have any impact on students' academic development. This result is consisted with the other research studies in Turkey (Kapıkıran & Kıran, 1999; Uzun et. al., 2010; Yaman, 2004; Yayan & Berberoğlu, 2009)

Ten years before the CITO Turkey research, in 1999, Kapıkıran and Kıran, worked with 41 third grade students in a primary school. In their study design, they distributed the

students to the groups with or without homework. They found no significant result too. Although the sample of this research is too small to generalize the result, it was confirmed by the other studies having representative samples. For example, Akyüz (2006), Uzun et. al. (2010), Yaman, (2003), Yayan and Berberoğlu (2009) used the TIMMS results, with sufficient number of student to make generalization.

Uzun et. al (2010) compared Turkey's and most successful five countries' achievement results with the aim of finding the factors of getting high or low achievement. One of the conclusions of the study is that Turkish students' low achievement cannot be explained by the time spend on homework. Bos and Cooper (1999), on the other hand, reached the same conclusion for 10 European education systems. In addition to this finding, types of homework (Yaman, 2004), and homework review in the classroom and emphasize on homework (Akyüz, 2006) do not contribute to students' learning.

Unlike the all studies mentioned above, Shahzada, Ghazi, Shahzad, Khan and Sha (2011) investigated the teachers' perceptions regarding the effect of homework on students' achievement. They worked with 300 hundred Indian teachers to find the percentages of teachers for each questions in author constructed questionnaire. According to the results of the study, majority of the teachers agree and strongly agree that homework contributes to students' intellectual development (93%), enriches students' affective capabilities (79%), helps students in psychomotor development (86%), compels students to study at home (87%), develops students' habit of study (90%), provides opportunity for revision and practice (93%) and to learn and work independently (83%) and provides feedback to the teacher about students' strengths and weaknesses (82%). Although the most of the studies agree that homework do not

contribute students learning, teachers place high emphasis on homework in their teaching. Therefore, teachers should be informed about the conducted studies conclusions and implications.

School Climate

School climate has been researched for many years. Today, it still attracts researchers attention because of its significant influences on educational constructs. Each researcher has defined school climate according to their own research perspectives. Therefore, there are lots of definitions in the literature. Marshall (2007), in her review of analyses, defined factors that that influence classroom climate as interaction between teacher and students, teachers' students' and parents' perception of school environment, academic development, feelings of safeness, trust and respect, and school size.

Some of the conducted studies investigate teachers' and students' perception about school climate, some of them relate these perceptions to students' academic development. Günbayı (2007) examined teachers' perceptions of school climate factors according to their background characteristics. He collected information from 204 high school teachers about their age, experience, gender, marital status, education levels and their teaching categories (social courses, national science courses and, art, music and physical education). He used ANOVA as a statistical method to find the possible differences among groups of teachers. According to the results, teachers teaching art, music and physical education, male teachers, single teachers, teachers having a degree of education and older teachers perceive their school climate more supportive comparing to the other teachers.

Like Günbayı, Huang and Fraser (2009) worked with 300 female and 518 male teachers from secondary school in Taiwan to examine the differences between female and male science teachers' perception of their school environment. They concluded that while female teachers perceive greater collaboration among teachers and stronger professional interest; male teachers perceive lower work pressure and better relationships between teacher and students.

Mitchell et al. (2010), on the other hand, investigated the discrepancies of teachers' and students' perceptions about school climate. From the data that they collected from 1881 fifth grade students and 90 teachers, they found that teachers' perceptions of school climate are more related to classroom-level factors: classroom management, class size, proportions of teachers with disruptive behavior. In contrast, students' perceptions are more related to school-level factors: student mobility, student-teacher relationships, and principal turnover.

In both of the researches, Johnson & Steven, 2006; Greenberg, 2004, academic achievement of students has been affected positively by school climate. While Greenberg (2004) used National Assessment of Educational Progress- 2000 (NAEP) data for school climate and 4^{th}, 8^{th}, and 12^{th} grade students' achievement results, Johnson and Stevens (2006) collected information, from 1106 teachers and all 4^{th} graders in 59 elementary schools, with the instruments: School-Level Environment Questionnaire (SLEQ) and Terra Nova Survey Plus standardized achievement test. Moreover, they added that socioeconomic status of schools has an important role in school climate, so in students achievement.

Working Conditions

Working conditions has been investigated to find its effect on students' achievement (Johnson, Kraft and Papay, 2011; Ladd, 2009), perceptions of teachers' self-efficacy (Dibbon, 2004; Moore & Marry, 1992; Öztürk, 2008), and job satisfaction and career intentions (Johnson et al., 2011 ; Ladd, 2011)

Ladd (2009) defined working conditions as "At the most general level, working conditions for teachers are influenced by the physical features of the work place, the organizational structure, and the sociological, political, psychological and educational features of the work environment"(p.6). The purpose of her research is to find out the possible relationships among working conditions factors based on the factor analyses of North Carolina survey questions (2006) and students achievement based on the test scores in mathematics and reading by keeping the factors – schools' racial and socioeconomic mix of students – as covariates. Determined factors of working conditions are leadership, facilities and resources, teacher empowerment, professional development, and time domain. Taken together all of the factors of working conditions, she reached the conclusion that the working conditions of teachers explain 10 to 15 percent of variance in mathematics and reading scores across the all schools in North Carolina. Moreover, school leadership and teachers ratings of school facilities were found as the most important predictor of achievement. Johnson et al. (2011), on the other hand, worked with 25.135 teachers in another states of USA, Massachusetts. Like Ladd (2009), one of the focuses of this study was teachers' perception about working conditions and their influence on students' academic growth. They used working conditions survey given to all teachers in the state in 2008. According to the results,

students whose teachers work in favorable conditions get higher scores than the other students.

In 1992, Moore and Marry concluded that working conditions affect teachers' self-efficacy. This result is confirmed by other studies with different research approaches. For example, classroom size are related with teacher efficacy. Teachers in overcrowded class have lower self-efficacy beliefs about themselves because of the discipline problems in the class (Dibbon, 2004).

Like the other self-efficacy and working conditions researches, Öztürk (2011) investigated teachers' perceptions about their working conditions and its relation to self-efficacy beliefs. In the study, 506 Turkish elementary teachers in İstanbul were used as sample of the study and author constructed working questionnaire and Teacher Sense of Efficacy Scale" were used as instruments. Relationships with colloquies and administration, psychical environment in schools, and changes in educational policies were the factors of working conditions and they all have positive effect on teachers' perception of self-efficacy.

Another construct that has been searched is the relationships between working conditions and teachers' job satisfactions and career plans. Ladd (2011) and Johnson et al. (2011) investigated how working conditions predict teachers' intended departures from schools in the states of North Carolina and Massachusetts respectively. They both concluded that inadequate facilities and resources matter a great deal for teachers who plan to transfer or leave the profession.

School Safety

Dr. Pamela L. Riley (2000) executive director in Center for the Prevention of School Violence, noted that: "A 'safe school' is one whose physical features, layout and policies, and procedures are designed to minimize the impact of disruptions and intrusions that might prevent the school from fulfilling its educational mission" (p.1). Moreover, she added that schools should be a place that students and teachers go without any fear for their safety. This could be happen if there is a school safety committee which consists of stakeholders from all perspectives with the members from parents, school administrators, teachers and students. The first task of the safety committee should be assessing the weaknesses about safety in their school by investigating the school environment and by surveying with teachers, students and parents to learn whether they feel safe in the school or not and if not what is the reasons behind those concerns. Then, they should take precautions according to the data that they collected.

Steinberg, Allensworth and Johnson (2011) studies tally with Riley suggestion. The purpose of their study is to find out what distinguishes Chicago Public schools where students and teachers feel safe from the other schools. They concluded that the key element of feeling safe in schools is the quality of relationships between teachers and students and between teachers and parents. Even in the schools located in areas with high crime rates and poverty, if there is a high quality relationship, students feel safer than the other students coming from communities with less poverty and crime. One of the implications of this report is the positive relationships between perception of school climate and safety.

Like Steinberg et al., Syvertsen, Flanagan and Stout (2009) concluded that school climate have a potential role in preventing schools from dangerous behaviors. For this purpose they conducted a survey with 1933 adolescents from 13 schools. In the survey, there was a hypothetical story in which one of their peer's plans about to do something dangerous in school, and it was questioned that what would they do, if they knew the plan. The possible actions that they would respond were intervening directly, telling a teacher and principal, discuss it with a friend and do nothing. Majority of the students stated that they would intervene rather than stay silence. Moreover, students who perceive their school climate as supportive reflected that they would inform teachers or principals about the plan. This shows that school climate has an effect to develop sharing responsibility among students and so has an indirect effect on keeping schools safe.

CHAPTER 3

METHODOLOGY

In this chapter, research design of the study, sampling procedure, instrumentation, variables included in the study and statistical analyses are presented.

