ELEMENTARY TEACHERS' AND ELEMENTARY MATHEMATICS TEACHERS' PERCEPTIONS OF MATHEMATICALLY GIFTED STUDENTS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF ELEMENTARY SCIENCE AND MATHEMATICS EDUCATION

FEBRUARY 2013

Approval of the Graduate School of Social Sciences

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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ABSTRACT

ELEMENTARY TEACHERS' AND ELEMENTARY MATHEMATICS TEACHERS' PERCEPTIONS OF MATHEMATICALLY GIFTED STUDENTS

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February 2013, 103 pages

The purpose of this study was to examine elementary teachers' and elementary mathematics teachers' perceptions of mathematically gifted students in terms of teachers' gender, year of experience and area of teaching.

The data were collected from 176 elementary teachers and 90 elementary mathematics teachers from 60 state elementary schools in the center of Trabzon, in the fall semester of 2011-2012 academic year. In order to determine teachers' perceptions of mathematical giftedness, the instrument called as *Teachers' Judgments of Gifted Mathematics Student Characteristic (TJGMSC)* was used. The results were evaluated in terms of three dimensions of TJGMSC: *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver*. Besides, in order to analyze the data, one-way MANOVA was conducted.

The results of the study illustrated that there were no significant differences among teachers' TJGMSC scores, in terms of their gender and year of experience. However, a significant difference was found between elementary teachers and elementary mathematics teachers in terms of their TJGMSC scores for only the dimension of *school smart mathematics student*. To illustrate, elementary teachers' scores regarding this dimension were higher than those of elementary mathematics teachers.

Keywords: Mathematical Giftedness, Teachers' Perceptions, Elementary Teachers, Elementary Mathematics Teachers

ÖZ

SINIF ÖĞRETMENLERİNİN VE İLKÖĞRETİM MATEMATİK ÖĞRETMENLERİNİN MATEMATİKTE ÜSTÜN ZEKÂLI ÖĞRENCİLERE YÖNELİK ALGILARI

Tütüncü, Sumeyra
Yüksek Lisans, İlköğretim Fen ve Matematik Alanları Eğitimi Bölümü
Tez Yöneticisi: Doç. Dr. Mine Işıksal-Bostan

Şubat 2013, 103 sayfa

Bu çalışmanın amacı sınıf öğretmenlerinin ve ilköğretim matematik öğretmenlerinin matematikte üstün zekâlı öğrencilere yönelik algılarını; cinsiyet, tecrübe ve öğretmenlik alanı değişkenlerine göre incelemektir.

Çalışmanın verileri 2011-2012 sonbahar döneminde Trabzon'da bulunan 60 devlet okulunda çalışmakta olan 176 sınıf ve 90 ilköğretim matematik öğretmeninden toplanmıştır. Çalışmada öğretmenlerin matematikte üstün zekâlı öğrencilere yönelik algılarını incelemek için *Matematikte Üstün Zekâlı Öğrenci Özelliklerinin Öğretmen Tarafından Değerlendirilmesi* olarak adlandırılan bir ölçek kullanılmıştır. Çalışmanın sonuçları bu ölçeğin alt boyutları olan okul başarısı yüksek olan öğrenciler, matematiksel bakış açısıyla gerçek dünya algısı ve yaratıcı problem çözücü değişkenlerine göre değerlendirilmiştir. Çalışmada verilerin analizi tek yönlü çok değişkenli varyans analizi ile gerçekleştirilmiştir.

Çalışmanın sonucunda kullanılan ölçekte öğretmenlerin elde ettikleri puanların cinsiyet ve tecrübe değişkenlerine göre farklılık göstermediği görülmüştür. Fakat öğretmenlerin puanları öğretmenlik alanı değişkenine göre farklılık göstermiştir. Bu farklılık yalnızca "okul başarısı yüksek olan öğrenciler" alt boyutunda gözlenmiştir. Daha açık bir ifadeyle, bu boyut için sınıf öğretmenlerinin puanları ilköğretim matematik öğretmenlerinin puanlarına göre daha yüksektir.

Anahtar Kelimeler: Matematikte Üstün Zekâlılık, Öğretmen Algıları, Sınıf Öğretmenleri, İlköğretim Matematik Öğretmenleri

To My Mother and Father

ACKNOWLEDGEMENTS

First of all, I would like to thank my supervisor Assoc. Prof. Dr. Mine Işıksal-Bostan for her valuable guidance, encouragement and patience throughout the process of writing thesis.

I also would like to thank examining committee for their contribution to my thesis.

I am certainly indebted to my dear family. Especially, my mother Nurşen Tütüncü and my father Ömer Tütüncü always encouraged me during the process of master education. Besides, they were always with me when I needed help. I am also grateful to my sisters Tuba Tütüncü and Selma Kahraman for their support when I was dispirited.

I also would like to thank my school principle Muhammet Kahraman, assistant principle Erdoğan Şahinoğlu and my workmates for their understanding when I was under stress.

I also thank my friend Gülşen Vural. Despite the long distance between us and her busy schedule at work, she spared me her valuable time and helped me to express my study in English well.

I would like to thank Assist. Prof. Dr. Abdullah Fıçıcı since he gave me permission to implement his instrument in my study.

Lastly, I would like to thank Berna Aygün who has contributed to this study a lot by sharing her experiences with me.

TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

H_0	Null hypothesis
IMGS	Identifying Mathematically Gifted Students
IV	Independent Variable
M	Mean
MANOVA	Multivariate Analysis of Variance
MoNE	Ministry of National Education
MTSI	Mathematical Thinking Strategies Inventory
N	Number of the Participants
p	Significance Value
SD	Standard Deviation
TJGMSC	Teachers’ Judgments of Gifted Mathematics Student Characteristics

CHAPTER 1

INTRODUCTION

Giftedness is a term which researchers have been interested in for many years, since gifted students show promise for the future of countries (Sosniak and Gabelko, 2008). In order to express gifted individuals, different words such as "talented", "able", "high ability", "gifted", "promising" are used by the researchers. As there is no single word referring to giftedness, there is also no single definition for this concept. In the past years, giftedness was defined restrictedly. For instance, Terman (1926) defines giftedness as obtaining high scores from intelligence tests which placed individuals 1% segment of the society (as cited in Jeong, 2010). However, for decades giftedness has had more flexible definitions. For instance, according to Witty (1958), presenting latent in any area of human being refers as giftedness (as cited in Renzulli, 2000).

As a special area of giftedness, giftedness in mathematics has also been studied by researchers for decades (Greenes, 1981; House, 1987, as cited in Bicknell, 2008; Krutetskii, 1976; Sheffield, 1994). The issue of giftedness in mathematics is clarified by characteristics of gifted mathematics students. When the expression mathematically gifted is heard, many people remember the students who are successful in school mathematics and in national examinations. On the contrary, many researchers have agreed that accuracy of computations and being successful at school mathematics are not only determinants of mathematical giftedness (Deal and Wismer, 2010; Sheffield, 1994). In fact, besides computational skills, mathematical giftedness requires abilities such as seeing connection between mathematics terms (Greenes, 1981; Miller, 1990; Sriraman, 2005; Waxman, Robinson, and Mukhopadhyay, 1996) having problem solving, reasoning and deduction skills (House, 1987, as cited in Bicknell, 2008; Krutetskii, 1976; Miller, 1990; Rotigel and Fello, 2004; Sriraman, 2005; Waxman et al., 1996), and thinking creatively (Greenes, 1981; Krutetskii,1976; Miller, 1990; Rotigel and Fello, 2004; Waxman et al., 1996). After identifying such characteristics, the following issue should be how to teach mathematically gifted students.

Krutetskii (1996) claims that teachers should try to improve all students' mathematical abilities, and then they should implement additional activities to support mathematically gifted students. According to Miller (1990) teachers decide on mathematically gifted students according to their school success in mathematics; however, this is not adequate. In fact, teachers should know the characteristics forming mathematical giftedness and depending on such characteristics they should prepare suitable environments for mathematically gifted students. To illustrate, several researchers have showed that teachers should prepare challenging tasks for such students (Diezmann, 2005; Taylor, 2008; Whitlow-Malin, 2006) in order to develop their mathematical abilities. Besides, competitions related to mathematics have positive impacts on developing such students' gifts (Choi, 2009).

To conclude, in order to support mathematically gifted students, teachers should identify mathematically gifted students. Besides, they should know the characteristics of mathematically gifted students for such identification (Mann, 2005). Depending on this fact, this study focuses on teachers perceptions of mathematical giftedness. Teachers' perceptions of mathematical giftedness were determined by their evaluation on mathematically gifted students' characteristics. More specifically, the instrument "*Teacher's Judgments of Gifted Mathematics Student Characteristics (TJGMSC)"*, which was developed by Ficici (2003), was used for such determination. The results of the study were evaluated with respect to the dimensions of TJGMSC which were *school smart mathematics student*, *mathematics perspective for the real world* and *creative problem solver.*

1.1 Purpose of the Study

The aim of this study is to investigate teachers' perceptions of mathematically gifted students with respect to their gender, year of experience and area of teaching. In order to reach this aim, following research questions are examined in this study.

1.2 Research Questions

Research questions of the study, sub-questions and hypothesis for each question are presented in this section.

Research Question: Is there a significant difference in teachers' perceptions of mathematically gifted students in terms of gender, year of experience and area of teaching?

Sub-question 1: Is there a significant difference between male and female teachers in terms of their scores of TJGMSC for each sub-dimension; *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver*?

H_0: There is no significant difference between male and female teachers in terms of their scores of TJGMSC for each sub-dimension; *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver*.

Sub-question 2: Is there a significant difference among teachers having teaching experiences between 1 and 5 years, 6 and 10 years, 11 and 15years, and above 15 years in terms of their scores of TJGMSC for each sub-dimension; *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver*?

H_0: There is no significant difference among teachers having teaching experiences between 1 and 5 years, 6 and 10 years, 11 and 15 years, and above 15 years in terms of their scores of TJGMSC for each sub-dimension; *school smart* *mathematics student, mathematics perspective for the real world* and *creative problem solver*.

Sub-question 3: Is there a significant difference between elementary mathematics teachers and elementary teachers in terms of their scores of TJGMSC for each sub-dimension; *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver*?

H_0: There is no significant difference between elementary mathematics teachers and elementary teachers in terms of their scores of TJGMSC for each sub-dimension; *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver*.

1.3 Significance of the Study

As stated before, mathematically gifted students have needs different from other students (Ficici, 2003; Fox and Pope, 2005; Johnson, 2000; Krutetskii, 1976; O'Boyle, 2008). To illustrate, in order to develop their mathematics abilities, such students are in need of challenging tasks (Diezmann and Watters, 2002; McComas, 2011; Whitlow-Malin, 2006), and learning environments depending on creative thinking (Kök, 2012), problem solving and projects (Altıntaş, 2009). Besides, several researchers have illustrated that mathematics competitions increase those students' interest in mathematics (Aygün, 2010; Choi, 2009). Thus, it can be concluded that mathematically gifted students have additional needs and one of the individuals who would meet such needs are teachers.

In order to meet the needs of mathematically gifted students, initial responsibility of the teachers is identifying such students. More specifically, identifying mathematically gifted students depends on determining the characteristics of those students (Ficici, 2003; Mann, 2005; Taylor, 2008). In other words, teachers should know the characteristics of mathematically gifted students to distinguish them from other students. Although literature review has revealed many studies related to identifying mathematically gifted students (Budak, 2007;

Dağlıoğlu, 2002; Freiman, 2003; Sak, 2005; Wilmot, 1983) and how to teach such students (Altıntaş, 2009; Ayebo, 2010; Aygün, 2010; Choi, 2009; Diezmann and Watters, 2002; Dimitriadis, 2012; Jordan, 2007; Kök, 2012; Whitlow-Malin, 2006), there are limited studies on teachers' perceptions of mathematical giftedness (Bicknell, 2008; Ficici, 2003; Leikin and Stanger, 2011). Thus, recent study focuses on teachers' perceptions of mathematical giftedness. More specifically, this study evaluates the amount of value that the teachers give to mathematically gifted students' characteristics.

There have existed several research studies examining gender differences for mathematically gifted students' achievement in mathematics and their attitudes towards mathematics (Hargreaves, Homer, and Swinnertan, 2008; Preckel, Goetz, Pekrun, and Kleine, 2008). Hargreaves et al. (2008) revealed that there was not a significant difference between male and female gifted students' mathematics achievement while Preckel et al. (2008) found that there was a significant difference between male and female gifted students in terms of their mathematics achievement in favor of male students. Moreover, both studies revealed that attitude scores of male students were higher than those of female students. On the other hand, studies related to gender differences of teachers' perceptions of mathematical giftedness are limited (Ficici, 2003). Ficici examined those differences among high school mathematics teachers. However, literature review did not serve any study related to gender differences of elementary teachers' and elementary mathematics teachers' perceptions of mathematical giftedness. Because of that, it is not clear whether gender affects the teachers' perceptions of mathematical giftedness. Thus, such an investigation, which is a focus of this study, would contribute to the clarification of this issue.

Leikin and Stanger (2011) claim that teachers' perceptions of mathematical giftedness depend on their teaching experiences. However, studies related to teachers' perceptions of mathematical giftedness in terms of their experience are limited. Moreover, another result of Ficici's study (2003) was that more experienced high school mathematics teachers had higher means for the dimensions of *school smart mathematics student* and *mathematics perspective for the real world.* Because of that, current study focuses on the differences among elementary teachers' and elementary mathematics teachers' perceptions of mathematical giftedness regarding their year of experience. In fact, such an investigation would reveal whether teachers' year of experience is an important indicator for valuing the characteristics of mathematically gifted students.

It is important to identify gifted students at early ages in order to contribute to their development (Silverman, 1992). This fact is valid for also mathematically gifted students. On the contrary, several researches have illustrated that students, who showed characteristics of mathematical giftedness at early ages, do not illustrate those characteristics at following years because of non-supporting curriculum and instructions (Gürel, 2011). In fact, after families and early childhood teachers, elementary schools' teachers meet with those students. Therefore, elementary school teachers have important role for realizing and improving gifted students. Since elementary teachers meet with mathematical gifted students before elementary mathematics teachers, the other concern of this study is to examine whether there are differences between elementary teachers' and elementary mathematics teachers' perceptions of mathematical giftedness.

1.4 Definitions of Important Terms

In this part important terms of the study are explained. The terms to be defined are mathematical giftedness, elementary teachers, elementary mathematics teachers, year of experience and perception of mathematically gifted students. Besides, the dimensions of school *smart mathematics student*, *mathematics perspective for the real world* and *creative problem solver* are defined.

Mathematical giftedness is defined as "a unique aggregate of mathematical ability that opens up the possibility of successful performance in mathematical ability" (Kruteskii, 1976, p. 77). In this study, mathematical giftedness refers to the abilities illustrating potential of being successful in mathematical activities.

Teachers' perception of mathematically gifted students is defined as teachers' consideration of the characteristics that mathematically gifted students should have. More explicitly, this term refers to the value teachers give to the characteristics of mathematically gifted students. In this study, teachers' perceptions of mathematical giftedness will be measured by the instrument called "Teachers' Judgments of Gifted Mathematics Student Characteristics (TJGMSC)" which was developed by Ficici (2003). This measurement consists of three dimensions, namely, *school smart mathematics student*, *mathematics perspective for the real world* and *creative problem solver*.

School smart mathematics student dimension consists of items regarding skills bringing school success such as high calculation skills, remembering formulas, understanding mathematical principles etc. Some examples for those items are "has good memory recall", "remembers formulas and procedures" and "has ability to do calculations quickly".

Mathematics perspective for the real world dimension consists of items regarding skills related to seeing mathematics in the real world and skills related to analytical thinking. Some examples for those items are "can see the world through a math lens", "sees the connections between different areas of mathematics" and "looks at the world from a mathematical perspective".

Creative problem solver dimension consists of items related to creativity. Some examples for those items are "generates new ways to solve problems" and "has spatial ability".

Elementary teachers are defined as teachers who are teaching graders 1 to 5. Participants of this study are elementary teachers of 4^{th} and 5^{th} graders.

Elementary mathematics teachers are defined as mathematics teachers who are teaching graders 6 to 8. Participant of this study are elementary mathematics teachers of graders 6 to 8.

Teachers' year of experience is defined as the number of years teachers spend teaching. In this study teachers' year of experience is divided into four groups such as experience between 1 and 5 years, 6 and 10 years, 11 and 15 years, and above 15 years.

CHAPTER 2

LITERATURE REVIEW

The present study focused on differences among teachers' perceptions on mathematically gifted students' characteristics with respect to teachers' gender, year of experience and area of teaching. This chapter includes literature review related to research questions. The chapter is divided into five parts: giftedness, mathematical giftedness, teachers' role for supporting mathematically gifted students, studies related to gender differences on mathematical giftedness and summary of the literature review.

2.1 Giftedness

Two concepts used to express high human performance are giftedness and talent. Gagne focused on differences between concepts of giftedness and talent. According to Gagne, giftedness includes "natural abilities" while talent includes "systematically developed abilities" (Gagne, 1995). In other words, giftedness can be considered as input while talent can be considered as output. In order to characterize one as gifted or talented (s)he must be at the top 10 percent of age peers in the field (Gagne, 2004). Talent and giftedness has common traits as; they are both related to human abilities, they both distinguish human beings who vary from standard and they both focus on superior individuals (Gagne, 2008). Although Gagne (1995) made such distinction between giftedness and talent, these terms have the same meaning in educational area (Sosniak and Gabelko, 2008). In the present study, the term giftedness was used rather than talent.

Definitions of giftedness have changed over time from limited definitions to comprehensive definitions. To illustrate, in 1926 Terman (as cited in Jeong,

2010) had a restricted definition of giftedness as having 1 % mental ability measured by Stanford-Binet Intelligence Scale or its' counterpart. On the contrary, Witty (1958) defined gifted as individual who had high potential in any area of human activity (as cited in Renzulli, 2000). Later, instead of giving definitions to giftedness, researchers put an emphasis on determining components of giftedness (Gagne, 1995; Renzulli, 1978; Sternberg, 1986)

Renzulli (1978) proposed "Three Ring Conception" theory which pointed out interaction of three components of giftedness as *above average ability*, *high levels of task commitment* and *high levels of creativity*. According to Renzulli (2000) those components do not illustrate giftedness separately but interaction of those dimensions revealed giftedness. More specifically, above average ability has been defined in two ways as general ability and specific ability. General ability refers to general intelligence. Renzulli (2005) claimed that people with above average ability showed performance or had possibility to be on 15-20% in any area. To illustrate, components of general ability were "capacity to process information, to integrate experiences that result in appropriate and adaptive responses to new situations, and the capacity to engage in abstract thinking" (p. 249). On the other hand, specific ability is related to how human beings express themselves in real life. Examples for specific ability are being talented in chemistry, ballet, mathematics, musical composition, sculpture, and photography. The other component of giftedness was task commitment which referred to motivation on a specific area or specific task. Task commitment is described with the terms "perseverance, endurance, hard work, dedicated practice, self-confidence, a belief in one's ability to carry out important work, and action applied to one's area(s) of interest." (p. 263). Lastly, according to Renzulli (2005), creativity portrays people who think originally and produce innovatively.

Renzulli (2000) also proposed that there are two types of giftedness as "schoolhouse giftedness" and "creative-productive giftedness". *Schoolhouse giftedness* is observed by school success which can be measured by standardized tests measuring cognitive abilities. Besides, *creative-productive giftedness* is observed by students' problem solving skills in challenging situations. Renzulli (2000) stated that although both types of giftedness are substantial, ignoring creative- productive giftedness make educators to overlook actual gifted students.

Similar to Renzulli's conception on giftedness, Sternberg also proposed that giftedness was not only what is measured by IQ or achievement tests (Sternberg & Clinkenbeard, 1995). He listed the components of giftedness as "memory-analytic", "creative-synthetic", and "practical-contextual" abilities. More specifically, memory-analytic abilities, which are in line with Renzulli's (2005) schoolhouse giftedness term, refer to abilities which can be measured by tests. On the other hand, creative-synthetic abilities, which are parallel to Renzulli's (2005) creative-productive giftedness term, cannot be measured by standardized test but those abilities reveal when creativity and synthesizing ideas are needed. Lastly, practical ability means applying analytic and synthetic abilities to real life situations (Sternberg & Clinkenbeard, 1995).

Moreover, in the following years Sternberg (2008) developed a model which was called WICS (wisdom, intelligence, creativity, synthesized) model. According to WICS model components of giftedness are "wisdom", "intelligence" and "creativity". Sternberg asserted that wisdom, intelligence and creativity could be developed by interaction of heritage and environment (Sternberg, 2008). Sternberg noted *wisdom* as the most vital point of giftedness. More specifically, wisdom means to apply "intelligence, creativity, and experience" to reach a goal (p. 260). Besides, Sternberg examined *intelligence* in two aspects: academic intelligence and practical intelligence. Academic intelligence includes "memory and analytical skills" (p.258) while practical intelligence includes using abilities and attitudes. Lastly, *creativity* needs to produce unusual, high qualified and proper opinions when solving the problems encountered. "Synthesize" means that each of the components of giftedness is necessary for revealing giftedness.

Available literature showed that giftedness does not have a single definition but all definitions and conceptions are in line. To illustrate, definitions and conceptions of giftedness have common components such as being successful at standardized tests, thinking analytically and creativity. Following part of the literature review will present mathematical giftedness which is a special area of giftedness.

2.2 Mathematical Giftedness

Many arguments on mathematically gifted students developed based upon Krutetskii's (1976) study on mathematical ability. Krutetskii (1976) explained mathematical ability with four components: "obtaining mathematical information", "processing mathematical information", "retaining mathematical information" and "mathematical cast of mind". *Obtaining mathematical information* refers to understanding formal structure of a problem while *processing mathematical information* requires a set of abilities. To illustrate, having the skills of logical thinking, generalization, curtailment of mathematical reasoning, flexibility in mathematical thinking and reversibility are components of those abilities. Besides, *retaining mathematical information* refers to mathematical memory while *"mathematical cast of mind"* refers to explaining the events mathematically, being keen on mathematical activities and being highly concentrated on mathematical activities (p.302). Furthermore, Krutetskii (1976) proposed three types of mathematically gifted students. He classified mathematically gifted students as analytic, geometric and harmonic. The analytic type student tends to make abstract constructions while solving problems, besides they are more successful at abstract problems rather than visual problems. On the contrary, geometric type students tend to make visualizations (graphs, diagrams etc.) while solving problems. In contrast to analytic type students, they are successful at visual problems rather than abstract problems. On the other hand, harmonic type students illustrate both analytic and geometric type students' characteristics. Those students succeed in solving problems by both abstractions and visualizations (Krutetskii, 1976).

Krutetskii (1976) also stated characteristics of mathematically gifted students. Later on, several researchers studied those characteristics and they stated additional characteristics (Greenes, 1981; House, 1987, as cited in Bicknell; Rotigel & Fello, 2004; Sheffield, 1999; Sriraman, 2005). Especially, many researchers have discussed that when mathematical giftedness has been associated with only computational skills, problem solving skills and creativity have been ignored (Miller, 1990; Sheffield, 1999). In the following part of the section the characteristics of mathematically gifted students are summarized in terms of characteristics which make them successful in school mathematics, show their analytical abilities, illustrate their creative abilities and reveal their motivation at mathematics.

The strongest argument for many researchers agreement on mathematically gifted students' characteristics is that such students have skills needed to be successful in school mathematics. To illustrate, mathematically gifted students are curious about numbers and understand numeric concepts from early ages (House, 1987, as cited in Bicknell; Sheffield, 1994; Rotigel and Fello, 2004; Waxman et al., 1996). They adopt mathematics curriculum earlier than classmates (Waxman et al., 1996). During the problem solving process, mathematically gifted students are able to reach correct solutions more rapidly than their peers (Miller, 1990; Rotigel & Fello, 2004). Besides, mathematical giftedness is also associated with being fast at learning and applying mathematical ideas (Deal & Wismer, 2010; Greenes, 1981; Miller, 1990; Waxman et al., 1996; Sriraman, 2005). Such students also have the skill to understand formal structure of a mathematical problem and memorization of mathematical generalizations and structures (Krutetskii, 1976).

Mathematically gifted students are also successful in concept development. Besides, they are curious about reasons for mathematical ideas and have abilities of inferential thinking or deductive reasoning (Rotigel and Fello, 2004; Sriraman, 2005; Waxman et al., 1996). Also, they ask questions on "how" and "why" mathematical ideas are constructed (Rotigel and Fello, 2004). They have ability to make connections between different mathematics subjects (Greenes, 1981; Miller, 1990; Sriraman, 2005; Waxman et al., 1996). They tend to solve problems abstractly rather than using concrete materials (Miller, 1990; Waxman et al., 1996). Greenes (1981) stated that when faced with problems including much information they show a tendency to organize and generalize the data. According to Krutetskii (1976) they have reasoning ordered and divided appropriately, which revealed their ability of proving. Moreover, mathematically gifted students have advanced problem solving skills (Miller, 1990) and courageously try different thinking strategies when faced with obstacle (Waxman et al., 1996). They can keep in mind the problems not yet figured out (Waxman et al., 1996) and cope with problems with short solutions (House, 1987, as cited in Bicknell; Krutetskii, 1976). Furthermore, those students are successful at illustrating mathematical ideas with different tools such as manipulatives, equations, stories etc. and they acquire different understandings from such tools (Waxman et al., 1996). Besides, such students make sense of small and large numbers (Miller, 1990; Waxman et al., 1996).

Although, Krutetskii stated importance of thinking originality on mathematical giftedness in 1976, importance of creativity for mathematical giftedness has been studied in the last decades (Miller, 1990). More specifically, mathematically gifted students are flexible and creative while solving mathematical problems (Greenes, 1981; Kruteskii, 1976; Rotigel & Fello, 2004; Waxman et al., 1996). They can reverse cognitive processes (Krutetskii, 1976; Sheffield, 2009) and they have high spatial abilities (Kruteskii, 1976).

Lastly, mathematically gifted students illustrate attitudinal and motivational characteristics (Koshy, Ernest, and Casey, 2009). In fact, mathematically gifted students love mathematics and they are pleased with dealing with challenging situations (Koshy et al., 2009). They are persistent on solving a problem instead of giving up (Waxman et al., 1996; Koshy et al., 2009). Mathematically gifted students also take pleasure of challenging mathematical games, and novel where challenging problems exited them (Waxman et al., 1996). Moreover, they prefer mathematical activities when they have selection chance. Besides, they have ability to work independently and they enjoy dealing with large numbers (Waxman et al., 1996).

The available literature review revealed two recent qualitative studies (Choi, 2009; Freimann, 2003) related to mathematically gifted students' characteristics. These studies had consistent results with the characteristics mentioned above. To illustrate, Choi's (2009) study focused on characteristics of five Korean mathematically gifted high school students. The participants of the mentioned study illustrated the characteristics such as "persistence, self-discipline, self-assertiveness, competitiveness, confidence, and diligence throughout their life course." (Choi, 2009, p.125). They also had positive attitude towards mathematics. Choi (2009) emphasized the importance of retaining mathematical information, since without retention it is impossible to gain next level of mathematics. Moreover, participants showed following characteristics: understanding and gaining mathematical ideas more quickly than peers, reading books related to mathematics, ability to solve challenging problems and high speed of calculations. Choi (2009) stated that in order to identify mathematically gifted students, those characteristics should be known by teachers.

Freiman (2003) also conducted a qualitative study with the purpose of getting a model to identify and encourage mathematically gifted students at the elementary school. Freiman (2003) drew a conclusion parallel to Choi's results such as: when faced with a problem, mathematically gifted students notice the details and find effective solutions, besides they are persistent in reaching a goal. Other results of Freiman's study are those: such students are curious about deep mathematical understanding than given mathematical tasks requires, they realize patterns and relationships, construct mathematical structures, think originally and have deep ideas, move among different strategies and structures and think critically. Furthermore, Freiman (2003) expressed teachers' responsibilities for encouraging mathematically giftedness as listening, administering and guiding students. In this way, teachers would support students' making discovery rather than loading them with knowledge or problem solving methods by rote.

Studies summarized above illustrated the characteristics of mathematically gifted students. After determining the characteristics of mathematically gifted students, the following concern is how to identify them. The following part of the section reveals studies on identifying mathematical giftedness.

2.2.1 Studies on Identifying Mathematically Gifted Students

Besides determining the characteristics of mathematically gifted students, available literature review revealed studies on developing an instrument (Sak, 2005; Wilmot, 1983) or a model (Budak, 2007; Dağlıoğlu, 2002) in order to identify mathematically gifted students. In this section these studies are summarized in two parts: developed instruments to identify mathematically gifted students and developed models to identify mathematically gifted students.

2.2.1.1 Developed Instruments in order to Identify Mathematically Gifted Students

Wilmot (1983) developed an instrument called Mathematical Thinking Strategies Inventory (MTSI) for identifying mathematically gifted students. Wilmot (1983) studied with 1134 fourth, fifth and sixth graders in Illinois state of United States. Construction of the test depended on common thinking strategies of mathematical abilities such as perception of patterns, structures, and relationships; inductive reasoning and generalization; and deductive and analytic reasoning. Cronbach's Alpha Coefficient of Reliability of MTSI was .75. In order to identify mathematical giftedness, another instrument was developed by Sak (2005) whose participants were 291 middle school students from southwestern part of Unites

States. The instrument, called "Three Mathematical Minds" (M^3), had 27 problems with three sub-dimensions; knowledge, creativity and analytical factor. To illustrate, problems for knowledge dimension were related to areas such as algebra, geometry and statistics, while problems for analytical dimension required skills for deduction. Besides, creativity factor required induction skills, identifying irrelevant data and thinking flexibly to see whole picture. In fact, M^3 was a reliable instrument with .73 reliability coefficient level according to Kuder-Richardson analysis.

Studies mentioned above illustrates that there exist reliable instruments in order to identify mathematically gifted students. Those instruments are based on the characteristics of mathematically gifted students such as reasoning skills and creativity. Although these instruments are reliable and they depended on mathematically gifted students' characteristics, these types of limited instruments are inadequate for identifying mathematical giftedness.

2.2.1.2 Developed Models in order to Identify Mathematically Gifted Students

Since determining mathematical giftedness by instruments had a single step could overlook some gifted students, more detailed measuring tools are needed (Budak, 2005). In Turkey, Budak (2007) and Dağlıoğlu (2002) developed models in order to meet that need. To illustrate, Dağlıoğlu (2002) proposed a model in order to identify mathematically gifted students in early childhood years. This model includes four steps as: teachers' and parents' evaluation of students, measuring general cognitive performances of the students, activities determining mathematical, cognitive and creative abilities and, applying mathematics activities suitable for 5-8 years old students. In the study, firstly 220 candidates were selected to be mathematically gifted by teachers and parents; however, at the end only 29 of those students were considered as mathematically gifted. According to the study, although teachers were more successful at evaluating children's mathematical performance, parents were more successful at observing their cognitive and creative abilities. The other interesting result was that both parents and teachers overestimated children's mental skills; they both underestimated children's creativity.