3.1 Research Design

The purpose of the study is to further analyze the teacher background indices (MCFL, EMH, TAWC, TPSC,TPSS) and to relate them to Turkish students mathematics achievement in TIMSS 2007 considering the relationship between teacher background characteristics (age, gender, and teaching experience) and teacher background indices. To achieve the purposes, the collected data were analyzed with quantitative methods. First of all, the frequencies of each teacher background characteristics and teacher background indices were analyzed. Then, one-way analyses of variance (one-way ANOVA) run for each index variables considering the age, gender and teaching experience separately. As a last step, correlation coefficients between mathematics achievement and each index variables were computed. For the significant relationships, a follow-up ANOVA were considered to see the mean differences for the levels of teachers (high, medium, low) for each index variables.

3.2 Sampling

There are two-target populations in TIMSS: 4th and 8th grades. In TIMSS 2007 Technical Report (2008), while explaining the target population of the study, UNESCO's International Standard Classification of Education (ISCED) was considered. In the present study, the target population is 8th grade Turkish students.

The uniform sampling design, two-stage cluster sampling design, specified for each participating country in TIMSS 2007. At the first stage, schools were determined considering probability proportional – to- size (PPS). At the second stage, one class from each school was chosen. Schools and classes have equal chance to present the sample.

National Research Coordinators (NRCs) and TIMSS & PIRLS International Study Center, IEA Secretariat, IEA Data Processing and Research Center (DPS), and Statistics Canada collaborate in the process of sampling. In Turkey, TIMSS National Center in the Research and Development Center of Education (EARGED) is responsible for sending the list of elementary schools to DPS where the schools are sampled randomly with a computer program. Each school has two substitutes to be prepared for the unexpected conditions. Then, DPS choose one class for each school with the same method (Joncas, 2008).

In April of 2007, 4498 8th grade Turkish students in 146 elementary schools participated to TIMSS 2007 study. Since the teacher thought the sampled classroom were chosen automatically, 146 mathematics teachers were in the study as well. Gender of the sampled students is presented in the Table 3.1.

Table 3.1 Sex of the Eight Grade Turkish Students in TIMSS 2007

Sex	Frequency	Percent
Female	2093	46.5
Male	2405	53.5
Total	4498	100.0

3.3 Instrumentation

TIMSS 2007 used achievement tests and background questionnaires to measure the trends in education all over the world. Two *achievement tests* were used, mathematics and science achievement tests, to assess what the students learn in these content areas. Background questionnaires, on the other hand, were used to explain the educational context behind the scores. *Student questionnaire* asked students about demographic information, home backgrounds, attitudes toward mathematics and science, and experience in these content areas. *Teacher background questionnaires* collected information from mathematics and science teachers about their backgrounds and trainings, beliefs, attitudes, and their instructional approaches. *School questionnaires* completed by school principals about school climate and facilities for teaching and learning. Finally, *curriculum questionnaires,* sought information about the organization of the curriculums and policies and emphasis in mathematics and science (Erberber, Arora & Preuschoff, 2008).

In the present study, 8^{th} grade mathematics achievement test scores and data from mathematics teacher background questionnaire were used.

3.3.1 Mathematics Achievement Test

Mathematics achievement test includes 214 items to measure both content and cognitive domains. While the content domains specified the subject matter, the cognitive domains specified the thinking processes. At the eight grade, mathematics achievement test covered four content domains – number (30%), algebra (30%), geometry (20%), and data and chance (20%), and three cognitive domains – knowing (35%), applying (40%), and reasoning (25%). The topic areas for each content domain are shown in the Table 3.2.

Table 3.2 Topic Areas Included in the Mathematics Content Domain in 8th Grade

Eight Grade Content Domains	Eight Grade Topic Areas
Number	Whole numbers
	Fractions and decimals
	Integers
	Ratio, proportion, and percent
Algebra	Patterns
	Algebraic expressions
	Equations/formulas and functions
Geometry	Geometric shapes
	Geometric measurement
	Location and movement
Data and Chance	Data organization an representation
	Data interpretation
	Chance

117 of the total 215 items were in multiple choice format and the rest of the items (98) were in the constructed response format, requiring students to generate, write and explains their answers. Students get one score point for each correct multiple choice item, and get one or two points for the items in constructed response format. While the

items requiring short answers worth one score point, the items requiring longer explanations worth two-score points (Ruddock, O'Sullivan, Arora & Erberber, 2008).

3.3.2 Mathematics Teacher Background Questionnaire (MTBQ)

Mathematics teacher background questionnaire includes 33 questions to collect information from mathematics teachers about their demographics, experience, attitudes, pedagogical information, instruction load, resources related to teaching mathematics, mathematics course content, and comments of teaching mathematics (Erberber et al., 2008).

In the present study, as fit for purpose of the study, some of the variables were taken into the consideration: variables about teacher background characteristics (age, gender, and teaching experience) and the index variables (MCFL, EMH, TAWC, TPSC, TPSS). The variables are explained in the next section.

3.4 Variables Included in the Study

From the mathematics teacher background questionnaire, background characteristics variables and mathematics teacher background indices were analyzed in this study.

3.4.1 Background Characteristics of Mathematics Teachers

TIMSS 2007 Mathematics Teacher Background Questionnaire collected data about teachers' background characteristics including gender, age, and teaching years of experience. For female and male teachers, it was coded as 1 and 2 respectively. To determine the trends in age of the teachers, there were age intervals: under 25, 25 to 29, 30 to 39, 40 to 49, 50 to 59, and 60 or older. They were coded as 1 for under 25, and 6

for 60 or older. For teaching experience, there were no intervals. Teacher wrote their exact years of teaching.

3.4.2 Background Indices

TIMSS 2007 collected background variables from students, teachers, schools, and National Research Coordinators to describe the educational context behind achievement results. These background variables were summarized in the international reports (Martin, Mullis & Foy, 2008) as pictures or tables. To make the summarization concisely, index variables were computed by combining data from several questions that measure the common characteristic (Martin & Preuschoff, 2008).

3.4.2.1 Computing Background Indices

In TIMSS 2007 technical report, index is defined as "a composite variable that assigns students to one of three levels – high, medium, and low – on the basis of responses to a series of component variables" (Martin & Preuschoff, 2008, p. 281). While high and low categories of an index represent the responses that are the most and least supportive educational contexts respectively, the medium level represents responses somewhere in between.

As an example, the Index of Students' Perception of Being Safe in School (SPBSS) groups the following items (Figure 3.1) to measure the frequency of incidents that students have. For this index, students at high level reported that none of the incidents happened to them during the last month. Those students perceived school as a safety place. On the other hand, students at low level reported three or more incidents.

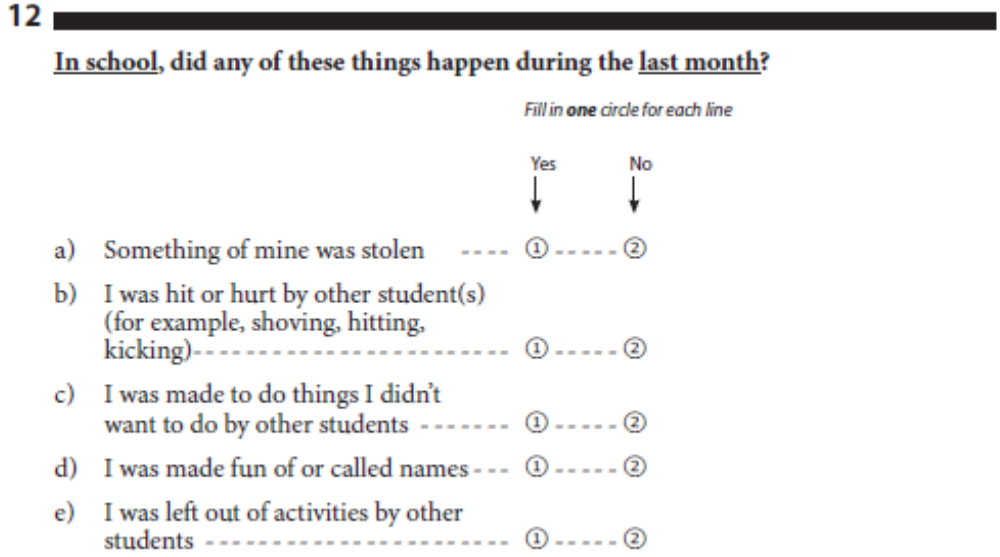

Figure 3.1 Item of the Index Variable - SPBSS

There are two different methods to determine the levels of index variables. The combined response method was used considering the frequencies of responses like the example above. On the other hand, the scale method was used when items had a quantitative continuum like Likert scale format. In this method, average of responses' numerical values determined the cutoff points for each level (Martin & Preuschoff, 2008). In the PASW data, high level teachers coded as 1, medium level teachers coded as 2 and low level teachers coded as 3.

3.4.2.2 Reliability of Background Indices

In TIMSS 2007, Cronbach's alpha coefficients of each index variable for each participant country were computed to assess reliability (Martin & Preuschoff, 2008). The reliability coefficients are presented for each index variable in the following parts.

3.4.2.3 Teacher Background Indices

In TIMSS 2007 Eight grade - Mathematics Teacher Background Questionnaire, the five indexes were computed: The Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations (MCFL), The Index of Teachers' Emphasis on Mathematics Homework (EMH), The Index of Teachers' Perception of School Climate (TPSC), The Index of Teachers' Adequate Working Conditions (TAWC) and The Index of Teachers' Perception of Safety in School (TPSS).

The Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations (MCFL)

Mathematics teachers reported their ideas about limitations of teaching mathematics by answering the question on a 4-point scale (Not applicable-Not at all, A little, Some, A lot). In the question, to what extend the student related factors - *students with different academic abilities, students who came from wide range of backgrounds* (e.g., economic, language), *students with special needs* (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment), *uninterested students, and disruptive students* –limit their instruction was examined. (See appendix A). The items were coded as 1 if teachers selected not applicable or not at all and 4 if teachers selected a lot for the extension of students' factors that limit mathematics instruction.

According to the average of teachers' responses, the cutoff points were determined. While the cutoff point for high level was less than or equal to 2, the cutoff point for low level was greater than 3. Therefore, the points greater than 2 but less than 3 was the

indicator of the medium level. In other words, teachers at the high level reported that the related factors do not limit their instruction or they have little effects. In contrast, teachers at the low level reported that they limit some or a lot (Martin & Preuschoff, 2008).

The international median of reliability coefficients for this index variable was computed as 0.69. For Turkey data, the value was 0.64.

The Index of Teachers' Emphasis on Mathematics Homework (EMH)

Mathematics teachers reported their emphasis on homework by answering the related two questions. While the first question examined frequency of assigning homework – *Every or almost every lesson, About half of the lessons, Some lesson* – the second question examined the amount of homework that teachers assign – *Fewer than 15 minutes, 15-30 minutes, 31-60 minutes, 61-90 minutes, More than 90 minutes* (See Appendix A).

Teachers, at the high level, reported that they assign more than 30 minutes of homework in half of the lessons or more. On the other hand, teachers, at the low level, reported that they assign less than 30 minutes of homework in fewer than half of the lessons. All other combinations of frequency and amount of homework assigned belong to the medium level. In other words, the frequency and amount of assigning homework was greater for the high level teachers (Martin & Preuschoff, 2008).

The international median of reliability coefficients for this index variable was computed as 0.01. For Turkey data, the value was 0.20.

The Index of Teachers' Perception of School Climate (TPSC)

Mathematics teachers reported their ideas about school climate by answering the question on a 5-point scale: very high =1, high = 2, medium= 3, low = 4 and very low = 5. The questions examined teachers' perception about school climate across eight items – *Teacher job satisfaction, Teachers' understanding of the school's curricular goals, Teachers' degree of success in implementing the school's curriculum, Teachers' expectation for students achievement, Parental support for students achievement, Parental involvement in school activities, Students' regard for school property, Students' desire to do well in school.* (See Appendix A).

According to the average of teachers' responses, the cutoff points were determined. While the cutoff point for high level was less than or equal to 2, the cutoff point for low level was greater than 3. Therefore, the points greater than 2 but less than or equal to 3 was the indicator of the medium level. In other words, teachers at the high level rated their school climate as very high or high across the eight items in the question. In contrasts, teachers at the low level rated them as at least "medium", "low" or "very low" so they do not perceive the school climate as supportive for learning and teaching (Martin & Preuschoff, 2008).

The international median of reliability coefficients for this index variable was computed as 0.82. For Turkey data, the value was 0.83.

The Index of Teachers' Adequate Working Conditions (TAWC)

Mathematics teachers reported their ideas about adequate working conditions by answering the question on a 3-point scale: not a problem =1; minor problem = 2; and

serious problem = 3. The questions examined the teachers' perceptions across the three items – *The school building needs significant repair, Classrooms are overcrowded, Teachers do not have adequate work space outside their classrooms* (See Appendix A).

According to the average of teachers' responses, the cutoff points were determined. While the cutoff point for high level was equal to 1, the cutoff point for low level was greater than 2. Therefore, the points greater than 1 but less than or equal to 2 was the indicator of the medium level. In other words, teachers at the high level reported that the following items were not a problem for teachers. On the other hand, teachers at the low level reported that they were either a problem or a serious problem. School resources are not available for them to provide effective mathematics instruction (Martin & Preuschoff, 2008).

The international median of reliability coefficients for this index variable was computed as 0.60. For Turkey data, the value was 0.51.

The Index of Teachers' Perception of Safety in School (TPSS)

Mathematics teachers reported their ideas about school safety and security by answering the question on a 4-point scale: agree a lot =1, agree = 2, disagree= 3, and disagree a lot = 4. The question examined the teachers' perception of safety in three items: *The school is located in a safety neighborhood, I feel safe at this school, The school's security policies and practices are sufficient* (See Appendix A).

According to the average of teachers' responses, the cutoff points were determined. While the cutoff point for high level was less than or equal to 2, the cutoff point for low

level was greater than or equal to 3. Therefore, the points between 2 and 3 were the indicator of the medium level. In other words, teachers at the high level agreed with the following three items on average. In contrast, teachers at the low level disagreed with them (Martin & Preuschoff, 2008).

The international median of reliability coefficients for this index variable was computed as 0.83. For Turkey data, the value was same.

3.5 Statistical Analyses

As it is explained in the research design part of this chapter, the present study used descriptive statistics, one-way ANOVA, correlation and follow-up ANOVA methods. In the first part of the statistical analyses, frequencies, percents and mean values of teacher background characteristics and background indices were calculated. By this method, Turkish teachers' overall characteristics were analyzed. Moreover, which level the teachers belong for each index variable was investigated. Then, the possible level differences for index variables considering the age, gender and teaching experience as factors were questioned by using one-way ANOVA method. Therefore, 15 different ANOVA (five index variables x three background characteristics) was run.

As the last step of the present study, the possible relationships among students' mathematics scores and teacher background indices were examined. Before the correlation was run, classes' average scores were calculated using the data in the achievement test results file. Then, the average scores were written in the teacher background questionnaires data file using the school ids. In other words, the classes' average scores were matched to the teachers by using the schools' ids in both of the

files. After the correlation results were analyzed, for the significant relationships, the follow-up ANOVA's was run too see the possible average score differences considering the level of teachers for each index variable. For all of the statistical analyses, the package program PASW was utilized.

CHAPTER 4

RESULTS

In this section, the findings of the descriptive and inferential statistical analyses are presented. For inferential statistics, ANOVA and Correlational Results are presented.

4.1 Descriptive Statistics

In this part of this chapter, descriptive statistics of teacher background characteristics and teacher background indices were explained.

4.1.1 Background Characteristics of Mathematics Teachers

Table 4.1 includes the number of mathematics teachers from total 146 teachers who respond the questions about their background characteristics.

Table 4.1 Valid number of teachers for each background characteristics

Gender	146
Age	146
Teaching Experience	135

Gender

For the characteristics of gender, almost the frequencies of male and female teachers are equal.

Table 4.3 Gender of Mathematics Teachers for Turkey

	Frequency	Percent
FEMALE	67	45.9
MALE	79	54.1
Total	146	100.0

Age

For Turkey data, the greatest proportion of the mathematics teachers was found to be in the ages between 25-29 years old. Even half of the teachers (49.3%) are under 30, and none of them is older than 60 (Table 4.2)

Table 4.2 Ages of Mathematics Teachers for Turkey

Age	Frequency	Percent
UNDER 25	20	1.7
25 TO 29	52	35.6
30 TO 39	25	17.1
40 TO 49	27	18.5
50 TO 59	22	15.1
Total	146	100.0

Teaching Experience

Average year of experience is approximately 11(μ=10.61) for Turkish mathematics teachers. In the present study, the teaching experience variable was split up the categories for the ANOVA statistics. The considerable proportion of teachers (41.1 %) had teaching experience less than 5 years. Even 17.1 % of them were in their first or second years. There was no teacher who had more than 30 years experience in Turkey.

Table 4.4 Experience of Mathematics Teachers for Turkey

Number of years	Frequency	Percent
First two years	25	17.1
3-5 years	35	24.0
6 to 10 years	31	21.2
11-20 years	17	11.6
More than 20 years	27	18.5
OMITTED	11	7.5
Total	146	100.0

4.1.2 Teacher Background Indices

The following table summarizes teacher background indices with the number of teachers who respond the corresponding questions and the mean values of each index variable.

Table 4.5 Teacher Background Indices Statistics

		MCFL	EMH	TPSC	TAWC	TPSS
N	Valid	145	144	146	146	145
	Missing	1	2	0	0	1
Mean		2.25	1.93	2.48	2.29	1.34

Table 4.6 Descriptive Statistics of Levels of Indices

	MCFL		EMH		TPSC		TAWC		TPSS	
	N	%	N	%	N	%	N	%	N	%
HIGH	22	15.1	51	34.9	8	5.5	15	10.3	106	72.6
MEDIUM	65	44.5	52	35.6	60	41.1	73	50.0	29	19.9
LOW	58	39.7	41	28.1	78	53.4	58	39.7	10	6.8
Omitted	1	.7	2	1.4	-	-	-	-	1	.7
Total	146	100.0	146	100.0	146	100.0	146	100.0	146	100.0

The Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations (MCFL)

Turkish mathematics teacher belong to the medium level since the overall average (μ=2.25) is greater than 2 but less than 3. That means they thought that the related students' factors affect "a little" (codes as 2) or "some" (coded as 3) on average. However, when the percentages of each level (Table 4.6) are taken into the consideration, it can be seen that 39.7% of the teachers, low level teachers, reported that the related students' factors limit their instruction "a lot" or at least "some".