Another researcher who developed a model for identifying mathematically gifted students was Budak (2007). He conducted a study with 275 6th and 8th graders from Erzurum, Trabzon and Ordu in order to develop a model for identifying mathematically gifted students (IMGS). As stated before, Budak (2007) asserted that to identify mathematically gifted students a single instrument was insufficient. On the other hand, to prevent overestimating students who were not gifted, there should not be many processes. Depending on this idea the model had three steps which are similar to Dağlıoğlu's (2002) processes. In the first step students were nominated by teachers, parents and peers; also, in this step problem solving attitude inventory was implemented to students. The students who are selected in the first step move to the second step. In the second step students are exposed to the problem solving activities and the giftedness test which is suitable for their level. Lastly, in the third step students are evaluated by being observed in the classroom environment. The result of the study illustrated that students selected by IMGS showed mathematical giftedness characteristics such as abstract thinking ability, willingness to learn, persistency, curiosity and creativity. Therefore, IMGS served to its purpose which is to identify mathematically gifted students.

To conclude, the studies presented in this section had the purpose to determine the characteristics of mathematically gifted students. Researchers focused on characteristics of mathematically gifted students; in order to identify and encourage such students, knowing their characteristics is a prior step. After determining mathematically gifted students, teachers have responsibilities in order to support these students' mathematical ability (Waxman et al., 1996).

2.3 Teachers' Role of Encouraging Mathematically Gifted Students

According to Krutetskii (1976) mathematics teachers should give opportunity to all students for improving their mathematical skills; however, they should deal particularly with students who have high ability. In this context, teachers should be able to designate such students. Besides, to identify mathematically gifted students, teachers should know the characteristics of mathematically gifted students in the first step (Ficici, 2003).

Miller (1990) stated that while evaluating mathematical giftedness, teachers generally focused on students' computational skills and their ability to apply taught procedures. However, teachers having such an approach might have made mistake while determining mathematically gifted students. Although success in school mathematics might be a hint to realize mathematically gifted students, it is not enough. According to Miller (1990), since mathematics' curriculums depend on computational skills rather than complex reasoning abilities; real mathematically gifted students might get bored from the process and they might be unsuccessful at school mathematics. Therefore, teachers should know the real characteristics of mathematically gifted students (Miller, 1990). However, researches revealed that teachers had difficulties while deciding which student was mathematically gifted (Koshy et al., 2009).

Determining mathematically gifted students is not enough for teachers. After determining mathematically gifted students, teachers should also know how to nurture those students. However, mathematics teachers do not know how to teach gifted students (Ficici, 2003) and they need to be trained on how to provide opportunities to mathematically gifted students (Johnson, 2000; Koshy et al., 2009). Besides, teachers should be encouraged to develop such students (Johnson, 2000). Moreover, teachers should use challenging tasks and they need strong mathematical knowledge to prepare those tasks (Deal and Wismer, 2010; Johnson, 2000).

To conclude, teachers have a key role in determining and teaching mathematically gifted students. As mentioned before, teachers should recognize such students with awareness of characteristics of mathematically gifted students. However, literature review revealed that studies related to teachers' identification of mathematically gifted students are limited.

2.3.1 Studies on Nurturing Mathematically Gifted Students

Many researchers revealed that regular classroom environment have not met the needs of mathematically gifted students (Choi, 2009; Diezmann & Watters, 2002; Goldberg, 2008; Jordan, 2007). To illustrate, more challenging tasks provide high level of thinking and positive attitudinal behaviors of mathematically gifted students (Diezman, 2005; Diezmann and Watters, 2002; McComas, 2011). Several researchers showed that although teachers generally give importance to identify mathematically gifted students, they have difficulties in offering suitable instruction to those students (Ayebo, 2010; Jordan, 2007) Teachers claimed that reasons for that case were large class size, not having enough training and not enough time. Besides, teachers noted that they needed the help of an assistant in order to implement special instruction to mathematically gifted students in the classroom.

The study of Dimitriadis (2012) focused on conditions of mathematically gifted primary school students. As a similar result to the studies of Jordan (2007) and Ayebo (2010), Dimitriadis (2012) showed that teachers had noticed that mathematically gifted students needed differentiated instruction. However, having such awareness did not make teachers meet the needs of mathematically gifted students. In fact, in order to meet the needs of mathematically gifted students, teachers also should be supported and educated. Choi (2009), whose study was mentioned before, also studied environmental factors on five Korean mathematically gifted high school students. More specifically, Choi (2009) drew a conclusion that formal education had negative impact on mathematically gifted students' academic development since they were at regular classroom settings with limited productive learning experiences. Moreover, teachers, who are participants of Choi's study, directed such students to private tutors rather than dealing with them at schools. Choi (2009) argued that public schools should offer a curriculum to maximize students' capacity. Furthermore, mentioned study revealed that informal education, which was provided by parents and competitions, supported those students development. For instance, parents provided additional education and had good relationships with their children. In addition, mathematically gifted students' parents and siblings had relatively high educational background with at least college degrees (Choi, 2009). Moreover, competitions made those students more interested in mathematics.

Studies mentioned above revealed that although teachers were conscious about the fact that mathematically gifted students should have activities more than ordinary classroom activities; teachers did not know how to teach those students in classroom environment. On the other hand, other researchers have studied how mathematically gifted students could be supported and they have drawn a conclusion that challenging tasks have been needed for such students' development (Whitlow-Malin, 2006). To illustrate, Diezmann and Watters (2002) studied with 20 gifted 11-12 years old students to investigate the impact of challenging tasks on their learning of mathematics. Results showed that challenging tasks gave opportunity to reveal gifted characteristics such as high level and flexible thinking abilities and persistence to reach goal. Moreover, in their research study Vilkomir and O'Donoghue (2009) suggested examples of problems which would help students to develop mathematical ability depending on Krutetskii's components of mathematical ability. In fact, being parallel to Krutetskii's (1976) suggestion, authors suggested that in the first step all students should be given the opportunity to develop components of mathematical ability. Next, mathematically gifted students should be identified.

Literature review presented a few Turkish studies related to the fact that opportunities should be provided to mathematically gifted students. To illustrate, Aygün (2010), conducted need analysis for mathematics education of middle school gifted students. Participants of the study were 5 students, 16 teachers and 1 expert whose opinions were received. Aygün stated that gifted students should have opportunities to learn deeply and discuss their ideas. Besides, they should have a learning environment which supported their reasoning, proofing, problem solving, problem constructing, thinking abstractly and high level thinking abilities. Moreover, enrichment of topics should be done for making students learn mathematics in depth; besides, acceleration should be done to enable such students to take higher level lessons. Furthermore, Aygün (2010) stated that the curriculum for such students should be flexible, which enhances thinking abilities and creativity. Besides, the curriculum should include usage of mathematics topics, history of mathematics, life story of well-known mathematicians and their inventions. The study also showed that such students should have discovery learning and project based learning rather than lecturing. Moreover, Aygün (2010) similar to Choi, (2009) stated that competitions had positive effects on such students since with competitions they see challenging problems and solutions of those problems, and they meet other gifted students.

Studies mentioned above illustrated that ordinary classroom environments are insufficient for identifying and encouraging mathematically gifted students. In other words, additional activities and additional attention are needed for mathematically gifted students. The following part of the section presents the studies related to alternative activities for such students.

2.3.2 Studies on Alternative activities for Mathematically Gifted Students

There are research studies from Turkey which focused on the effects of the alternative activities on mathematical giftedness (Altıntaş, 2009; Kök, 2012). To illustrate, Kök (2012) carried out an empirical study with 30 gifted 5^{th} graders in

Istanbul, to examine the effects of a developed curriculum based on “creative thinking” and “parallel curriculum model”. The paralel curriculum model was developed by Tomlinson, Kaplan, Renzulli, Leppien, Burns and Purcell (2002) depending on the idea that since intelligence is influenced by the environment and the opportunities, the opportunities provided to the students must be rich and flexible (as cited in Kök, 2012). Kök (2012) prepared a differentiated geometry instruction depending on creative thinking and parallel curriculum model, and examined the effects of this instruction through 15 students in experimental group and 15 students in control group. The results showed that this type of a curriculum increased students’ creativity, spatial ability and success in geometry. Furthermore, Altıntaş (2009) carried out an experimental study on 7th grade 25 gifted and 22 non-gifted students to examine the effectiveness of an activity, depending on Purdue Model, on students’ mathematics success, critical thinking abilities and attitudes on solving mathematics problems. Purdue Model was developed by Feldhusen and Kollof (1986) depending on thinking abilities, problem solving and project supported learning (as cited in Altıntaş, 2009). Results of the study illustrated that such an activity was more effective than ordinary classroom activities, on students’ achievement of mathematics, thinking abilities and attitudes towards solving mathematics problems. Another result of the study was that when students’ success increased their anxiety decreased. Moreover, while gender had no effect on students’ success in mathematics, the students with parents having undergraduate degree were more successful at mathematics.

To conclude, the studies mentioned in this section illustrated that mathematically gifted students need more than usual classroom activities. In other words, differentiated instructions are more effective on developing gifted students abilities comparing to ordinary instructions. The individuals who will provide such instructions are teachers. Thus, the present study focuses on teachers’ perceptions of mathematically gifted students.

2.3.3 Studies related to Teachers' Perceptions of Mathematically Gifted Students

Although past studies showed teachers deficiency on identifying gifted students, recent studies illustrated that teachers are more successful in identifying gifted students (Ficici, 2003). However, literature review revealed that there are a few studies on teachers' perceptions of mathematical giftedness (Bicknell, 2008; Ficici, 2003; Leikin and Stanger, 2011).

Leikin and Stanger (2011) studied with three 5th and 6th grade elementary school mathematics teachers in order to examine their descriptions of the mathematically gifted students. Results showed that there are similarities and differences between those three teachers' descriptions. In fact, teachers' conceptions of mathematical giftedness were not systematic; on the contrary, their conceptions depended on their teaching experiences. Another interesting result was that mathematically gifted students help teachers at teaching process; however, teachers did not give opportunity to have particular activities on mathematics for mathematically gifted students. In fact, students enhanced lessons quality by immediate answers to questions, by their different strategies and by deepening mathematical discussions.

Another study examining how teachers perceived the characteristics of mathematically gifted students was from New Zealand (Bicknell, 2008). Mentioned research study focused on how students, teachers and parents perceive mathematical giftedness through 15 gifted 6th and 8th graders, those students' parents and 13 teachers. The results showed that according to parents the characteristics such as constructing patterns, playing with puzzles, playing challenging games including numbers and problem solving are indicators of mathematical giftedness, at early ages. Besides, in school years parents and students decided the mathematically gifted students by comparing the students with peers. Also, according to the results of the study, the students thought that computational skills, succeeding in competitions, problem solving skills and success in particular projects illustrated mathematical giftedness. Moreover, the study revealed that according to the teachers some characteristics of mathematically gifted students are those: they are interested in mathematics, they see world from the mathematics perspective, they are able to think abstractly and they play games requiring mathematical skills. However, teachers noted an unfavorable behavior of such students as their presentation of work was in low quality. For instance, those students generally had awful hand writing.

Available literature did not serve any other study on elementary teachers' or elementary mathematics teachers' perceptions of mathematical giftedness; however, Mann's (2005) study included relationship between teachers' perceptions of the students' mathematical ability and the students' mathematical creativity. More specifically, Mann (2005) examined predictors of students' mathematical creativity by regression analysis whose subjects were 89 seventh graders. Creative Ability in Mathematics Test (CAMT) (Balka, 1974) was implemented to measure students' mathematical creativity (as cited in Mann, 2005). Multiple regression analyses results illustrated that the most significant predictor was mathematical achievement which explained 23 % of the variance on the CAMT scores of the students. The other significant predictors were gender, attitude towards mathematics and self-perceptions of creativity, with 12% of the variance on the CAMT scores of the students. Besides, although there was high correlation between teachers' perceptions of students' mathematical ability and creativity, teachers' perceptions of students' mathematical ability and creativity were not significant predictors for students' CAMT scores.

Literature review revealed that there was a study, conducted by Ficici (2003), related to the perceptions of high school mathematics teachers on mathematical giftedness. Ficici's (2003) purpose was to examine the relationship between high school mathematics teachers' characteristics and their perceptions of mathematically gifted students. Ficici studied with 296 teachers from South Korea, 389 teachers from Turkey and 262 teachers from United States to examine perceptions of high school mathematics teachers on mathematically gifted students by using the instrument *Teachers' Judgments of Gifted Mathematics Student Characteristics*. He evaluated mathematical giftedness with three dimensions as school success, using mathematics in real world and being analytical thinker, and being creative. Ficici (2003) used regression analysis in order to determine the relationship between teachers' characteristics and their perceptions of mathematically gifted students. The characteristics of the teachers were gender, their highest degree of education, their teaching subject, the area of their degree, their year of experience in teaching and the grade level they taught mathematics. In the study, regression analysis was conducted for each dimension (school success, using mathematics in real world and being creative thinker, and being creative) separately for which criterion variables were teachers' characteristics. Results illustrated that for the first dimension of being successful at school mathematics, the significant predictors were: teachers' year of experience, in which grade they teach mathematics and their highest degree of education. More specifically, more experienced teachers' means were higher, while teachers teaching higher levels and having higher degree of education had lower means. For the second dimension *seeing the world from mathematics perspective and being analytical thinker*, the significant predictors were: teaching grade level, experience and gender. To illustrate, more experienced teachers and female teachers' means were higher, while teachers of higher graders had lower means. For the last dimension (being creative), the significant predictors were: teaching grade level and teachers' experience. More specifically, the more the teachers were experienced, the higher means they had while teachers of higher graders had smaller means. Furthermore, Ficici's (2003) another purpose was to explore the differences among teachers with respect to their country. The results illustrated that there was a significant difference among perceptions of teachers from Turkey, South Korea and United States. To illustrate, teachers from Turkey had the highest mean scores for all dimensions. Besides, teachers from South Korea had the lowest mean scores for the dimensions *using mathematics in the real world and being creative thinker* and, *school success*; while teachers from United States had the lowest mean scores for the dimension creative problem solver.

When Ficici's (2003) results for Turkish teachers are examined, the results illustrated that for the dimension *school smart mathematics student* the only significant predictor was teachers' year of experience. More specifically, the mean scores of more experienced teachers were higher, i.e. for those teachers, the characteristics forming *school smart mathematics student dimension* were more valuable comparing to less experienced teachers. Besides, for the dimension *mathematics perspective for the real world*, gender and years of experience were significant predictors. In fact, the mean scores of female teachers and more experienced teachers were higher. Lastly, the research study show that there was no significant relationship between Turkish teachers' mean scores of *creative problem solver* dimension and their characteristics. This result means that Turkish teachers' characteristics did not affect their value of the dimension *creative problem solver*.

As a result, literature review illustrated that although teachers have an important role for identifying mathematically gifted students and supporting their mathematical abilities, there are limited studies related to teachers' perceptions of mathematical giftedness. Besides, studies on elementary teachers and elementary mathematics teachers' perceptions of mathematical giftedness are inadequate. Thus, present study focuses on perceptions of elementary teachers and elementary mathematics teachers and differences between their perceptions. Moreover, Ficici's (2003) study revealed that there was a relationship between Turkish high school mathematics teachers' perceptions of mathematically gifted students and their characteristics as gender and year of experience. However, available literature review has not served any other study supporting or not supporting that result, which shows the need for more studies regarding this issue. Thus, present study also examines the differences among teachers' perceptions of mathematical giftedness in terms of teachers' gender and their year of experience.

2.4 Studies related to Gender Differences on Mathematical Giftedness

Literature review showed that there are limited studies on gender differences among mathematically gifted students (Hargreaves et al., 2008; Preckel et al., 2008) and teachers' perceptions of mathematical giftedness with respect to gender (Ficici, 2003). In this section, the studies reached from the literature related to this issue are summarized.

Hargreaves et al. (2008) conducted a study among gifted students in order to investigate gender differences on performance and attitudes towards mathematics. Participants of the study were 500 gifted 9 and 13 years old students from England. Although the study illustrated that there were no gender differences in students' performance in mathematics, there was a difference regarding the attitudes of students. Hargreaves et al. (2008) examined students' attitudes in three areas as students' attitudes towards test, students' attitudes towards mathematics and students' beliefs on whether girls or boys were better at mathematics. To illustrate boys' attitude scores were higher than those of girls'. The results also illustrated that many students thought that boys were better than girls at mathematics. Moreover, another study (Preckel et al., 2008) focused on gender differences of 181 gifted and 181 non-gifted 6th graders in mathematics success, academic self-concept, interest and motivation in mathematics. The results of the study revealed that boys' achievement test scores were higher for both gifted and non-gifted students while there was not a significant difference between boys' and girls' grades. Besides, another result, which was consistent with the results of Hargreaves et al. (2008), was that for both gifted and non-gifted students, girls' academic self-concept, interest and motivation scores were lower than boys'. Moreover, the results illustrated that gender differences among gifted students were more remarkable in favor of boys in terms of self-concept, interest and motivation scores rather than non-gifted counterparts.

As mentioned before, Ficici (2003) studied on teachers' perceptions of mathematically gifted students by conducting regression analysis. More detailed examination of the results regarding gender showed that for the dimensions school *smart mathematics student* and creative *problem solver*, gender was not a significant predictor. However, for the dimension *mathematics perspective for the real world*, gender was a significant predictor. In fact, that dimension was significant predictor for Turkish and South Korean teachers. More specifically, in both countries, male teachers' means were lower than female teachers for mentioned dimension.

Studies summarized above showed that there is lack of studies on the differences among male and female teachers' perceptions of mathematically gifted students. Thus, as stated above, one of the purposes of the present study is to investigate the differences between male and female teachers in terms of their perceptions of mathematical giftedness.

2.5 Summary of the Literature Review

Recent theories on giftedness provide broader conception of giftedness rather than depending on conventional intelligence tests (Davidson, 2009). Although there exist differences among definitions or conceptions of giftedness, some generalizations can be made. To illustrate, definitions and conceptions of giftedness have become broader in contrast to past definitions and conceptions (Renzulli, 2000). For example, creativity and motivation can be expressed as new dimensions of giftedness (Sternberg, 2008; Renzulli, 2000). Moreover, giftedness is considered as set of skills which can be developed (Gagne, 1995).

Literature review showed that many ideas related to mathematical giftedness were based on Krutetskii's (1976) study. Krutetskii used the term "mathematical cast of mind" which refers to mathematical giftedness. Depending on Krutetksii’s work, many researchers expressed the characteristics of mathematical giftedness. Those characteristics can be summarized as having high level computational, analytical and problem solving skills; being interested and motivated in mathematics (Krutetskii, 1976; Sheffield, 1999). It can be said that in recent years, researchers have emphasized creativity and motivation in mathematical giftedness (Miller, 1990).

Literature review also showed that teachers have a vital role for promoting mathematically gifted students. First of all, teachers should know the characteristics of mathematically gifted students and identify them (Ficici, 2003). Besides, teachers should provide classroom environments and activities to challenge those students (Johnson, 2000; Koshy et al., 2009). In order to be able to provide such conditions, teachers should have strong background on mathematical knowledge (Deal and Wismer, 2010; Johnson, 2000); in addition, teachers should be trained on determining and nurturing such students (Johnson, 2000). Moreover, teachers should be supported to deal with mathematically high ability students (Johnson, 2000).

Literature review also illustrated that researches on mathematical giftedness are generally focused on identifying mathematically gifted students and the conditions and learning environments which nurture such students. Although some researchers have drawn a conclusion that teachers have known the characteristics of mathematically gifted students (Ficici, 2003), studies on this issue are inadequate to support this conclusion. Thus, the present study focused on teachers’ perceptions of mathematically gifted students. In addition, gender is an important factor affecting success in mathematics and attitudes towards mathematics (Hargreaves et al,, 2008; Preckel et al., 2008), which raise a concern about the effect of gender on teachers’ perceptions of mathematical giftedness. Besides, since teachers’ experiences are vital for their conceptions of giftedness (Leikin and Stanger, 2011), another concern of the study was the effect of teachers’ year of experience on their perceptions of mathematical giftedness. In particular, as mentioned before Ficici's (2003) research study revealed that for Turkish high school mathematics teachers, there was a relationship between teachers' perceptions of mathematically gifted students' characteristics, and teachers' gender and year of experience. However, literature review did not serve any study to support or not to support this result. In fact, present study focused on differences among teachers' perceptions in terms of their gender and year of experience. Furthermore, some researchers have stated that determining mathematical giftedness at early ages has been important in order to provide their development (Budak, 2007). In fact, elementary teachers meet mathematically gifted students earlier than elementary mathematics teachers. Hence, the present study also focuses on whether there are differences between elementary teachers' and elementary mathematics teachers' perceptions of mathematically gifted students.

CHAPTER 3

METHODOLOGY

This chapter discusses about methods and procedures of the research study. In particular, design of the study, population and sample, instruments, data collection procedure, data analysis procedure, internal and external validity of the study and, limitations of the study are discussed, respectively.

3.1 Design of the Study

The present study attempts to investigate the differences among teachers' ratings on mathematically gifted students' characteristics in terms of teachers' gender, year of experience, and area of teaching. Also, it aims to investigate differences among teachers' ratings of mathematically gifted students' characteristics with respect to the three dimensions of the implemented survey named "Teachers' Judgments of Gifted Mathematics Student Characteristics (TJGMSC)" (Ficici, 2003). Those dimensions are *school smart mathematics student*, *mathematics perspective for the real world* and *creative problem solver*. In order to examine the research questions, quantitative methods were used. Namely, survey research and causal comparative research designs were used. According to Fraenkel and Wallen (2006) in survey research, people's opinions on a particular issue are examined. Since in the recent study the teachers' perceptions of mathematically gifted students are examined, survey research design has been used. More specifically, cross-sectional survey has been carried out since the data was collected from "predetermined population" at "one point in time" (Fraenkel and Wallen, 2006, p. 398). Since the other aim of the study is to examine the differences among teachers in terms of their gender, year of experience and area of teaching, causal comparative research design was also used. To illustrate, causal comparative research focuses on “the cause or consequences of differences that already exist between or among groups of individuals.” (Fraenkel and Wallen, 2006, p. 370). In fact, the current study compared teachers’ perceptions of mathematically gifted students according to variables such as gender, year of experience and area of teaching which already exist for teachers.

3.2 Population and Sample

In this study the target population was elementary teachers teaching mathematics to 4^{th} and 5^{th} graders and elementary mathematics teachers, in Trabzon. Elementary teachers teaching mathematics to 4^{th} and 5^{th} graders and elementary mathematics teachers in the center of Trabzon were chosen as accessible population. In fact, elementary teachers teach students of 1^{st} to 5^{th} graders, showing a sharp difference among grade levels teachers have taught. Teachers of 4^{th} and 5^{th} graders were selected in order to reduce this difference. Convenience sampling method which is defined as collecting data from subjects who are available (Fraenkel and Wallen, 2006) was used to collect data. More specifically, the present study involved 266 teachers from 60 schools in the center of Trabzon. Those 60 schools were all state elementary schools in the center of Trabzon. Data collector reached all 60 schools and available 266 teachers contributed to the study. Table 3.1, Table 3.2 and Table 3.3 show the distribution of the participants.

Table 3.1

Distribution of the Participants with respect to Gender, Year of Experience and Area of Teaching

	N	Percentage
Gender		
Female	122	45.9 %
Male	144	54.1 %
Year of Experience		
1-5 years	15	5.6%
6-10 years	48	18%
11-15 years	52	19.6%
Above 15 years	151	56.8%
Area of Teaching		
Elementary Teachers	176	66.2%
Elementary Mathematics Teachers	90	33.8%

Table 3.1 indicates that the number of female teachers is 122 and the number of male teachers is 144; thus, the numbers of male and female teachers are close to each other. On the other hand, there are sharp differences among teachers' numbers with respect to year of experience. More specifically, many teachers have more than 15 years of teaching experience with the number of 151 (56.8 %), while a few teachers have between 1 and 5 years of teaching experience with the number of 15 (5.6%). In addition, the number of elementary teachers (*N*=176) is more than the number of elementary mathematics teachers (*N*=90).

Table 3.2

Distribution of the Participants with respect to Education Level

Education level	N	Percentage
College	13	4.9%
Open	9	3.4%
Bachelor’s	226	85.0%
Graduate	18	6.8%
Total	266	100%

Table 3.3

Distribution of the Participants with respect to Graduate Programme

	N	Percentage
Elementary Education	119	44.7%
Mathematics Education	35	13.2%
Elementary Mathematics Education	37	13.9%
Science and Literature Faculty	33	12.4%
Architecture/Engineering Faculty	18	6.8%
Other teaching Programmes	6	2.3%
Economy Faculty	5	1.9%
Training Institute	13	4.9%

Table 3.2 shows that most of the teachers, namely 85% of teachers, have bachelor’s degree (*N*= 226), while the number of teachers with other degrees, such as college, open and graduate is limited. Besides, Table 3.3 shows that most of teachers are graduated from Faculty of Education. More specifically, the percentage of teachers graduated from elementary education department is 44; the percentage of teachers graduated from mathematics education department is 13.2, and the percentage of teachers graduated from elementary mathematics education department is 13.9.

3.3 Measuring Instruments

In order to answer research questions, a survey named “Teachers’ Judgments of Gifted Mathematics Student Characteristics (TJGMSC)” developed by Ficici (2003) was used. Part of the instrument including 46 items which expressed characteristics of mathematically gifted students was selected for recent study. As a result of factor analysis, Ficici (2003) illustrated that this part of TJGMSC included three sub-dimensions as *school smart mathematics student*, *mathematics perspective for the real world*, and *creative problem solver*. More explicitly, 27 of those items are related to three mentioned dimensions (Appendix B) which were used in the recent study. Among those 27 items, 7 items (with numbers 12, 13, 19, 21, 22, 23, and 24) were related to *school smart mathematics student* dimension, 12 items (with numbers 2, 3, 4, 5, 6, 7, 8, 9, 10, 17, 26, and 27) were related to *mathematics perspective for the real world dimension* and, 8 items (with numbers 1, 11, 14, 15, 16, 18, 20, and 25) were related to *creative problem solver* dimension. Table 3.2 illustrates items for each dimension.

Table 3.4

Items of TJGMSC for each Dimension

Dimensions	Items
School Smart Mathematics Student	Displays ability to do calculations accurately.
	Has good memory recall.
	Remembers formulas and procedures.
	Has ability to do calculations quickly.
	Earns high scores in math/quantitative test(s).
	Thinks in a sequential and procedural manner.
	Understands mathematical concepts, principles, and strategies.

Table 3.4 *(continued)*

Items of TJGMSC for each Dimension

Dimensions	Items
Mathematics Perspective for the Real World	Relates math to everyday life.
	Can see the world through a math lens.
	Understands how mathematics is used in the real world.
	Makes connections between math and other subject areas.
	Looks at the world from a mathematical perspective.
	Sees the connections between different areas of mathematics.
	Can explain concepts in math terms.
	Is able to provide reasons to support their solutions.
	Displays a strong number sense (i.e, makes sense of large and small numbers**,** estimates easily and appropriately).
	Can distinguish relevant and irrelevant information(s) in math problems.
	Asks high-level questions such as "why" or "what if" that increases the depth and complexity of the mathematics being studied.
	Displays an interest in analyzing the mathematical structure of a problem.

Table 3.4 *(continued)*

Items of TJGMSC for each Dimension

Dimensions	Items
Creative Problem Solver	Is able to think creatively.
	Generates new ways to solve problems.
	Has creative (unusual and divergent) ways of solving math problems.
	Offers different solutions to one problem.
	Generates many ideas, solutions, explanations, etc.
	Has ability to incubate when s/he cannot solve the problem immediately.
	Has spatial/3D ability.
	Enjoys solving challenging problems.

TJGMSC was a 5-point Likert-type scale with degree 1 (not very important) to 5 (very important). For each participant a mean score was calculated with respect to mentioned three dimensions. For instance, in order to calculate a participant's mean score on school smart mathematics student dimension, related 7 items' scores were added and to obtain a mean score total score was divided into 7. Therefore, for a dimension, the least mean score was 1 and the higher mean score was 5. More specifically, for a dimension having scores close to 5 means that the teachers give more importance to that dimension, while having scores close to 1 means that teachers give less importance to that dimension.

In order to check validity of TJGMSC, factor analysis was conducted by Ficici (2003). Three factors were selected with 42 % variance on the gifted mathematics student characteristics. As mentioned before**,** those three factors are school smart mathematics student, mathematics perspective for the real world and, creative problem solver. Ficici (2003) stated alpha values of those factors as .901, .882 and .840, respectively. Besides, the currents study found alpha levels of those factors as .783, .779 and .747.

3.4 Data Collection Procedure

The survey was carried out on 266 teachers from 60 schools which were in the center and center villages of Trabzon. Data was collected in the fall semester of 2011-2012 academic year. In the spring semester of 2010-2011 academic year, the researcher contacted Ficici to express the purpose of the study. The permission for using the survey was asked by an e-mail. Besides, official permissions were obtained from Middle East Technical University Human Subjects Ethic Committee and Trabzon Ministry of Education Administration. Appendix A shows the certificate of the permission.

During data collection procedure, participants of the study signed consent form, prepared by the researcher, to provide honesty and to be informed about the study. Besides, participants did not have to write their names in order not to feel stressed. Moreover, participants filled the surveys in their schools. When some teachers were absent, the surveys with consent forms were left to school administration. It is also worth noting that all the participants took part in the study on a voluntary base. Teachers filled the surveys at their rest times. The rest times differed from teacher to teacher. Some teachers filled the survey in the morning, some at lunch time and some in the evening. Filling the survey lasted approximately 15 minutes.

3.5 Data Analysis

In the present study quantitative method strategies, which examine relationships among variables (Fraenkel and Wallen, 2006), were used in order to address research questions. Statistical analyses were done by SPSS 15.0 (Statistical Package for Social Sciences). Namely; mean, standard deviation and, skewness and kurtosis values were calculated for descriptive statistics. When there are more than one dependent variable MANOVA is conducted (Pallant, 2007). Besides, in order to investigate differences among teachers' perceptions on mathematically gifted students with respect to gender, year of experience and, area of teaching**,** one-way MANOVA was conducted. Lastly, practical significances of the results were evaluated by eta square.

3.6 Internal and External Validity of the Study

Internal validity means to what extent researchers' results are "appropriate, meaningful, correct, and useful" (Fraenkel and Wallen, 2006, p. 151). Besides, external validity refers to "generalizability" of the results "from a sample to a population" (Fraenkel and Wallen, 2006, p.108). In this part of the chapter internal and external validities are discussed.

3.6.1 Internal Validity of the Study

According to Fraenkel and Wallen (2006), possible treats for internal validity in causal-comparative researches and survey researchers are subject characteristics, mortality, location and instrumentation.

Fraenkel and Wallen (2006, p.170) defined subject characteristics threat as the fact that "the selection of people for a study may result in the individuals (or groups) differing from one another in unintended ways that are related to the variables to be studied". Indeed, in that study it was difficult to select subjects with similar personal characteristics since some differences existed among teachers such as age, graduate level, their cultural background and their personal attitudes.

On the other hand, the researcher chose teachers teaching similar graders to control at least that difference. Namely, elementary teachers were chosen from teachers teaching 4th and 5th grades and mathematics teachers were chosen from elementary mathematics teachers. Besides, most teachers had bachelor's degree only. After that, it was assumed that there was no threat of subject characteristics.