The Index of Teachers' Emphasis on Mathematics Homework (EMH)

Since the grouping teachers to the levels was not done by averaging the values and setting the cutoff variables for this index variable, it is not appropriate to make interpretations on mean value of the index (μ=1.93). Therefore, it should be looking at the each questions' statistics (Table 4.7). According to the results, the mean values of frequency of assigning homework and the amount of homework assigned are 1.72 and 2.49 respectively. That means, most of the Turkish mathematics teachers assign homework at least "half of the lessons" (coded as 2) or "every or about every lessons" (coded as 1) and it takes more than 30 minutes. Therefore, Turkish teachers belong to the high level of index because it fits the high level criteria (more than 30 minutes of homework in half of the lessons or more) when the averages of each question are taken separately. On the other hand, the percentages of high, medium and low level are 34.9, 35.6 and 28.1 respectively (Table 4.6). In other words, 34.9 % of the Turkish mathematics teachers are at the high level, i.e. they assign more 30 minutes of homework in half of the lessons or more, 35.6% of the Turkish mathematics teachers are

at the medium level, and 28.1 % of the Turkish mathematics teachers are at the low level i.e. they assign less than 30 minutes of homework in fewer than half of the lessons.

Table 4.7 Statistics of Homework Questions

		MAT\FREQUENCY OF MATHS HOMEWORK	MAT\MIN ASSIGN FOR HOMEWORK IN TIMSS CLS
N	Valid	138	139
	Missing	8	7
Mean		1.72	2.49

The Index of Teachers' Perception of School Climate (TPSC)

Turkish mathematics teacher belong to the medium level since the overall average (μ=2.48) is greater than 2 but less than 3. That means that teachers do not perceive their school climate as supportive. On the contrary, they also do not perceive them as low or very low for learning. They perceive them somewhere in between. However, the percentages of levels are considerably different from each other (Table 4.6). Only 5.5 % of the teachers are at the high level. In other words, very small numbers of teachers (8) perceive their school climate as supportive. On the other hand, more than half of the teachers (78) reported their school climate as not supportive.

The Index of Teachers' Adequate Working Conditions (TAWC)

Turkish mathematics teacher belong to the low level since the overall average (μ=2.29) is greater than 2, i.e. they do not believe that the school resources are adequate to conduct effective instruction. When the percentages are compared, it is appropriate to say that just 10.3 % of the Turkish mathematics teachers thought that the school

resources are adequate and so not a problem for effective instruction (Table 4.6). On the contrary, all the other teachers thought them as not adequate or even a serious problem.

The Index of Teachers' Perception of Safety in School (TPSS)

Turkish mathematics teacher belong to the high level since the overall average (μ=1.34) is less than 2, i.e. they feel safe and secure in their schools. Most of the teachers are at the high level but 19.9 % and 6.8 % of teacher are at the medium and low level of this index respectively (Table 4.6). In other words, although most of the teacher agreed that their schools are safety places, some of them disagreed with the idea of being in a safety school.

4.2 ANOVA Results

Fifteen one-way analyses of variance were conducted to evaluate the relationship between the teacher background characteristics (age, gender, and experience) and teacher background indices (MCFL, EMH, TPSS, TAWC, and TPSC). While the independent variables were the teacher background characteristics, the dependent variables were the teaching background index variables. The groups of dependent variables were stated in the tables: Table 4.2, Table 4.3 and Table 4.4.

In the following parts, analyses of variance results were explained for each dependent variable considering each teaching background characteristics as independent variable (See Appendix B).

4.2.1 Mathematic Classes with Few or No Limitation (MCFL)

Gender

The ANOVA was not significant, $F(1,143) = .01$, $p = .93$. The strength of relationships between the gender of Turkish mathematics teachers and their perception of the factors on limitations to teach, as assessed by η^2, was .00, indicating that there were no differences in the mean scores between female or male teachers (Green & Salkind, 2007).

Age

The ANOVA was not significant, $F(4,143) = 2.08$, $p = .09$. The strength of relationships between the ages of Turkish mathematics teachers and their perception of the factors on limitations to teach, as assessed by η^2, was medium, with the ages of mathematics teachers accounting for 6% of the variance of the dependent variable (Green & Salkind, 2007). Since the *p* value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

Experience

The ANOVA was significant, $F(4,130) = 2.57$, $p = .04$. The strength of relationships between the teaching experience and their perception of the factors on limitations to teach, as assessed by η^2, was medium, with the teaching experience accounting for 7% of the variance of the dependent variable (Green & Salkind, 2007).

To evaluate pairwise differences, follow up tests were conducted. Because the result of the homogeneity test was nonsignificant ($p = .07$), it was concluded that the variances of groups are equal and chosen to use Tukey HSD test, a test assume equal variances

among the five groups (Green & Salkind, 2007). There was significant difference in the means between the teachers who were in their first two years of teaching (M = 2.48, SD = .59) and the teacher who had more than 20 years teaching experience (M = 1.93, SD = .83). The teachers who were in their first two years of teaching perceived the related factors as a greater limitation to give qualified instruction in comparison to the teachers who had more than 20 years teaching experience. There were no any other significant mean differences between the groups of teachers who had different years of teaching experience (Table 4.8).

Table 4.8 Post-hoc Comparisons- Experience vs MCFL

	(I) GEN\YEARS BEEN TEACHING	(J) GEN\YEARS BEEN TEACHING	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	First two years	3-5 years	.17	.182	.892
		6 to 10 years	.13	.186	.962
		11-20 years	.36	.218	.461
		More than 20 years	.55*	.192	.037
	3-5 years	6 to 10 years	-.04	.171	.999
		11-20 years	.20	.205	.873
		More than 20 years	.39	.178	.191
	6 to 10 years	11-20 years	.24	.209	.788
		More than 20 years	.43	.183	.136
	11-20 years	More than 20 years	.19	.215	.899

*. The mean difference is significant at .05 level.

4.2.2 Teachers' Emphasis on Mathematics Homework (EMH)

Gender

The ANOVA was significant, $F(1,142) = 3.97$, $p = .048$. The strength of relationships between the gender of Turkish mathematics teachers and their perception of the factors on limitations to teach, as assessed by η^2 , was small, with the gender of mathematics

teachers accounting for 3% of the variance of the dependent variable (Green & Salkind, 2007). Male teachers (M = 2.05, SD = .79) on the average emphasized on mathematics homework more than female teachers (M = 1.79, SD = .80). The eta square index indicated that 3% of the variance of the emphasis on homework variable was accounted for by gender of teachers (Green & Salkind, 2007).

Table 4.9 Descriptive Statistics of Teachers' Gender for Emphasis on Homework

	Mean	**Std. Deviation**
Female	1.79	.795
Male	2.05	.788
Total	1.93	.799

Age

The ANOVA was not significant, $F(4,139) = .57$, $p = .69$. The strength of relationships between the ages of Turkish mathematics teachers and their emphasis on mathematics homework, as assessed by η^2, was small, with the ages of mathematics teachers accounting for 2% of the variance of the dependent variable (Green & Salkind, 2007). Since the p value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

Experience

The ANOVA was not significant, $F(4,128) = .22$, $p = .93$. The strength of relationships between the Turkish mathematics teachers' experience and their emphasis on mathematics homework, as assessed by η^2, was small, with the mathematics teachers' experience accounting for 1% of the variance of the dependent variable (Green & Salkind, 2007). Since the p value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

4.2.3 Teachers' Perception of School Climate (TPSC)

Gender

The ANOVA was not significant, $F(1,144) = 1.15$, $p = .29$. The strength of relationships between the gender of Turkish mathematics teachers and their perception of school climate, as assessed by η^2, was small, with the gender of mathematics teachers accounting for 1% of the variance of the dependent variable (Green & Salkind, 2007).

Age

The ANOVA was not significant, $F(4,141) = 2.05$, $p = .09$. The strength of relationships between the ages of Turkish mathematics teachers and their perception of school climate, as assessed by η^2, was medium, with the ages of mathematics teachers accounting for 6% of the variance of the dependent variable (Green & Salkind, 2007). Since the *p* value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

Experience

The ANOVA was not significant, $F(4,130) = 2.05$, $p = .09$. The strength of relationships between the Turkish mathematics teachers' experience and their perception of school climate, as assessed by η^2, was medium, with the mathematics teachers' experience accounting for 6% of the variance of the dependent variable (Green & Salkind, 2007). Since the *p* value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

4.2.4 Teachers' Adequate Working Conditions (TAWC)

Gender

The ANOVA was not significant, $F(1,144) = .20$, $p = .66$. The strength of relationships between the gender of Turkish mathematics teachers and their perception of adequate working conditions, as assessed by η^2, was small, with the gender of mathematics teachers accounting for 1% of the variance of the dependent variable (Green & Salkind, 2007).

Age

The ANOVA was not significant, $F(4,141) = 1.49$, $p = .21$. The strength of relationships between the ages of Turkish mathematics teachers and their perception of adequate working conditions, as assessed by η^2, was small, with the ages of mathematics teachers accounting for 4% of the variance of the dependent variable (Green & Salkind, 2007) . Since the *p* value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

Experience

The ANOVA was not significant, $F(4,130) = .86$, $p = .49$. The strength of relationships between the Turkish mathematics teachers' experience their perception of adequate working conditions, as assessed by η^2, was small, with the mathematics teachers' experience accounting for 3% of the variance of the dependent variable (Green & Salkind, 2007). Since the *p* value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

4.2.5 Teachers' Perception of Safety in School (TPSS)

Gender

The ANOVA was not significant, $F(1,143) = 1.45$, $p = .23$. The strength of relationships between the gender of Turkish mathematics teachers and their perception of safety in schools, as assessed by η^2, was small, with the gender of mathematics teachers accounting for 1% of the variance of the dependent variable (Green & Salkind, 2007).

Age

The ANOVA was not significant, $F(4,140) = 2.04$, $p = .09$. The strength of relationships between the ages of Turkish mathematics teachers and their perception of safety in schools, as assessed by η^2, was medium, with the ages of mathematics teachers accounting for 6% of the variance of the dependent variable (Green & Salkind, 2007) . Since the *p* value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

Experience

The ANOVA was not significant, $F(4,129) = 1.30$, $p = .28$. The strength of relationships between the Turkish mathematics teachers' experience their perception of adequate working conditions, as assessed by η^2, was small, with the mathematics teachers' experience accounting for 4% of the variance of the dependent variable (Green & Salkind, 2007). Since the *p* value is not significant, there was no need conduct post hoc comparisons to evaluate pairwise differences among the means.

4.3 Correlation Results

In this part of the present study, Pearson's product moment-correlation coefficient r was computed to find out the relationship between each teacher background index variable and the students' mathematics achievement scores. In addition, a follow up one-way ANOVA was run for the significant relationships. Therefore, additional information about the possible mean differences in mathematics scores considering the index levels that the teachers belong were obtained.

The results of the correlational analyses are shown in Table 4.10. It presents the correlation coefficients, asterisks (*) indicating whether a particular correlation is significant at the .05 level (*) or the .01 level (**), *p* values associated with the significance tests, and the sample size (*N*).

Table 4.10 Correlation between Students' Mathematics Scores and Index Variables

		MCFL	EMH	M-TPSC	M-TAWC	M-TPSS
Stu_average	Pearson Correlation	-.313**	-.014	-.475**	-.301**	-.188*
	Sig. (2-tailed)	.000	.864	.000	.000	.024
	N	145	144	146	146	145

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

4.3.1 Relationship between Mathematics Classes with Few or No Limitation (MCFL) and Students' Mathematics Achievement Scores

The correlation between the teachers' responses to the questions forming the index variable, Mathematics Classes with Few or No Limitation, and their classes' average mathematics scores was significant, r (143) = -.31, $p < .01$. Since the correlation is significant, follow-up one way analyses of variance was administered. In this analysis,

while the teachers at the different levels (high, medium and low) represented the independent variable, students' mathematics achievement scores represented the dependent variable.

The ANOVA was significant, $F(2,142) = 11.59$, $p = .00$. The strength of relationships between the levels of this index variable and the students' mathematics achievement scores, as assessed by η^2, was strong, with the levels of the index variable accounting for 14% of the variance of the dependent variable (Green & Salkind, 2007).

To evaluate pairwise differences, follow up tests were conducted. Because the result of the homogeneity test was significant ($p = .00$), the Dunnett's *C* test, a test does not assume equal variances among the three levels, was preferred to conduct post-hoc analyses (Green & Salkind, 2007). There was significant mean difference between the teachers at the high level ($M = 509.57$, $SD = 108.68$) and the teachers at the medium level ($M = 431.31$, $SD = 73.11$) in their classes' average mathematics achievement scores. Moreover, there was significant mean difference between the teachers at the high level ($M = 509.57$, $SD = 108.68$) and the teachers at the low level ($M = 432.62$, $SD = 59.15$), but no significant differences between the teachers at the medium level and the teachers at the low level.

The class average scores of the teachers at the high level, who do not perceive the related factors as a limitation to give a qualified instruction, were greater than the other classes whose teachers at the medium or low levels. In other words, according to the results, the students of the teachers who do not perceive the factors as a limitation got higher scores than the students of the teachers who perceive some or a lot as a limitation (Figure 4.1)

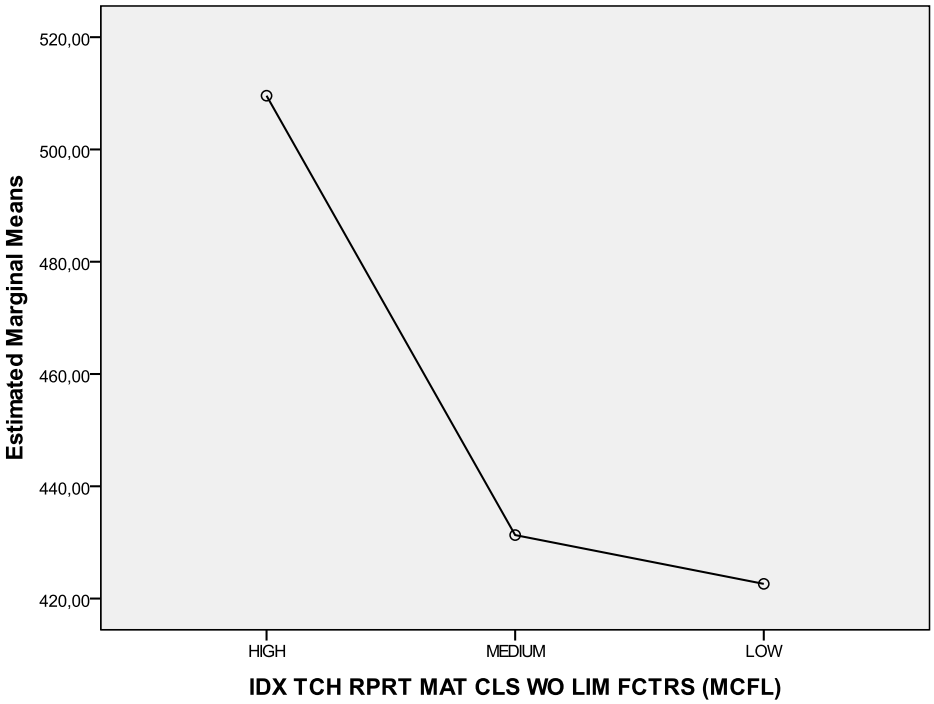

Figure 4.1 Estimated Marginal Means of Students' Average Scores for MCFL

Since the students of the teacher at the high level shows a greater performance and since the high level teachers were coded as 1 (medium level=2 and low level=3), the reason why the correlation has negative sign could be explained. In other words, the lower code the teachers had (the higher level they belong), the higher scores their students had.

4.3.2 Relationship between Teachers' Emphasis on Mathematics Homework (EMH) and Students' Mathematics Achievement Scores

The correlation between the Teachers' Emphasis on Mathematics Homework and their classes' average mathematics scores was nonsignificant, r (142) = -.01, p > .05. Since there was no relationship, the follow-up ANOVA was not administered.

4.3.3 Relationship between Teachers' Perception of School Climate (TPSC) and Students' Mathematics Achievement Scores

The correlation between the Teachers' Perception of School Climate and their classes' average mathematics scores was significant, r (144) = -.48, $p < .01$. Since the correlation is significant, follow-up one way analyses of variance was administered.

The ANOVA was significant, $F(2,143) = 21.00$, $p = .00$. The strength of relationships between the levels of this index variable and the students' mathematics achievement scores, as assessed by η^2, was strong, with the levels of the index variable accounting for 23% of the variance of the dependent variable (Green & Salkind, 2007).

To evaluate pairwise differences, follow up tests were conducted. Because the result of the homogeneity test was significant ($p = .00$), the Dunnett's C test was preferred to conduct post-hoc analyses (Green & Salkind, 2007). All the binary combinations among the three levels were significant. The class average score of the teachers at the high level ($M = 542.12$, $SD = 78.15$), who rated the related questions as "high" or "very high", was greater than the classes whose teachers at the medium level ($M = 466.80$, $SD = 90.14$) and the classes whose teachers at the low level ($M = 407.16$, $SD = 50.30$) who rated them as "low" or "very low". In addition, medium level teachers' classes got higher scores than the low level teachers' classes (Figure 4.2).