Mortality threat means loss of subjects during the data collection process (Fraenkel and Wallen, 2006). Firstly, since survey was applied once and in a short time period, dropout of subjects did not occur. On the other hand, some teachers were absent because of their lesson hours. That is, some teachers' lessons started in the morning while some teachers' lessons started in the afternoon. Therefore, for those absent teachers blank surveys were given to the administration of the school, then on another day those surveys were collected. Depending on the facts mentioned above, mortality threat was assumed to be controlled.

Location threat occurs when the places where data are collected affect the interpretations of the results (Fraenkel and Wallen, 2006). Although data was collected from 60 different schools, many conditions for teachers were similar to each other. More specifically, teachers filled surveys at teachers' room. As a consequence, it was assumed that location threat was controlled.

According to Fraenkel and Wallen (2006), in order to diminish instrumentation threat, issues which must be examined are instrument decay, data collector characteristics and data collector bias. Firstly, instrument decay occurs when the instrument allows the researcher to have different interpretations for the same cases. In fact, in present study the survey includes 5-point Likert scale instead of a scale including open-ended items. Besides, the researcher entered the data to SPSS carefully with giving numbers all scales. In that case, when the researcher recognized an error, it was easy to turn back and to correct it. On the other hand, Fraenkel and Wallen (2006, p.412) stated that when the interviewers "get tired or are rushed" the instrument decay also occurs. Unfortunately, some teachers filled the survey at their rest time while some teachers were on duty with more stress. Besides, some teachers filled the survey in the morning while some were filled in the evening, which affects their fatigue level. However, since the survey did not have items taking long time or items hard to fill, it was assumed that instrument decay was controlled. As a result, it was assumed that instrument decay did not exist. Next, data collector characteristics threat occurs when data collectors have different characteristics like gender, age or ethnicity. Indeed, the data was collected by the same person who was informed by the researcher related to the data collection procedure in detail. The data collector only informed participants about the research and he did not interact with participants. Then, there was no threat for data collector characteristics. Lastly, data collector bias occurs when the data collector changes the actual results. In fact, the data collector was informed by the researcher about data collection procedure without informing expected results. Therefore, it was assumed that data collector bias was not a threat for the present study.

3.6.2 External Validity of the Study

Fraenkel and Wallen (2006, p.104) defined external validity as "the extent to which the results of a study can be generalized". As mentioned before**,** the target population of this study was elementary teachers of 4th and 5th graders and elementary mathematics teachers, in Trabzon. Elementary teachers of 4th and 5th graders and elementary mathematics teachers from center and center villages of Trabzon were chosen as accessible population. Despite the usage of convenience sampling method -which limits the generalization- (Fraenkel & Wallen, 2006), it could be claimed that the generalizability was not well. To illustrate, sample included most of the individuals in the population. Besides, it could be said that all teachers' conditions, e.g. educational level, working environment, were similar. Then, it can be said that the individual differences among teachers were at a minimum level. However, there was a conspicuous difference, that is, mean age for elementary teachers employed in Trabzon was relatively high. That case resulted in considering ecological generalizability which means “the extent to which the results of a study can be generalized to conditions or settings other than those that prevailed in particular study” (Fraenkel and Wallen, 2006, p. 108). In particular, data were collected from teachers at public schools which let the researcher to generalize results to teachers at public schools. Besides, since data was collected from Trabzon -which is one of the largest cities of Black Sea Region-, the results can be generalized to teachers in Black Sea Region.

3.7 Limitations of the Study

In this section limitations of the study will be presented. Firstly, quantitative methods limit the participants while expressing their thoughts. In fact, in the present study participants were constraint with items of the TJGMSC while expressing characteristics of mathematically gifted students. Open-ended items would make more depth into evaluation of teachers’ perceptions on mathematically gifted students. Next limitation is that, data was collected from one city, which limited the researcher to generalize the results to whole country. Lastly, data was collected at different times of a day (morning, afternoon and evening), which might have an effect on teachers’ concentration and attention.

CHAPTER 4

RESULTS

The aim of this research study was to explore the differences among teachers' perceptions of mathematically gifted students in terms of variables *gender*, *year of experience* and *area of teaching*. More specifically, the differences among teachers' appreciation of the characteristics of mathematically gifted students are evaluated in terms of three dimensions such as students' school success, their analytical thinking and ability to see mathematics in the real world, and creativity. After previous chapters which illustrated review of previous researches and methodology of the present study, this chapter includes the results of the study. The results of one-way MANOVA analysis according to independent variables are presented.

In this chapter the differences among teachers' perspectives of the mathematically gifted students' characteristics are evaluated in terms of teachers' *gender*, *year of experience* and *area of teaching*. In the instrument used for the present study, there exist three dimensions for examining teachers' ratings of the mathematically gifted student characteristics. According to Pallant (2007) when the number of dependent variables is more than one, MANOVA must be conducted rather than ANOVA, in order to control Type 1 error. In this chapter, MANOVA results are presented in three sections with respect to independent variables. In addition, those sections include two parts of descriptive statistics and inferential statistics.

4.1 Teachers' Perceptions on Mathematically Gifted Students in terms of Gender

One-way MANOVA was conducted to determine the differences on male and female teachers' perceptions of mathematically gifted students' characteristics. Following two parts indicated descriptive statistics and inferential statistics of the results.

4.1.1 Descriptive Statistics

In this part, female and male teachers' mean scores and standard deviations are presented for each dimension of TJGMSC. As can be seen from Table 4.1., for all dimensions, female teachers' mean scores were higher than male teachers'. More specifically, for the dimension of *school smart mathematics student*, mean score of female teachers was 4.367 *(SD*=.499*)* and mean score of male teachers was 4.348 *(SD*=.437*)*. In addition, for the dimension of *mathematics perspective for the real world*, mean score of female teachers was 4.233 *(SD*=.375*)* and mean score of male teachers was 4.202 *(SD*=.393*)*. Besides, for the dimension of *creative problem solver*, mean score of female teachers was 4.413 *(SD*=.371*)* and mean score of male teachers was 4.369 *(SD*=.428*)*. It can be observed that for both females and males the higher mean belonged to *creativity*, while for both males and females the lowest mean belonged to the dimension *realizing mathematics in the real world*. To illustrate, while both male and female teachers gave importance to all dimensions, the most important dimension for them was *creativity*.

Table 4.1

Descriptive Statistics of TJGMSC Scores with respect to Gender

Gender	M	SD	N
Dimension 1: School Smart Mathematics Student			
Female	4.367	.499	122 (45.9%)
Male	4.348	.437	144 (54.1%)
Total	4.357	.466	266 (100%)
Dimension 2: Mathematics Perspective for the Real World			
Female	4.233	.375	122(45.9%)
Male	4.202	.393	144(54.1%)
Total	4.216	.385	266(100%)
Dimension 3: Creative Problem Solver			
Female	4.413	.371	122(45.9%)
Male	4.369	.428	144(54.1%)
Total	4.389	.403	266(100%)

4.1.2 Inferential Statistics

In this part of the study, inferential statistics for the research question of whether there is a significant difference between male and female teachers in terms of TJGMSC scores is examined. Firstly, assumptions of one way-MANOVA are presented with respect to gender. Secondly, the results of one way MANOVA are summarized.

4.1.2.1 Assumptions of One Way-MANOVA

Before conducting one-way MANOVA, the assumptions to be checked are sample size, normality, univariate and multivariate outliers, linearity, multicollinearity and singularity and homogeneity of variance matrices (Pallant, 2007). Assumptions multivariate normality, multivariate outliers and multicolinearity and singularity were checked for whole independent variables, while other assumptions were examined for each of the independent variables *School smart mathematics student, mathematics perspective for the real world* and *creative problem solver*, separately.

The first assumption to be checked is sample size. According to Pallant (2007) each cell must include cases more than the number of dependent variables. Actually, this analysis included 6 cells and 3 dependent variables, therefore the minimum sample size for the analysis was 18 (6*3). Thus, sample size assumption was met with 266 subjects.

The second assumption of one-way MANOVA is normality which requires checking both univariate and multivariate normality. In order to ensure univariate normality, it must be checked that skewness and kurtosis values are between -2 and +2 (Pallant, 2007). As Table 4.2 illustrated, this assumption was ensured with skewness and kurtosis values between -.844 and .866. Besides, the histograms with respect to dependent variables *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver* are presented in Appendix C. Accordingly; there was no violation of univariate normality assumption. In order to provide multivariate normality assumption, Mahalanobis distance was checked. In fact, the critical value for three dependent variables is 16.27 (Pallant, 2007). Analysis showed that the greatest mahalanobis distance was 17.22 while the other distances were under 16.27. Pallant (2007) maintained that MANOVA tolerated a few outliers when their scores were not extreme and sample size was reasonable. Therefore, it can be said that there was no violation of multivariate normality.

Table 4.2

Skewness and Kurtosis Values of TJGMSC Scores with respect to Gender

	Skewness	Kurtosis	N
Dimension 1: School Smart Mathematics Student			
Female	-.749	-.346	122
Male	-.499	-.035	144
Dimension 2: Mathematics Perspective for the Real World			
Female	-.844	.866	122
Male	-.426	-.051	144
Dimension 3: Creative Problem Solver			
Female	-.678	.195	122
Male	-.612	-.227	144

The other assumption to be checked is existence of univariate and multivariate outliers. Boxplots placed at Appendix D revealed that there was no existence of univariate outliers. Besides, according to Pallant (2007), check of multivariate normality provides check of multivariate outliers. Hence, multivariate assumption of outliers had been also checked. Moreover, another assumption to be checked is linearity. A matrix of scatterplots between each pair of the variables, separately for the groups was created and *Figure 4.1* illustrated that there was no explicit evidence of non-linearity.

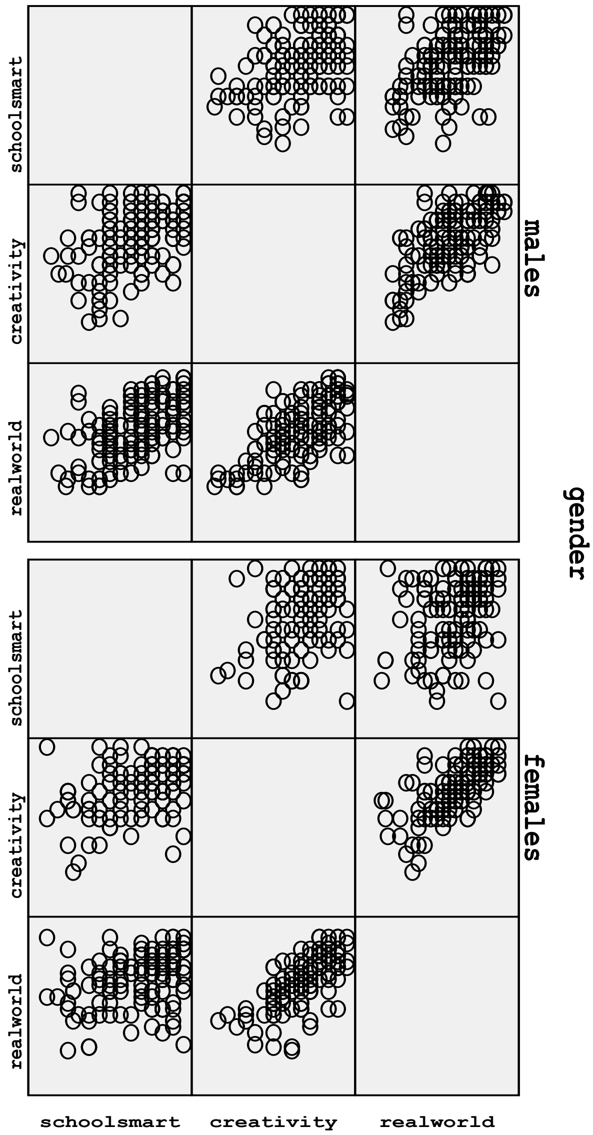

Figure 4.1 A matrix of scatterplots between variables *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver* for males and females

The other assumption is homogeneity of variance which controls whether the variability of scores for each of the groups is similar (Pallant, 2007). As it was illustrated in Table 4.3, only the significance value of the dimension of *school smart mathematics student* was smaller than .05. However, since group sizes are similar, violation of this assumption can be ignored (Stevens, 2009).

Table 4.3

Levene's Test of Equality of Variances with respect to Gender

Dimensions	Significance
School Smart Mathematics Student	.043
Mathematics Perspective for the Real World	.085
Creative Problem Solver	.553

Next assumption to be checked is multicollinearity and singularity. For checking multicollinearity and singularity, relationships among dependent variables should be examined. For reliable MANOVA, dependent variables should be "moderately correlated" (Pallant, 2007). More specifically, high correlation (.50 to 1) among dependent variables shows multicollieарity and small correlation (.10 to .29) among dependent variables shows singularity. Table 4.4 revealed that all values were more than .10 which provides controlling singularity assumption. Besides, Pallant (2007) stated that correlations around .8 or .9 cause violation of multicollinearity assumption. Since all values were under .8, multicollinearity assumption was also checked.

Table 4.4

Summary of Correlations among the Dimensions of TJGMSC

	School Smart Mathematics Student	Mathematics Perspective for the Real World	Creative Problem Solver
School Smart Mathematics Student	1.000	-	-
Mathematics Perspective for the Real World	.411*	-	-
Creative Problem Solver	.409*	.661*	-

Lastly, the assumption homogeneity of variance matrices were checked by conducting Box's test. Box's test value p=.021 and that value is not significant p>.001 (Pallant, 2007). Then, this assumption was also met.

4.1.2.2 One-Way MANOVA Results with respect to Gender

Following check of assumptions, results of one-way MANOVA with respect to gender will be examined in this section. In order to address whether there was a significant difference between female and male teachers' perceptions of mathematically gifted students, one-way MANOVA was conducted at .05 significance level. In the analysis, dependent variables were *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver* while the independent variable was gender. The results from the analysis are shown in Table 4.5. Table 4.5 indicated that there was not a statistically significant difference between males and females on the combined dependent variables, $F(3, 262)=.257$, $p=.856$; Wilks' Lambda=.997; partial eta squared =.003. Since there was not a significant difference, between subject results were not examined. More specifically, not obtaining a significant difference between male and female teachers means that both of them gave similar importance to all dimensions.

Table 4.5

MANOVA Results with Respect to Gender

IV	Wilks' Lambda	F	df	Significance	Eta Squared
Gender	.997	.257	3	.856	.003

4.2 Teachers' Perceptions of Mathematically Gifted Students in terms of Year of Experience

One-way MANOVA was conducted to examine the differences in teachers' perceptions of mathematically giftedness according to year of experience.

Descriptive statistics and inferential statistics of MANOVA results are presented in the following sections.

4.2.1 Descriptive Statistics

One of the most important findings, seen from Table 4.2, was that the dimension with higher mean score was *creative problem solver* for less experienced teachers while the dimension with lowest mean score was *school smart mathematics student*. Moreover, for all teachers, the dimension with lowest mean score was *mathematics perspective for the real world*. More specifically, *for the dimension of school smart mathematics student*, the mean of teachers with an experience of 1-5 years was 4.295 *(SD*=.522*)*; the mean of teachers with an experience of 6-10 years was 4.223 *(SD*=.481*)*; the mean of teachers with 11-15 years of experience was 4.306 *(SD*=.542*)*, and the mean of teachers with experience above 15 years was 4.411 *(SD*=.449*)*. Besides, for the dimension of *mathematics perspective for the real world*, the mean of teachers with 1-5 years of experience was 4.226 *(SD*=.409*)*; the mean of teachers with an experience of 6-10 years was 4.068 *(SD*= .376*)*; the mean of teachers with 11-15 years of experience was 4.224 *(SD*=.434*)*, and the mean of teachers who have experience above 15 years was 4.225 *(SD*=.380*)*. Lastly, for the dimension *creative problem solver*, the mean of teachers experienced 1-5 years was 4.450 *(SD*=.450*)*, the mean of teachers experienced 6-10 years was 4.332 *(SD*=.472*)*, the mean of teachers experienced 11-15 years was 4.416 *(SD*=.364*)* and, the mean of teachers with experience above 15 years was 4.392 *(SD*=.383*)*. Those results showed that teachers at all experience intervals gave high importance to all dimensions.