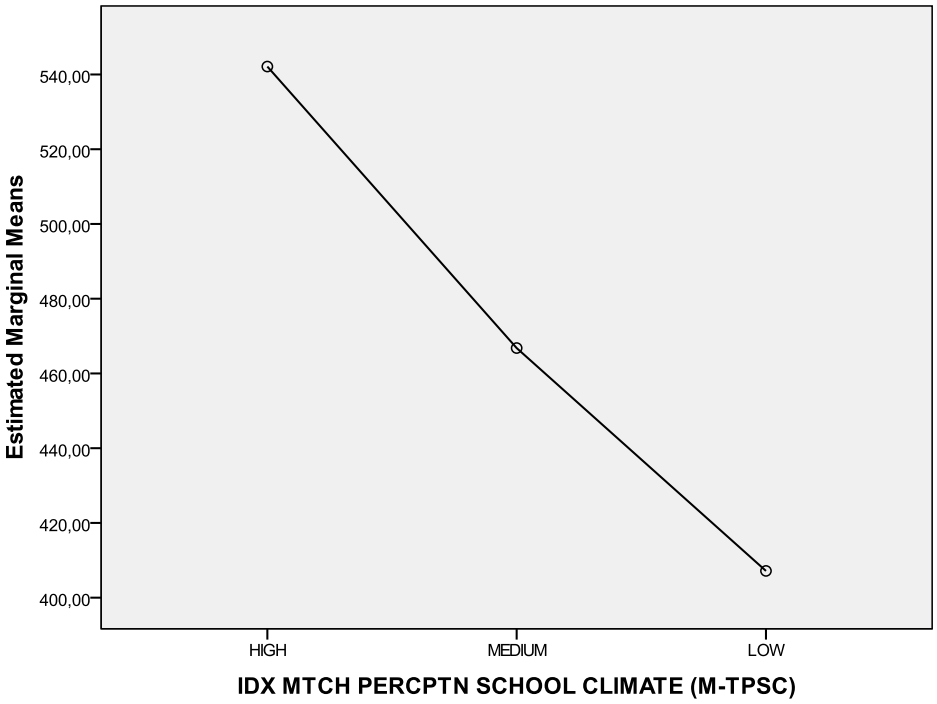

Figure 4.2 Estimated Marginal Means of Students' Average Scores for TPSC

4.3.4 Relationship between Teachers' Adequate Working Conditions (TAWC) and Students' Mathematics Achievement Scores

The correlation between the Teachers' Perception of Adequate Working Conditions and their classes' average mathematics scores was significant, r (144) = -.30, $p < .01$. Since the correlation is significant, follow-up one way analyses of variance was administered. The ANOVA was significant, $F(2,143) = 8.47$, $p = .00$. The strength of relationships between the levels of this index variable and the students' mathematics achievement scores, as assessed by η^2, was medium, with the levels of the index variable accounting for 11% of the variance of the dependent variable (Green & Salkind, 2007).

To evaluate pairwise differences, follow up tests were conducted. Because the result of the homogeneity test was significant ($p = .03$), the Dunnett's C test was preferred to conduct post-hoc analyses (Green & Salkind, 2007). There was significant mean

difference between the teachers at the high level (M = 508.54, SD = 104.66) and the teachers at the low level (M = 418.15, SD = 67.97) in their classes' average mathematics achievement scores but no significant differences between the teachers at the high level and the teachers at the medium level and between teachers at the medium level and the teachers at the low level (Figure 4.3). The class average scores of the teachers at the high level, who rated the related problems as "not a problem", were greater than the classes whose teachers at the low level, who reported them either a "minor problem" or a "serious problem".

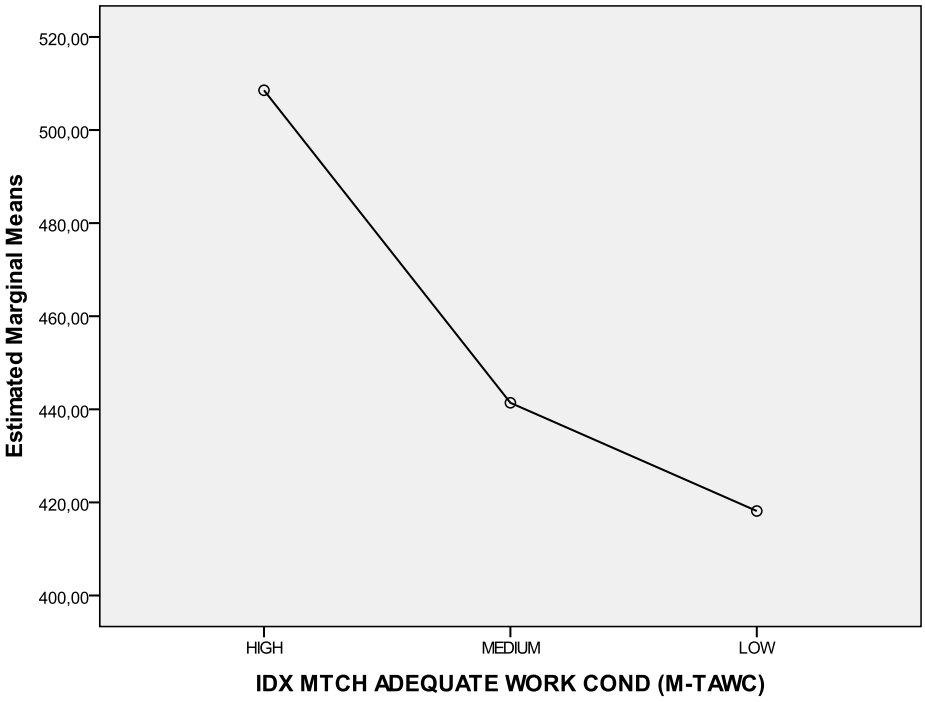

Figure 4.3 Estimated Marginal Means of Students' Average Scores for TAWC

4.3.5 Relationship between Teachers' Perception of Safety in School (TPSS) and Students' Mathematics Achievement Scores

The correlation between the Teachers' Perception of Safety in School and their classes' average mathematics scores was significant, r (143) = -.19, $p < .05$. Although the correlation is significant, the follow-up ANOVA was not significant, $F(2,142) = 3.03$, $p = .052$. Therefore, there is no significant mean difference among the teachers who belong to the different levels regarding their students' mathematics achievement.

CHAPTER 5

DISCUSSION

In the present study, an analysis of Turkish mathematics teacher background indices was made with the help of descriptive and inferential statistics and their relation to 8th grade Turkish students' mathematics achievement was computed. In this section, the results of these statistics are discussed regarding the related studies' findings. Moreover, implications of the study and suggestions for further researches are presented.

5.1 Mathematics Teachers Background Indices

In mathematics teachers' background questionnaire of TIMSS 2007, five index variables (MCFL, EMH, TPSC, TAWC, TPSS) were determined. In this part of this chapter, results of the analyses of indices are discussed within the following subsections.

5.1.1 Mathematic Classes with Few or No Limitation (MCFL)

A significant relationship between the teachers' perception of limitation and their classes' average mathematics scores is found. The classes of the high level teachers got significantly higher scores than the classes of the teachers at the medium or low level. In other words, students whose teachers commented that the students related factors do not limit their instruction or they have little effects were more successful than the other students whose teachers thought the factors affect in some extent or a lot. This result is

consistent with the findings of the study of Coygill et. al. (2010) in which perception of limitation to teach affects students' science and mathematics achievement across ten countries.

Although the present study concluded that, the fewer limitations that the teachers perceive, the higher scores that their students get, only 15% of the Turkish mathematics teachers belong to the high level. On the other hand, majority of the teachers feel that the factors limit their instruction a lot. According to Teaching and Learning International Survey (TALIS) Report (2010), the time allocated to teaching was higher in the classrooms that teachers perceived less limitation in proctoring. Therefore, in the present study, for this index variable, the reason why most of the Turkish mathematics teachers perceived the related students factors as limitation may be derived from their effectiveness in overcoming the discipline problems in their classrooms.

Moreover, the related factors were greater limitations for the teachers who were in their first two years of teaching comparing to the teachers who have more than 20 years teaching experience. One possible explanation of this result is about ability in applying classroom management strategies effectively. Oliver and Reschly (2007) concluded that experienced teachers are more confident that they can easily manage their classroom than the inexperienced teachers. They have an opportunity to learn how to manage classroom effectively by passage of time. In the present study, since the teachers who were in their first two years of teaching do not have enough experience dealing with the problems in the classroom, it is understandable their feelings that in some extend the related factors limit their instruction.

5.1.2 Teachers' Emphasis on Mathematics Homework (EMH)

When looked at the relationships between emphasis on homework and mathematics achievement, no significant relationship is found. This result is not unexpected when the findings of the related studies are considered (Akyüz, 2006; Bos & Cooper, 1999; Kapıkıran & Kıran, 1999; Uzun et. al., 2010; Yaman, 2004; Yayan and Berberoğlu, 2009). However, there are also some studies arguing that emphasis on homework affects students' achievement positively. For example, Marzona (1998) stated that homework deepen students' understanding. One of the reasons of this finding in the present study may result from the index variable of teacher background questionnaire in TIMSS 2007 in which the emphasis on homework was measured by examining the frequency of assigning homework and the amount of homework that teachers assign. These items just give descriptive data in this issue. However, the quality of the assigning homework may be more important. For example, what kinds of homework that the teachers assign and whether they provide appropriate feedback or not are important questions still unanswered in TIMSS questionnaires. Another reason may be the inconsistency between the measured constructs in TIMSS mathematics test and in any typical homework that Turkish teachers usually assign. In Turkish education system, because of the exam that students have to take like SBS exam, teachers intend to give homework with similar exam type questions in them. This encourages students to memorize the algorithms of the questions. Therefore, this situation may cause students to be less successful in TIMSS mathematics tests in which students have to use their cognitive abilities in line with the content development. Berberoğlu (2008) claims that in Turkish education system, uncertainty and false descriptions of learning objectives cause serious problems

in preparing contents of the homework. Therefore, the learning objectives and appropriateness of content of homework to them need to be reconsidered.