Table 4.6

Descriptive Statistics of TJGMSC Scores with respect to Year of Experience

	M	SD	N
Dimension 1: School Smart Mathematics Student			
1-5	4.295	.522	15 (5.6%)
6-10	4.223	.481	48 (18.1%)
11-15	4.306	.542	52 (19.5%)
Above 15	4.411	.449	151 (56.8%)
Dimension 2: Mathematics Perspective for the Real World			
1-5	4.226	.409	15 (5.6%)
6-10	4.068	.376	48 (18.1%)
11-15	4.224	.434	52 (19.5%)
Above 15	4.225	.380	151 (56.8%)
Dimension 3: Creative Problem Solver			
1-5	4.450	.450	15 (5.6%)
6-10	4.332	.472	48 (18.1%)
11-15	4.416	.364	52 (19.5%)
Above 15	4.392	.383	151 (56.8%)

4.2.2 Inferential Statistics

In this part of the study inferential statistics for the research question of whether there was a significant difference among TJGMSC scores of teachers with respect to their year of experience is examined. In particular, assumptions of one way-MANOVA and the results of one way MANOVA are summarized with respect to year of experience.

4.2.2.1 Assumptions of One-Way MANOVA

The first assumption to be examined is sample size which is provided with a sample size of 266. To illustrate, there were 12 cells and sample size must have been at least 36 (12*3). The second assumption of one-way MANOVA is normality. As Table 4.7 illustrates, all skewness and kurtosis values were between -2 and +2. Besides, Appendix C shows histograms with normal curves. Accordingly, there was no violation of univariate normality assumption. For multivariate normality Mahalanobis distances was checked at 4.1.2.1 section. Moreover, boxplots in the Appendix D illustrated that no outliers existed. Furthermore, as *Figure 4.2* showes there was no obvious existence of nonlinearity.

Table 4.7

Skewness and Kurtosis Values of TJGMSC Scores with respect to Year of Experience

	Skewness	Kurtosis	N
Dimension 1: School Smart Mathematics Student			
1-5	-.234	-1.290	15
6-10	-.352	-.591	48
11-15	-.489	-.862	52
Above 15	-.546	-.334	151
Dimension 2: Mathematics Perspective for the Real World			
1-5	-1.049	.297	15
6-10	-.262	-.090	48
11-15	-.605	.027	52
Above 15	-.377	-.671	151
Dimension 3: Creative Problem Solver			
1-5	-.737	-813	15
6-10	-.673	-.025	48
11-15	-.569	.068	52
Above 15	-.625	-.121	151

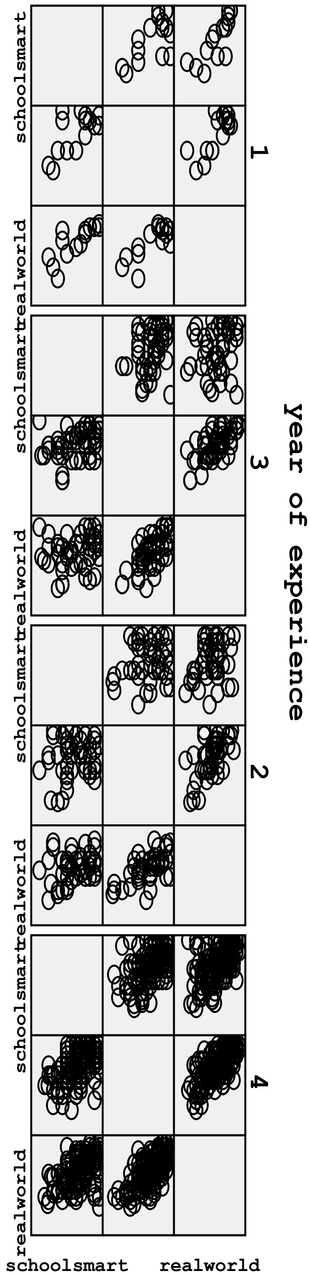

Figure 4.2 A matrix of scatterplots between variables *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver with respect to year of experience.*

Following assumption to be checked was homogeneity of variance matrices, for which Box's test was conducted. Box's test value was p=.005 and that value was not significant (p>.001). This gave permission for continuing the analysis. Lastly, homogeneity of variance assumption must be checked. Table 4.8 showed that for school smart mathematics student dimension there existed violation of this assumption (p=.013). On the other hand, Tabachnick and Fidell (2007) suggest an alpha level of .025 or .01 rather than .05. Therefore, provided that the alpha level was .01, there was no violation of homogeneity of variances assumption.

Table 4.8

Levene's Test of Equality of Variances with respect to Year of Experience

Dimensions	Significance
School Smart Mathematics Student	.013
Mathematics Perspective for Real World	.506
Creative Problem Solver	.069

4.2.2.2 One-Way MANOVA Results with respect to Year of Experience

One-way MANOVA at .05 significance level was conducted to examine whether there was a significant difference among teachers' perception on gifted students with respect to experience. In the analysis dependent variables were school smart mathematics student, mathematics perspective for the real world and creative problem solver while the independent variable was year of experience. Table 4.8 indicated that there was not a statistically significant difference among teachers with different years of experience on the combined dependent variables, $F(9, 632.922)=1.872$, p=.053;Wilks' Lambda=.938; partial eta squared =.021. More specifically, this result illustrated that both less experienced teachers and more experienced teachers gave similar importance to all dimensions.

Table 4.9

MANOVA Results with respect to Year of Experience

IV	Wilks' Lambda	F	df	Significance	Eta Squared
Year of Experience	.938	1.872	9	.053	.021

4.3. Teachers' Perceptions of Mathematically Gifted Students in terms of Area of Teaching

In order to address the last issue of the study, whether there was a significant difference between elementary teachers' and elementary mathematics teachers' perception on mathematical giftedness, one-way MANOVA was conducted. Descriptive and inferential statistics of the results are illustrated in the following part.

4.3.1. Descriptive Statistics

As can be seen from Table 4.9, elementary teachers' mean scores were more than elementary mathematics teachers' mean scores in all dimensions. In particular, for the dimension of *school smart mathematics student*, the mean score of elementary teachers was 4.416 *(SD*=.427*)* and the mean score of elementary mathematics teachers was 4.235 *(SD*=.524*)*. In addition, for the dimension of *mathematics perspective for the real world*, the mean score of elementary teachers was 4.240 *(SD*=.389*)* and the mean score of elementary mathematics teachers was 4.162 *(SD*=.387*)*. Besides, for the dimension of *creative problem solver,* the mean score of elementary teachers was 4.391 *(SD*=.393*)* and the mean score of elementary mathematics teachers was 4.387 *(SD*=.424*)*. The other conspicuous result was that the dimension with the lowest mean score was mathematics perspective for the real world for both elementary and elementary mathematics teachers. In other words, although both elementary teachers and elementary mathematics teachers gave high importance to all dimensions, the least important dimension for them was *mathematics perspective for the real world*.

Table 4.10

Descriptive Statistics of TJGMSC Scores with respect to Area of Teaching

Area of Teaching	M	SD	N
Dimension 1: School Smart Mathematics Student			
Elementary Teachers	4.416	.427	176 (66%)
Elementary Math Teachers	4.235	.524	90 (34%)
Dimension 2: Mathematics Perspective for the Real World			
Elementary Teachers	4.240	.389	176 (66%)
Elementary Math Teachers	4.162	.387	90 (34%)
Dimension 3: Creative Problem Solver			
Elementary Teachers	4.391	.393	176 (66%)
Elementary Math Teachers	4.387	.424	90 (34%)

4.3.2 Inferential Statistics

This part included inferential statistics related to the research question of whether there was a significant difference between elementary teachers and elementary mathematics teachers with respect to their perception on mathematically gifted students. The first section pointed out assumptions of one-way MANOVA and the second section summarized results of one-way MANOVA with respect to area of teaching.

4.3.2.1 Assumptions of One Way MANOVA

The first assumption which must be checked is normality. As in 4.1.2.1 section, there were 6 sections which required having sample size of 18 (6*3).

Since sample size of the analysis was 266, this assumption was provided. The other assumption is univariate normality. To illustrate, skewness and kurtosis values are presented in Table 4.10. It was seen that all values were between -2 and +2, and then normality assumption was provided according to Pallant (2007). Besides, histograms in Appendix C supported infringement of normality assumption by histograms with normal curves. Moreover, boxplots in Appendix D showed that the assumption of outliers was provided with no existence of outliers. Lastly, *Figure 4.3* illustrated infringement of linearity assumption.

Table 4.11

Skewness and Kurtosis Values of TJGMSC Scores with respect to Area of Teaching

	Skewness	Kurtosis	N
Dimension 1: School Smart Mathematics Student			
Elementary Teachers	-.574	-.338	176
Elementary Math. Teachers	-.272	-.915	90
Dimension 2: Mathematics Perspective for the Real World			
Elementary Teachers	-.405	-.604	176
Elementary Math. Teachers	-.464	-.008	90
Dimension 3: Creative Problem Solver			
Elementary Teachers	-.602	-.130	176
Elementary Math. Teachers	-.746	.131	90

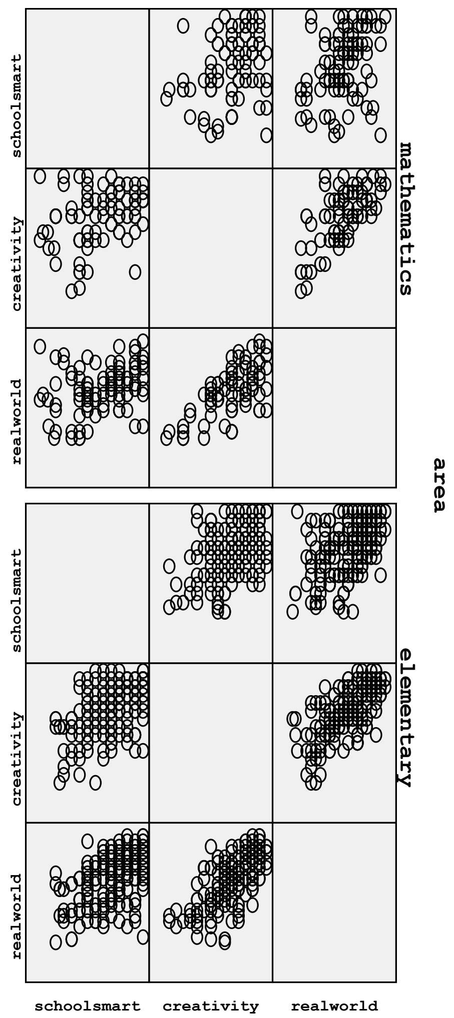

Figure 4.3 A matrix of scatterplots between variables *school smart mathematics student, mathematics perspective for the real world* and *creative problem solver with respect to area of teaching.*

Next assumption to be checked is homogeneity of variance-covariance matrices. In order to check this assumption, Box's test was conducted. Significant value of Box's test was .043 and that value was not significant at the significance value .001 (Pallant, 2007). Thus, homogeneity of variance-covariance matrices assumption is provided. Lastly, homogeneity of variance assumption must be checked. Table 4.11 showed that there existed violation of this assumption only for school smart mathematics student dimension (p=.001). As mentioned before, Tabachnick and Fidell (2007) suggest an alpha level of .025 or .01 rather than .05. Unfortunately, violation of homogeneity of variance continued. On the other hand, in such a case, Stevens (2009) suggests more detailed examination of sample sizes of groups. More specifically, if the group with larger sample size has small variance, F statistics is "liberal", i.e. actual alpha level of significance is larger than .05 for F statistics. In present MANOVA analysis, larger sample variances belong to elementary mathematics teachers' group which has small size. Depending on this argument, it can be said that significant results were not influenced by this violation; however, for non-significant results this violation constituted a limitation.

Table 4.12

Levene's Test of Equality of Variances with respect to Area of Teaching

Dimensions	Significance
School Smart Mathematics Student	.001
Mathematics Perspective for the Real World	.636
Creative Problem Solver	.286

4.3.2.2. One-way MANOVA Results with respect to Area of Teaching

One-way MANOVA at .05 significance level was conducted to examine whether there was a significant difference between elementary teachers and elementary mathematics teachers in perception of mathematically gifted students. In the analysis, dependent variables were school smart mathematics student, mathematics perspective for the real world and, creative problem solver while the independent variable was area of teaching. Table 4.12 indicated that there was a statistically significant difference between elementary and elementary mathematics teachers on the combined dependent variables, $F(3, 262)=4.242$, p=.006;Wilks' Lambda=.954; partial eta squared =.046.

Table 4.13

MANOVA Results with respect to Area of Teaching

IV	Wilks' Lambda	F	Df	Significance	Eta Squared
Area of Teaching	.954	4.242	3	.006	.046

The results given in Table 4.12 revealed that there was a significant difference between elementary teachers and elementary mathematics teachers with respect to dependent variables. In fact, to better understand the difference among dependent variables between-subjects effects were examined. Before interpreting the analysis, Bonferroni adjustment was used to reduce the chance of Type 1 error. In order to apply Bonferroni adjustment original alpha level of .05 was divided the number of dependent variables. Then, significance level became .017. Table 4.13 shows the between-subject effects results.

Table 4.14

Results of Follow-up Analysis for MANOVA

Dependent Variable	*df*	F	Significance*(p)*
School Smart Mathematics Student	1	9.486	.002
Mathematics Perspective for the Real World	1	.005	.944
Creative Problem Solver	1	2.070	.151

According to table 4.13, there was a significant difference between elementary teachers and elementary mathematics teachers on the dimension *school smart mathematics student*. More specifically, for *school smart mathematics student* dimension elementary teachers' mean score (*M*=4.416, *SD*=.427) was higher than elementary mathematics teachers' mean score (*M*=4.235, *SD*=.524). More specifically, compared to elementary mathematics teachers, elementary teachers gave more importance to the *school smart mathematics student* dimension; while both groups of teachers gave similar importance to other two dimensions.

4.4. Summary for Results of Analysis

In the present study, it was intended to examine the difference among teachers' perceptions of mathematically gifted students in terms of gender, year of experience and area of teaching. Teachers' perceptions of mathematically gifted students were examined in three dimensions as *school smart mathematics student*, *mathematics perspective for the real world* and *creative problem solver*. The results revealed that there were not statistical differences among teachers' value given to mathematically gifted students' characteristics in terms of gender and year of experience. On the other hand, there was a statistical difference between elementary teachers and elementary mathematics teachers for the *school smart mathematics student* dimension. More specifically, elementary teachers mean scores are higher than elementary mathematics teachers for the dimension of *school smart mathematics student*. In other words, for elementary teachers, the dimension of *school smart mathematics student* was more important than it was for elementary mathematics teachers. Besides, both elementary teachers and elementary mathematics teachers gave similar value to the dimensions *mathematics perspective for the real world* and *creative problem solver*.

CHAPTER 5

DISCUSSIONS, IMPLICATIONS AND RECOMMENDATIONS

The purpose of the current study was to examine the differences among teachers' perceptions of mathematically gifted students in terms of their gender, year of experience and area of teaching. In the light of the literature review, this chapter discusses the results of the study and introduces implications and recommendations for further researches.