Although there were no significant relationships between the emphasis of homework and students mathematics achievement, majority of the teachers (71%) commented that they give at least 30 minutes of homework and at least in half of the lessons. Moreover, male teachers placed more emphasis on mathematics homework than female teachers. There is no argument to support the statement above so the result could be derived from the sample of the study or there is need to more data, such as video, to support the idea with convincing proofs.

5.1.3 Teachers' Perception of School Climate (TPSC)

Teachers' perception of school climate and their classes' average mathematics scores are significantly related. More specifically, students whose teachers characterized their school climate as supportive for learning and teaching get significantly higher scores than the other students. This result was expected when the related studies in the literature were examined. According to the researches, Greenberg (2004), Johnson and Steven (2006), academic achievement is affected positively by teachers' perception of school climate. Classes of the teachers rated their school climate positively are more successful. However, when the descriptive data about the level of Turkish mathematics teachers is examined, it is clearly seen that most of the teachers rated the related items as low or very low in their schools. In other words, while the majority of the teachers (53%) meet the low level criteria in which teachers rated the aspects of school climate as low and very low, only 6% of them commented positively on the related aspects. In contrast, in the study of Coygill et. al., (2010) around 36% of the New Zealander mathematics

teachers were at the high level. The reason behind the perception of Turkish teachers about their school climate should be investigated. Questions may be answered if it was possible to make interviews with the teachers.

5.1.4 Teachers' Adequate Working Conditions (TAWC)

The result of the present study coincides with the finding of the studies in the literature with respect to the relationships between teachers' adequate working conditions and students' achievement. According to Ladd (2009), working conditions of teachers had a positive effect on students' mathematics and reading scores. Especially, teachers' perceptions of school facilities were found to be the most important factor. Students are more successful if their teachers are in more favorable conditions (Johnson et al., 2011). In the present study, students of the teachers who rated the related items in the index variable as not a problem for them (high level teachers) get significantly higher scores than the students whose teachers reported them as either minor problem or serious problem (low level teachers). The percentages of high, medium and low level teachers are 10, 50 and 40 respectively. Therefore, most of the Turkish mathematics teachers were in the consensus that school resources are not available for them to provide effective mathematics instruction.

In the related literature, it can be seen that teaching and therefore students' achievement have been affected negatively by deficiencies in school resources (TALIS Report, 2010). Therefore, there is need to improve the quality of school resources in the Turkish elementary schools.

5.1.5 Teachers' Perception of Safety in School (TPSS)

Results indicated that teachers' perception of safety in schools and their students' mathematics achievement is significantly related. However, since the correlation coefficient is small (r=.19), there is not a significant mean differences among the group of teachers who belong to the different level of this index variable.

In the study, Caygill et. al., (2010) found that proportions of the teachers who agreed that their school was a safety place change in the range of 65 to 96 percents across ten participated countries in TIMSS 2007. This ratio for Turkey in this study is 72.6%. In other words, 72.6% of the Turkish mathematics teachers feel safe in their schools. Although majority of teachers feel safe, 26.7% of teachers disagreed with the idea that their school is a safety place. This should not be underestimated and serious precautions should be taken to develop positive perceptions about safety (Riley, 2000).

5.2. Implications of the Study

Implications of the present study are stated in the following lines below:

The result of the present study showed that teachers' perceptions about the aspects of limitation have an impact on their students' mathematics achievement. Nevertheless, most of the Turkish mathematics teachers in TIMSS 2007 commented that the related aspects limit their instruction a lot. This could be about their self-perception in managing their classroom for creating effective teaching-learning environment. If teachers feel insufficient in managing their classroom, they may experience stress that cause decrease in productivity. Therefore, teacher education programs in our country should include more courses about how to handle such factors that cause limitations for the teachers in

classroom. Then, teachers may perceive less limitation with more self confidence and it would affect students' achievement positively.

In TALIS report (2010), teachers reported that they needed vocational trainings about teaching to the students with special needs. For the present study, it was one of the factors of teachers' reports about limitation. Therefore, vocational trainings should be given to make teachers perceive less limitation and be more adequate in this regard.

Teachers who were in their first two year of teaching perceive more limitation than the teachers with more than 20 years experience. Therefore, the training programs for the new teachers should emphasize more on classroom management strategies.

This study concluded that although the relationships between assigning homework and students achievement was not significant, most of the Turkish mathematics teachers place emphasis on homework in learning mathematics. This result may be come from the poor quality of assigned homework in Turkish elementary schools. Therefore, trainings about assigning appropriate and effective homework should be given to the teachers to improve their effects on students achievement.

In the present study, for the school climate index variable, it was concluded that students whose teachers perceive their school climate positively are more successful. Therefore, the aspects of the perception of school climate should be developed. For instance;

- Teachers should attend more training programs about understanding and implementing the new curriculum in mathematics.
- Teachers' salaries should be raised to increase their job satisfaction
- Parents should support their children achievement by involving more school activities and by communicating with the teachers.

❖ Teachers should encourage their students to do well in school.

Principals should facilitate adequate and supportive working conditions for teachers. For instance, the overcrowded classrooms and schools' requirements affect teachers' perceptions about adequacy of their working environment. Moreover, in overcrowded classrooms, the relationships between teachers and students are fewer than the optimum-sized classrooms (TALIS, 2010). In other words, the overcrowded classrooms have direct and indirect effects on teachers' perception of adequate working conditions and school climate respectively. Therefore, the class-sizes should be reduced and physical features of the schools should be developed to make them as better work places for teachers.

For the last index variable, the present study concluded that although majority of Turkish mathematics teachers reported they feel safe in their schools, certain number of teachers disagreed with them. Since safety in schools is one of the important problems in today's schools all around the word, precautions should be taken to provide safety in schools so that teachers can go their schools without feeling fear.

5.3. Suggestions for Further Researches

The followings are the suggestions of further researches:

- In this study, only the Turkish mathematics teachers were included. The researcher can conduct a cross-cultural study by using the other participated countries' data in TIMSS 2007.
- The researcher can carry out the research with a similar purpose by using TIMSS 2011 data when it is available.

- The researcher can carry out further research by taking into account of the effects of other variables in mathematics teacher background questionnaire.
- The researcher can carry out further research which investigates the factors affecting mathematics achievement by using the variables in student questionnaire, school questionnaire and curriculum questionnaire of TIMSS 2007.
- The researcher can carry out further research to investigate the reasons behind the teachers' perceptions about limitation to teach, school climate, working conditions and school safety within an experimental design.
- The researcher can carry out further research to analyze the quality of the assigning homework. In order to get more detailed information, classroom observations might be done.

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APPENDICES

APPENDIX A

MATHEMATICS TEACHER BACKGROUND INDICES

The Index of Teachers' Reports on Teaching Mathematics Classes with Few or No Limitations (MCFL)

In your view, to what extend do the following limit how you teach the TIMSS class?

Fill in **one** circle for each row

Students	Not applicable	Not at all	A Little	Some	A lot
a) *students with different academic abilities*	○	○	○	○	○
b) *students who came from wide range of backgrounds* (e.g., economic, language)	○	○	○	○	○
c) *students with special needs* (e.g., hearing, vision, speech impairment, physical disabilities, mental or emotional/psychological impairment)	○	○	○	○	○
d) *uninterested students*	○	○	○	○	○
e) *disruptive students*	○	○	○	○	○

The Index of Teachers' Emphasis on Mathematics Homework (EMH)

How often do you usually assign mathematics homework to the TIMSS class?

	Fill in **one** circle only
Every or almost every lesson ……	◯
About half of the lessons ……..	◯
Some lessons ……..	◯

When you assign mathematic homework to the TIMSS class, about how many minutes do you usually assign? (Consider the time it would take an average student in your class?

	Fill in **one** circle only
Fewer than 15 minutes ……..	◯
15 – 30 minutes ……..	◯
31 – 60 minutes ……..	◯
61 – 90 minutes ……..	◯
More than 90 minutes ……..	◯

The Index of Teachers' Perception of School Climate (TPSC)

How would you characterize each of the following within your school?

Fill in **one** circle for each row

		Very high	High	Medium	Low	Very low
a)	*Teachers' job satisfaction*	○	○	○	○	○
b)	*Teachers' understanding of the school curricular goals*	○	○	○	○	○
c)	*Teachers' degree of success implementing the school's curriculum*	○	○	○	○	○
d)	*Teachers' expectations for students achievement*	○	○	○	○	○
e)	*Parental support for student achievement*	○	○	○	○	○
f)	*Parental involvement in schools activities*	○	○	○	○	○
g)	*Students regard for school property*	○	○	○	○	○
h)	*Students' desire to do well in school*	○	○	○	○	○

The Index of Teachers' Adequate Working Conditions (TAWC)

In your current school, how severe is each problem?

Fill in **one** circle for each row

	Not a problem	Minor problem	Serious problem
a) *The school building needs significant repair*	○	○	○
b) *Classroom are overcrowded*	○	○	○
c) *Teachers do not have adequate workspace outside their classroom*	○	○	○

The Index of Teachers' Perception of Safety in School (TPSS)

Thinking about your current school, indicate the extent to which you agree or disagree with each of the following statements.

Fill in **one** circle for each row

	Agree a lot	Agree	Disagree	Disagree a lot
a) *The school is located in a safety neighborhood*	○	○	○	○
b) *I feel safe at school*	○	○	○	○
c) *This school's security policies and practices are sufficient*	○	○	○	○

APPENDIX B

ANOVA TABLES

I. Teacher Background Indices vs Teacher Characteristics

LIMITATION

Limitations vs Gender

Table B.1 Tests of Between-Subjects Effects of Limitations vs Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta
Corrected	,004[a]	1	,004	,008	,927	,000
Intercept	726,735	1	726,735	1,463E3	,000	,911
BT4GSEX	,004	1	,004	,008	,927	,000
Error	71,058	143	,497			
Total	804,000	145				
Corrected Total	71,062	144				

Limitation vs Age

Table B.2 Tests of Between-Subjects Effects of Limitation vs Age

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	3,987[a]	4	,997	2,081	,087	,056
Intercept	643,384	1	643,384	1,343E3	,000	,906
BT4GAGE	3,987	4	,997	2,081	,087	,056
Error	67,075	140	,479			
Total	804,000	145				
Corrected Total	71,062	144				

Limitation vs Experience

Table B.3 Descriptive Statistics of Limitation vs Experience

GEN\YEARS BEEN TEACHING	Mean	Std. Deviation	N
First two years	2,48	,586	25
3-5 years	2,31	,631	35
6 to 10 years	2,35	,755	31
11-20 years	2,12	,600	17
More than 20 years	1,93	,829	27
Total	2,25	,709	135

Table B.4 Tests of Between-Subjects Effects of Limitation vs Experience

Source	Type III Sum of	df	Mean	F	Sig.
Corrected Model	4,941[a]	4	1,235	2,569	,041
Intercept	636,923	1	636,923	1,325E	,000
VAR00002	4,941	4	1,235	2,569	,041
Error	62,496	130	,481		
Total	752,000	135			
Corrected Total	67,437	134			

HOMEWORK

Homework vs Gender

Table B.5 Descriptive Statistics of Homework vs Gender

GEN\SEX OF TEACHER	Mean	Std. Deviation	N
FEMALE	1,79	,795	66
MALE	2,05	,788	78
Total	1,93	,799	144

Table B.6 Tests of Between-Subjects Effects of Homework vs Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta
Corrected	2,480[a]	1	2,480	3,965	,048	,027
Intercept	526,925	1	526,925	842,366	,000	,856
BT4GSEX	2,480	1	2,480	3,965	,048	,027
Error	88,825	142	,626			
Total	628,000	144				
Corrected Total	91,306	143				

Homework vs Age

Table B.7 Tests of Between-Subjects Effects of Homework vs Age

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	1,474[a]	4	,369	,570	,685	,016
Intercept	488,552	1	488,552	755,958	,000	,845
BT4GAGE	1,474	4	,369	,570	,685	,016
Error	89,831	139	,646			
Total	628,000	144				
Corrected Total	91,306	143				

Homework vs Experience

Table B.8 Tests of Between-Subjects Effects of Homework vs Experience

Source	Type III Sum of	df	Mean	F	Sig.
Corrected Model	,589[a]	4	,147	,224	,925
Intercept	483,228	1	483,228	735,971	,000
VAR00002	,589	4	,147	,224	,925
Error	84,043	128	,657		
Total	589,000	133			
Corrected Total	84,632	132			

SCHOOL CLIMATE

School Climate vs Gender

Table B.9 Tests of Between-Subjects Effects of School Climate vs Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	,415[a]	1	,415	1,147	,286	,008
Intercept	894,661	1	894,661	2,476E3	,000	,945
BT4GSEX	,415	1	,415	1,147	,286	,008
Error	52,024	144	,361			
Total	950,000	146				
Corrected Total	52,438	145				

School Climate vs Age

Table B.10 Tests of Between-Subjects Effects of School Climate vs Age

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	2,885[a]	4	,721	2,052	,090	,055
Intercept	800,493	1	800,493	2,278E3	,000	,942
BT4GAGE	2,885	4	,721	2,052	,090	,055
Error	49,554	141	,351			
Total	950,000	146				
Corrected Total	52,438	145				

School Climate vs Experience

Table B.11 Tests of Between-Subjects Effects of School Climate vs Experience

Source	Type III Sum of	df	Mean	F	Sig.
Corrected Model	2,826[a]	4	,707	2,045	,092
Intercept	784,115	1	784,115	2,270E	,000
VAR00002	2,826	4	,707	2,045	,092
Error	44,907	130	,345		
Total	884,000	135			
Corrected Total	47,733	134			

WORKING CONDITIONS

Working Conditions vs Gender

Table B.12 Tests of Between-Subjects Effects of Working Conditions vs Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	,083[a]	1	,083	,198	,657	,001
Intercept	762,165	1	762,165	1,822E3	,000	,927
BT4GSEX	,083	1	,083	,198	,657	,001
Error	60,253	144	,418			
Total	829,000	146				
Corrected Total	60,336	145				

Working Conditions vs Age

Table B.13 Tests of Between-Subjects Effects of Working Conditions vs Age

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	2,448[a]	4	,612	1,490	,208	,041
Intercept	686,462	1	686,462	1,672E3	,000	,922
BT4GAGE	2,448	4	,612	1,490	,208	,041
Error	57,888	141	,411			
Total	829,000	146				
Corrected Total	60,336	145				

Working Conditions vs Experience

Table B.14 Tests of Between-Subjects Effects of Working Conditions vs Experience

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1,474[a]	4	,368	,858	,491
Intercept	652,320	1	652,320	1,519E3	,000
VAR00002	1,474	4	,368	,858	,491
Error	55,830	130	,429		
Total	760,000	135			
Corrected Total	57,304	134			

SCHOOL SAFETY

School Safety vs Gender

Table B.15 Tests of Between-Subjects Effects of School Safety vs Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	,527[a]	1	,527	1,452	,230	,010
Intercept	259,837	1	259,837	715,733	,000	,833
BT4GSEX	,527	1	,527	1,452	,230	,010
Error	51,914	143	,363			
Total	312,000	145				
Corrected Total	52,441	144				

School Safety vs Age

Table B.16 Tests of Between-Subjects Effects of School Safety vs Age

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	2,887[a]	4	,722	2,039	,092	,055
Intercept	222,708	1	222,708	629,185	,000	,818
BT4GAGE	2,887	4	,722	2,039	,092	,055
Error	49,555	140	,354			
Total	312,000	145				
Corrected Total	52,441	144				

School Safety vs Experience

Table B.17 Tests of Between-Subjects Effects of School Safety vs Experience

Source	Type III Sum of	df	Mean	F	Sig.
Corrected Model	1,951[a]	4	,488	1,295	,275
Intercept	225,994	1	225,994	600,302	,000
VAR00002	1,951	4	,488	1,295	,275
Error	48,564	129	,376		
Total	295,000	134			
Corrected Total	50,515	133			

II. Teacher Background Indices vs Their Classes Average Mathematics Scores

Limitation vs Achievement

Table B.18 Tests of Between-Subjects Effects of Limitation vs Achievement

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	128906,302a	2	64453,151	11,592	,000	,140
Intercept	2,381E7	1	2,381E7	4,282E3	,000	,968
BTDMCFL	128906,302	2	64453,151	11,592	,000	,140
Error	789561,379	142	5560,291			
Total	2,895E7	145				
Corrected Total	918467,682	144				

School Climate vs Achievement

Table B.19 Tests of Between-Subjects Effects of School Climate vs Achievement

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected	210520,565[a]	2	105260,283	21,002	,000	,227
Intercept	1,298E7	1	1,298E7	2,590E3	,000	,948
BTDMTPSC	210520,565	2	105260,283	21,002	,000	,227
Error	716697,453	143	5011,870			
Total	2,907E7	146				
Corrected Total	927218,018	145				

Working Conditions vs Achievement

Table B.20 Tests of Between-Subjects Effects of Working Conditions vs Gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	98169,095[a]	2	49084,547	8,466	,000	,106
Intercept	1,918E7	1	1,918E7	3,308E3	,000	,959
BTDMTAWC	98169,095	2	49084,547	8,466	,000	,106
Error	829048,923	143	5797,545			
Total	2,907E7	146				
Corrected Total	927218,018	145				