5.1 Gender Differences in terms of Teachers' Perceptions of Mathematical Giftedness

The first issue of the present study was whether there was a significant difference between male and female teachers regarding the dimensions of TJGMSC which are *school smart mathematics student*, *mathematics perspective for the real world*, and *creative problem solver*. The results illustrated that there were not significant differences between male and female teachers mean scores regarding three dimensions of TJGMSC. More specifically, for both male and female teachers, all dimensions are important with high mean scores; besides, they both gave similar importance to all dimensions.

The result not getting a significant difference in terms of gender variable was consistent with the findings of Ficici (2003) for the dimension *school smart mathematics student*. More specifically, the result of Ficici's (2003) regression analysis indicated that gender was not a significant predictor for that dimension. In other words, not only male but also female teachers gave importance to this dimension in the same way. Although available literature review has not included other study related to teachers' gender differences on their perceptions of mathematical giftedness, several studies have examined pre-service teachers' (Yazıcı and Ertekin, 2010) and in-service teachers' (Duatepe-Paksu, 2008) gender differences related to their mathematical beliefs regarding the process of learning mathematics. More specifically, the instrument which was used in those mentioned studies includes items similar to the items of TJGMSC. For instance, that scale includes items focusing on importance of memory, accurate and fast calculations, which are parallel to the items of *school smart mathematics student dimension.* For the dependent variable process of learning mathematics, while Yazıcı and Ertekin's study (2010) illustrated that male pre-service teachers gave more importance to that dimension, Duatepe-Paksu's (2008) study has showed that teachers' beliefs did not differ regarding their gender. Duatepe-Paksu's (2008) results are consistent with the current study, while Yazıcı and Ertekin's (2010) are inconsistent. At the same time, Duatepe-Paksu (2008) studied with in-service teachers just like in the current study, while Yazıcı and Ertekin (2010) studied with pre-service teachers. To conclude, teachers' means for the dimension *school smart mathematics student* might be similar since their beliefs of mathematics are similar.

The result of the current study regarding not having significant difference between male and female teachers for *mathematics perspective for the real world* dimension contradicts with the results of Ficici (2003) which showed a significant difference between male and female teachers in favor of female teachers. Ficici (2003) explained the possible reason for gender differences in the dimension *mathematics perspective for the real world* with the fact that male teachers' sense of mathematics might have been more theoretical than that of their female counterparts. That is to say, according to Ficici (2003) male teachers might give less importance to the qualities regarding the dimension *mathematics perspective for the real world* such as seeing life mathematically, having skills of induction and deduction; than those of regarding the dimension *school smart mathematics student* such as making calculations accurately and quickly, and remembering formulas. However, after 2005, mathematics curriculum was changed based on constructivist approaches. Certain aims of the new curriculum are making students use mathematics in daily life, notice the connections of mathematical concepts, and have reasoning and deduction skills (MoNE, 2009). To illustrate, lesson plans and learning activities have depended on those aims since the new curriculum was put into practice. Especially, *mathematics perspective for the real world* dimension also includes characteristics parallel to those skills such as having ability to connect mathematical concepts of different areas, seeing the world mathematically and being able to explain reasons for his/her solutions. Since the new curriculum supports these skills, not only female teachers but also male teachers might give importance to such skills. To conclude, a possible explanation for not having a difference between male and female teachers in terms of their scores of *mathematics perspective for the real world* dimension might be because of the similarity of the new mathematics curriculums' purposes and *mathematics perspective for the real world* dimension's items. In other words, both male and female teachers might give importance to this dimension since their values of such items might be affected by the purpose of the new mathematics curriculum.

The available literature illustrated a study examining teachers' values related to mathematics education (Durmuş, Bıçak and Çakır, 2008). A dimension for this study was *constructivist values* including items related to the importance of mathematical concepts and connections, problem solving and reasoning skills etc. which are parallel to the dimension of *mathematics perspective for the real world*. In fact, Durmuş et al. (2008) also found no difference between male and female teachers in this dimension. Thus, another possible reason for not finding difference between male and female teachers in terms of the dimension of *mathematics perspective for the real world* might be related to male and female teachers' similar constructivist values which refer to the importance teachers give to the skills such as reasoning and problem solving.

The current study's results were consistent with those of Fıcıcı's study for the dimension *creative problem solver*. To illustrate, according to Ficici's (2003) regression analysis gender was not a significant predictor for that dimension; similar to Ficici's results, the present study also found no differences between male and female teachers with respect to this dimension. There might be several possibilities for the explanation of this result. It can be said that both male and female teachers took similar courses and had similar field experiences in their undergraduate education. Moreover, it can be said that in their undergraduate education they did not have any courses related to importance of creativity. In fact, teachers' conceptions of mathematical giftedness might be affected by their educational background. Hence, the results of the present study not having significant difference between male and female teachers in terms of their perceptions of mathematical giftedness might be explained with both male and female teachers' similar educational background. Moreover, both male and female teachers have not had any experiences on mathematically gifted students while working in the field. To illustrate, their in-service trainings and teaching experiences in schools are not related to mathematically gifted students. Thus, the other possibility for not getting difference between male and female teachers' perceptions of mathematical giftedness might be their similar teaching experiences.

5.2 Difference among Teachers' Perceptions of Mathematical Giftedness in terms of Their Years of Experience

The present study indicated that teachers' sense of mathematically gifted students did not differ among teachers who have experiences of between 1 and 5 years, 6 and 10 years, 11 and 15 years and above 15 years. In other words, teachers at all year of experience intervals valued the characteristics of mathematically gifted students at a similar level.

Ficici's (2003) results for the dimensions *school smart mathematics student* and *mathematics perspective for the real world* are inconsistent with those of the present study. More explicitly, he found that for more experienced high school mathematics teachers', those dimensions were more important than they were for their less experienced counterparts. Those dimensions include items such as "remembers formulas and procedures", "calculates accurately", "makes connections between mathematics and other subject areas", "can explain concepts in mathematics terms" and "sees connections between different areas of mathematics". Different from the current study, Ficici (2003) conducted his study through high school mathematics teachers who might observe such characteristics more clearly compared to elementary teachers and elementary mathematics teachers. In fact, because of the possibility that elementary teachers and elementary mathematics teachers could not observe the characteristics of the dimensions *school smart mathematics student* and *mathematics perspective for the real world* as high school teachers, their teaching experiences might not change the amount of importance they give to those characteristics.

For the dimension school smart mathematics student, more experienced teachers were expected to have higher means, since most of them were in the field before the new curriculum had been implemented. In fact, before 2005, the mathematics curriculum was mostly based on procedural skills rather than conceptual skills, which was expected to cause higher means of more experienced teachers. On the contrary, a possible reason for not having a difference for *school smart mathematics student* dimension might be that the more experienced teachers might be adapted to the new curriculum which focuses on not only procedural skills but also reasoning skills.

For the dimension *mathematics perspective for the real world*, it was also expected that more experienced teachers would give more importance to the characteristics of that dimension. One possible explanation for not getting difference might be that for both less experienced and more experienced teachers, the characteristics of mathematically gifted students might not be clear. To illustrate, Krutetskii (1976) claims that mathematically gifted students could be realized when all students had been supported in developing mathematical abilities. On the contrary, several studies from the literature illustrated that with formal education teachers did not encourage mathematical giftedness (Choi, 2009; Diezmann and Watters, 2002; Goldberg, 2008; Jordan, 2007). As mentioned before, in the new mathematics curriculum Ministry of National Education (2009) places emphasis on developing problem solving skills, ability to use mathematics in daily life, realizing mathematical connections, reasoning and deduction skills. Although those skills are consistent with the characteristics of *mathematics perspective for the real world* dimension, teachers have difficulties to support those abilities due to lack of time, crowded classrooms and inappropriate classroom environments (Ören, 2010). Thus, not finding significant differences among teachers' values of the dimension *mathematics perspective for the real world* regarding their year of experience might be because of their teaching conditions not serving mathematical giftedness of the students. More specifically, regardless of the year of experience, due to limited conditions, more experienced teachers might not take note of the characteristics of *mathematics perspective for the real world* dimension more than less experienced teachers do.

Another study (Güner, Sezer and Akkuş-İspir, 2013) showed that elementary mathematics teachers generally did not apply activities the new curriculum proposed. Besides, according to this study, there was not a significant difference between frequencies of utilizing such activities for more experienced and less experienced elementary mathematics teachers. In other words, it can be said that regardless of their year of experience, teachers do not give importance to the activities of the new curriculum, which are thought to be parallel to the dimension *mathematics perspective for the real world.* Thus, another possibility for not getting differences for the mentioned dimension in terms of teachers' experiences might be that teachers with more experience or with less experience might pay similar attention to the activities supporting the characteristics of this dimension. Moreover, as stated before, those teachers' educational background did not include any training on mathematical giftedness. In fact, in-service trainings of those teachers also did not nurture them on this issue. Thus, another possibility for not getting a difference among teachers' perceptions in terms of year of experience might be their non-supporting educational background on this issue.

Being consistent with the results of Ficici's (2003) study, the current study found no differences among teachers' perceptions of mathematical giftedness in terms of *creative problem solver* dimension. To illustrate, this dimension includes abilities such as thinking creatively, using innovative ways while solving problems, producing different ideas and explanations, and solving challenging problems with relish. That is to say, the teachers' teaching environments and their applied activities might not support the improvement of such abilities and then in comparison with less experienced teachers, more experienced teachers might not give more importance to such abilities. Thus, a possible reason for not having differences among teachers' value of *creative problem solver* dimension might be that due to non-supporting environment and lack of activities for students' creativity, more experienced teachers are not luckier than less experienced teachers in order to observe students' creativity.

5.3 Difference between Teachers' Perceptions of Mathematical Giftedness regarding Area of Teaching

The current study showed that besides having high means, elementary teachers and elementary mathematics teachers also differ in terms of their value of mathematical giftedness. More detailed examination illustrated that the difference had existed only in the dimension *school smart mathematics student*. The available literature review did not provide any study examining the differences between elementary teachers and elementary mathematics teachers in terms of their value of mathematically gifted student characteristics. However, there might be several explanations for such a result.

In a related study, Ficici (2003) examined teachers' perceptions of mathematical giftedness in terms of teachers' degree. As a consequence, he found that teachers having higher degrees had smaller mean scores for the dimension *school smart mathematics student.* In other words, teachers having a master's or a higher degree gave less importance to this dimension. More specifically, this dimension requires the abilities such as having good memory, high calculation skills, remembering formulas, having high examination scores etc. On the contrary, Ficici (2003) argues that teachers with higher degrees have more complex perceptions of mathematics rather than such abilities. Depending on this idea, it can be said that in contrast to teachers with lower degrees, teachers with higher degrees might give less importance to the dimension *school smart mathematics student*. In fact, comparing with elementary teachers, elementary mathematics teachers had more courses, which are related to mathematics content and mathematics education, such as linear algebra, differential equations, and methods of teaching mathematics etc. Due to such courses, elementary mathematics teachers might have deeper understanding of mathematics rather than computational skills or remembering formulas. Because of that, in comparison with elementary teachers, they might give less importance to the characteristics of *school smart mathematics student* dimension.

Descriptive statistics of the current study showed that most of the elementary teachers participated to the study have more than 15 years of experience (with the number 123 out of 176). This fact might have resulted in the difference among teachers regarding their experience for *school smart mathematics student* dimension. More specifically, the teachers with 15 years of teaching background might value the characteristics of this dimension including calculation skills, memorization etc. more compared to less experienced teachers. As mentioned before, before 2005 mathematics curriculum had depended on calculation skills rather than reasoning skills. Therefore, teachers with more than 15 years of experience had been trained according to that perception in their pre-service and in-service trainings. Besides, they mostly had experiences depended on such understanding. Consequently, it can be said that in the current study, compared to elementary mathematics teachers, elementary teachers gave more importance to the dimension *school smart mathematics student* because they are more experienced teachers and more experienced teachers are expected to give more importance to mentioned dimension due to their trainings and teaching experiences that give more importance to computational skills.

On the other hand, the present study found that there were not significant differences between elementary teachers and elementary mathematics teachers regarding the dimensions of *mathematics perspective for the real world* and *creative problem solver*. In a study mentioned above, Durmuş et al. (2008) also revealed that there was not a significant difference among elementary mathematics, science and technology, and elementary teachers in terms of their constructivist values of mathematics education, which is consistent with the result of current study. On the other hand, because of their educational background, which is supported with more courses related to mathematics, elementary mathematics teachers were expected to have significantly higher mean scores for those dimensions. Considering two dimensions of TJGMSC, not having significant difference between elementary teachers and elementary mathematics teachers might have some possible reasons. More specifically, study of Leikin and Stanger (2011) illustrated that teachers' perceptions of mathematical giftedness depended on their teaching experiences. The reason for not having significant differences between elementary teachers and elementary mathematics teachers for the mentioned two dimensions might be because their teaching experiences were not supportive for the characteristics of those dimensions. Some example abilities required for those dimensions are perceiving the world from the mathematics viewpoint, ability to prove solutions, thinking creatively and taking pleasure in tackling challenging problems etc. Although these abilities are seen parallel with the aims of Ministry of National Education, elementary teachers and elementary mathematics teachers might not support such abilities because of several possibilities. As mentioned before, teachers' non-supporting educational background and not meeting with mathematically gifted students during their teaching experiences might be a reason. Besides, teachers' stress for national examinations might be another reason (Ficici, 2003). In fact, because of these examinations, teachers might focus on completing the topics rather than improving students' mathematical abilities related to the dimensions *mathematics perspective for the real world* and *creative problem solver*. Thus, not having significant differences for those dimensions might be due to the focus of national examinations.

5.4 Implications and Recommendations

The present study was conducted to examine teachers' perceptions of mathematically gifted students in terms of gender, year of experience and area of teaching. Results indicated that there were no significant differences among teachers' perceptions in terms of gender and year of experience. However, there was a significant difference between elementary teachers' and elementary mathematics teachers' perceptions. In this part of the section implications of the study for teachers, curriculum developers and policy makers are suggested; besides, suggestions for the future research studies are presented.

The present study illustrated that teachers' experiences did not change their perceptions of mathematically gifted students. This fact showed that teachers' in-service trainings and teaching experiences do not enable them to form understanding of mathematical giftedness. Therefore, in-service trainings should include lessons related to mathematical giftedness. More specifically, in these courses the characteristics of mathematically gifted students should be introduced. Besides, to make teachers' experiences contribute to their perceptions of mathematical giftedness, the mathematics curriculum should include objectives regarding such students. Even textbooks should include activities for mathematically gifted students. In this way, teachers would have better insight into mathematically gifted students.

Likewise, teacher education courses for elementary teachers and elementary mathematics teachers do not include lessons for identifying and supporting mathematical giftedness. There should be courses to make teacher candidates better identify and teach mathematically gifted students. To illustrate, such courses should include topics such as characteristics of mathematically gifted students and opportunities which support mathematical giftedness. Besides, in field practices teacher candidates should be given opportunities to meet mathematically gifted students in order to know such students. For instance, as a part of community service courses teacher candidates might go to Science and Art Centers to communicate with gifted students. Besides, in such centers pre-service teachers would see the learning environments provided for such students.

After suggesting implications, recommendations for the future studies could be suggested. In fact, present study, which was conducted with a small sample, can be replicated with larger samples. Besides, convenience sampling was used in the current study which limits generalizability of the results (Fraenkel and Wallen, 2006). Following research could be conducted through random sampling methods to increase generalizability of the results. Moreover, future studies can have participants from different regions rather than focusing on one city in order to examine differences among different cultures.

Current study was conducted with elementary teachers and elementary mathematics teachers who are in the field. Future studies might be done with pre-service teachers in order to observe effects of teacher training courses on pre-service teachers' perceptions of mathematical giftedness. Besides, teachers of private schools and teachers of government schools might be compared in terms of their perceptions of mathematically gifted students. In fact, students of private schools are lucky because environmental conditions are more suitable for developing and revealing their abilities. Such a study would illustrate whether this fact affects teachers' perceptions of mathematical giftedness. Even Science and Art Centers' teachers, who interact with gifted students in these centers, could be added to such studies. Such a study would illustrate whether these teachers have different perceptions of mathematical giftedness comparing to their counterparts from other schools.

Since the sample is limited, subjects of the current study have similar educational background. More specifically, most of them have bachelor's degree. Through a larger sample including teachers with master's degree or doctoral degree, the differences among teachers' perceptions of mathematical giftedness with respect to their degree could be examined. Such a study would show whether teachers' degree affect their perceptions of mathematical giftedness or not.

As mentioned in the literature review mathematical giftedness is an important issue since students with mathematical gift are candidates of being producing and leading individuals in the future (Sheffield, 1999). Those students must be identified and their talents should be developed (Ficici, 2003). Moreover, literature review showed that there are few studies from Turkey related to mathematical giftedness. The studies related to mathematical giftedness should be increased. Especially, research studies could be conducted on education of those gifted students.

REFERENCES

Altıntaş, E. (2009). *Purdue modeline dayalı matematik etkinliği ile öğretimin üstün yetenekli öğrencilerin başarılarına ve eleştirel düşünme becerilerine etkisi*. (Unpublished master's thesis). Marmara University, İstanbul.

Ayebo, A. (2010). *Teachers' perspectives on teaching mathematics to gifted/talented students* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3434064).

Aygün, B. (2010). *Üstün yetenekli ilköğretim ikinci kademe öğrencileri için matematik programına yönelik ihtiyaç analiz* (Unpublished master's thesis). Hacettepe University, Ankara.

Bicknell, B. (2008). Gifted Students and the role of mathematics competitions. *Australian Primary Mathematics Classroom, 13*(4), 16-20.

Budak, İ. (2007). *Matematikte üstün yetenekli öğrencileri belirlemede bir model*. (Unpublished doctoral dissertation). Karadeniz Technical University, Trabzon.

Choi, K. M. (2009). *Characteristics of Korean International Mathematical Olympiad (IMO) winners' and various developmental influences* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3386133).

Dağlıoğlu, H. E. (2002). *Anaokuluna devam eden beş-altı yaş grubu çocuklar arasından matematik alanında üstün yetenekli olanların belirlenmesi* (Unpublished doctoral dissertation). Hacettepe University, Ankara.

Davidson, J. E. (2009). Contemporary models of giftedness. In. L. V. Shavinia (Ed), *International handbook on giftedness* (pp. 81-97). Canada: Springer.

Deal, L. J. & Wismer M. G. (2010). NCTM principles and standards for mathematically talented students. *Gifted Child Today*, *33*(3), 55-65.

Diezman, C. M. (2005). Challenging mathematically gifted primary students. *Australasian Journal of Gifted Education, 14*(1), 50-57.

Diezmann, C. M., & Watters, J. W. (2002). The importance of challenging tasks for mathematically gifted students. *Gifted and Talented International, 12*(2), 76-84.

Dimitriadis, C. (2012). How are schools in England addressing the needs of mathematically gifted children in primary classrooms?. *Gifted Child Quarterly, 56*(2), 59-76.

Duatepe-Paksu, A. (2008). Comparing teachers' beliefs about mathematics in terms of their branches and gender. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 35*, 87-97.

Durmuş S., Bıçak B. & Çakır S. (2008). Fen ve teknoloji, matematik ve sınıf öğretmenlerinin sahip oldukları matematik ve matematik eğitimi değerlerinin farklı değişkenler açısından incelenmesi. *Değerler Eğitimi Dergisi, 16*(6), 93-112.

Ficici, A. (2003). *International teachers' judgment of gifted mathematics student characteristics* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3118947).

Fox, K. & Pope, S. (2005). Gifted and talented mathematicians. In. D. Hewitt (Ed). *Proceedings of the British Society for Research into Learning Mathematics, England, 25*, 33-38.

Fraenkel, J., & Wallen, N. (2006). *How to design and evaluate research in education.* New York: McGraw Hill Companies, Inc.

Freiman, V. (2003). *Identifying and fostering of mathematically gifted children at the elementary school* (Master's Thesis). Available from ProQuest Dissertations and Theses database. (UMI No. MQ77942).

Gagne, F. (1995). From giftedness to talent: A developmental model and its impact on the language of the field. *Roeper Review*, *18*(2), 103-111.

Gagne, F. (2004). Transforming gifts into talents: the DMGT as a developmental theory. *High Ability Studies, 15*(2), 119-147.

Gagne, F. (2008). Talent development as seen through the differentiated model of giftedness and talent. In T. Balchin, B. Hymer & D. J. Matthews (Ed), *The Routledge International Companion to Gifted Education* (pp. 32-41). New York: Routledge.

Goldberg, S. R. (2008). *An exploration of intellectually gifted students' conceptual views of mathematics* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3327045).

Greenes, C. (1981). Identifying the gifted student in mathematics. *Arithmetic teacher, 28*(6), 14-17.

Güner N., Sezer R. and Akkuş-İspir O. (2013). İlköğretim ikinci kademe öğretmenlerinin TIMSS hakkındaki görüşleri. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi, 33*, 11-29.

Gürel, R. (2011). *İlköğretim ikinci kademede okuyan üstün yetenekli olan ve olmayan öğrencilerin matematik kaygı düzeyleri ve bunların kaynakları* (Unpublished master's thesis). Hacettepe University, Ankara.

Hargreaves, M., Homer M., & Swinnerton, B. (2008). A comparison of performance and attitudes in mathematics amongst the 'gifted'. Are boys better at mathematics or do they just think they are?, *Assessment in Education: Principles, Policy & Practice*, *15*(1), 19-38.

Jeong, H. W. G. (2010). Teachers' perceptions regarding gifted and talented early childhood students (Doctoral Dissertation, Saint Louis University). Available from ProQuest Dissertations and Theses database (UMI No. 3419721)

Johnson, D. T. (2000). *Mathematics to gifted students in a mixed-ability classroom.*Reston, VA: ERIC Clearing House on Disabilities and Gifted Education (ERIC Document reproduction Service No. ED441302)

Jordan, J. M. (2007). *Differentiating instruction for mathematically gifted and talented k-5 students in a suburban Georgia school district: an exploratory case study with implications for staff development* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3278265).

Koshy, V., Ernest P., & Casey, R. (2009). Mathematically gifted and talented learners: theory and practice. *International Journal of Mathematical Education in Science and Technology*, *40*(2), 213-228.

Kök, B. (2012). *Üstün zekalı ve yetenekli öğrencilerde farklılaştırılmış geometri öğretiminin yaratıcılığa, uzamsal yeteneğe ve başarıya etkisi* (Unpublished master's thesis). İstanbul University, İstanbul.

Krutetskii, V. A. (1976). *The psychology of mathematical abilities in school children*. Chicago: The University of Chicago Press

Leikin, R. & Stanger, O. (2011). Teachers' images of gifted students and roles assigned to them in heterogeneous mathematics classes. In B. Sriraman & K. H. Lee (Ed), *The Elements of Creativity and Giftedness in Mathematics* (pp. 103-118).

Mann, E. L. (2005). *Mathematical creativity and school mathematics: Indicators of mathematical creativity in middle school students* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3205573).

McComas, K. K. (2011). *Mathematically gifted students' experiences of challenge with cognitively guided instruction* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3487221).

Miller, R. C. (1990). *Discovering mathematical talent*, Reston, VA: Eric Clearing House on Handicapped and Gifted Children. (ERIC Document reproduction Service No. ED321487)

Ministry of National Education [MoNE]. (2009). *İlköğretim matematik dersi öğretim programı 6-8. sınıflar.* Retrieved November 9, 2012 from http://ttkb.meb.gov.tr/

O'Boyle, M. W. (2008). Mathematically gifted children: Developmental brain characteristics and their prognosis for well-being. *Roeper Review*, *30*, 181-186.

Ören, Z. T. (2010). *İlköğretim 8. Sınıf Yeni Matematik Müfredatının Matematik Öğretmenleri Görüşleri Işığında İncelenmesi* (Unpublished master's thesis). Marmara University, İstanbul.

Pallant, J. (2007). *SPSS Survival manual: A step by step guide to data analysis using SPSS for windows* (3rd ed.). Berkshire, England: Open University Press.

Preckel, F., Goetz, T., Pekrun R., & Kleine M. (2008). Gender differences in gifted and average-ability students. *Gifted Child Quarterly*, *52*(2), 146-159.

Renzulli, J. S. (1978). What makes giftedness? Reexamining definition. *Phi Delta Kappan, 60*(3), 180-184.

Renzulli, J. S. (2000). The identification and development of giftedness as a paradigm for school reform. *Journal of Science Education and Technology 9*(2), 95-114.

Renzulli, J. S. (2005). The three-ring conception of giftedness: A developmental model for promoting creative productivity. In R. J. Sternberg & J. E. Davidson (Eds.), Conceptions of giftedness (2nd ed., pp. 246-279). New York: Cambridge University Press.

Rotigel, J. & Fello S. (2004). Mathematically gifted students: How can we meet their needs?. *Gifted Child Today, 27*(4), 46-51.

Sak, U. (2005). M^3:*The three-mathematical minds model for the identification of mathematically gifted students* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3162062).

Sheffield, L. J. (1994). The Development of Gifted and Talented Mathematics Students and the National Council of Teachers of Mathematics Standards. Storrs: The National Research Center on Gifted and Talented.

Sheffield, L. J. (1999). The development of mathematically promising students in the United States. *Mathematics in School, 28*(3), 15-18.

Sheffield, L. J. (2009). The impact of advanced curriculum on the achievement of mathematically promising elementary students. *Gifted Child Quarterly, 53*(3), 188-202.

Silverman, L.K. (1992). The importance of early identification of the gifted. *Highly Gifted Children, 8*(1), 16-17.

Sosniak, L. A. & Gabelko N. H. (2008). Every Child's Right: Academic Talent Development by Choice, not Chance. New York: Teachers College Press.

Sriraman, B. (2005). Are giftedness and creativity synonyms in mathematics?. *The Journal of Secondary Gifted Education, 17*(1), 20-36.

Sternberg, R. J. (1986). A triarchic theory of intellectual giftedness. In R. J. Sternberg & J. E. Davidson (Ed.), Conceptions of Giftedness (pp. 223-243). New York: Cambridge University Press.

Sternberg, R. J. (2008). Wisdom, intelligence, creativity, synthesized: a model of giftedness. In T. Balchin, B. Hymer & D. J. Matthews (Ed), *The Routledge*

International Companion to Gifted Education (pp. 255-264). New York: Routledge.

Sternberg, R. J., & Clinkenbeard, P. R. (1995). A triarchic view of identifying, teaching, and assessing gifted children. *Roeper Review, 17*(4), 255-260.

Stevens, J. (2009). *Applied multivariate statistics for the social sciences*. New York: Routledge Academics.

Tabachnic, B. G. & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Pearson Education.

Taylor, C. H. (2008). *Promoting mathematical understanding through open-ended tasks: Experiences of eight-grade gifted geometry class* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No.3332587).

Vilcomir T., & O'Donoghue, J. (2009). Using components of mathematical ability for initial development and identification of mathematically promising students. *International Journal of Mathematical Education in Science and Technology, 40*(2), 183-199.

Waxman B., Robinson N. M. & Mukhopadhyay S. (1996). Teachers nurturing math-talented young children. Storrs: The National Research Center on Gifted and Talented.

Whitlow-Malin D. J. (2006). *A mathematics acceleration experience for mathematically promising students* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 3279389).

Wilmot, B. A. (1983). *The design, administration, and analysis of an instrument which identifies mathematically gifted students in grades four, five and six* (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database (UMI No. 8324673).

Yazıcı E. & Ertekin E. (2010). Gender differences of elementary prospective teachers in mathematical beliefs and mathematics teaching anxiety. *World Academy of Science, Engineering and Technology, 67*, 128-131.

APPENDICES

Appendix A: Permission

FORM: 2

T.C.
MİLLÎ EĞİTİM BAKANLIĞI
Eğitimi Araştırma ve Geliştirme Dairesi Başkanlığı

ARAŞTIRMA DEĞERLENDİRME FORMU

ARAŞTIRMA SAHİBİNİN	
Adı Soyadı	Sumeyra TÜTÜNCÜ
Kurumu / Üniversitesi	ODTÜ Eğitim Fakültesi İlköğretim Fen ve Matematik Eğitimi Yüksek Lisans Programı
Araştırma yapılacak iller	Trabzon
Araştırma yapılacak eğitim kurumu ve kademesi	Trabzon Merkez ve Merkeze Bağlı İlköğretim Okulları
Araştırmanın konusu	"İlköğretim Matematik Öğretmenlerinin ve Sınıf Öğretmenlerinin Matematikte Üstün Yetenekli Öğrencilere Yönelik Algıları"
Üniversite / Kurum onayı	Var
Araştırma/proje/ödev/tez önerisi	Yüksek Lisans Tezi
Veri toplama araçları	3 sayfadan oluşan veri toplama aracı
Görüş istenilecek Birim/Birimler	
KOMİSYON GÖRÜŞÜ	
Araştırmanın yapılması uygun görülmüştür.	
Komisyon kararı	Oybirliği ile alınmıştır.
Muhalif üyenin Adı ve Soyadı: ………………… …………………………..	Gerekçesi; araştırmanın yapılması oy birliği ile uygun görülmüştür.

KOMİSYON

1../11/2011

Komisyon Başkanı	Üye	Üye
Ali AKSOY	Arzu AKTAŞ	Mahmut MARAP

Appendix B: The Instrument TJGMSC

Kişisel Bilgiler

- Cinsiyetiniz
  - ☐ E ☐ K
- Sahip olduğunuz en yüksek eğitim derecesi
  - ☐ Ortaöğretim
  - ☐ Açıköğretim Fak.
  - ☐ Lisans (Örgün öğretim)
  - ☐ Yüksek lisans
  - ☐ Doktora
- Mezun olduğunuz program
  - ☐ Öğretmen Okulu
  - ☐ Sınıf Öğretmenliği
  - ☐ Matematik Öğretmenliği
  - ☐ İlköğretim Matematik Öğretmenliği
  - ☐ Fen/Edebiyat Fakültesi
  - ☐ Diğer (Belirtiniz) ………….
- Öğretmenlik Yaptığınız Branş
  - ☐ Matematik Öğretmeni ☐ Sınıf Öğretmeni
- Kaç yıldır öğretmenlik yapıyorsunuz?
  - ☐ 1-5
  - ☐ 6-10
  - ☐ 11-15
  - ☐ 15 üstü
- Hangi sınıflara matematik öğretiyorsunuz?

……………………………………

Matematikte üstün yetenekli öğrenci özellikleri

Aşağıdaki ankette matematikte üsün yetenekli öğrencilere yönelik özellikler verilmiştir.Lütfen bu özellikleri önem sırasına göre değerlendiriniz.

1 = önemsiz 2 = az önemli 3 = biraz önemli 4 = önemli 5 = çok önemli

1. Matematik problemlerini çözerken yaratıcı (olağandışı ve farklı) yollara sahiptir.	1	2	3	4	5
2. Dünyaya matematiksel perspektiften bakar (örneğin; uzaysal ilişkilere dikkat eder, çoğunluğa apaçık gelmeyen matematiksel düzenleri bulur, sayısal bilgilere meraklıdır).	1	2	3	4	5
3. Güçlü bir sayı sezgisi sergiler (örneğin; küçük ve büyük sayılardan anlam çıkarır, kolay ve doğru tahmin eder).	1	2	3	4	5
4. Bir problemin matematiksel yapısının analizine ilgi gösterir.	1	2	3	4	5
5. Öğrenilen matematiğin derinliğini ve kompleksliğini artıracak "neden" veya "eğer" gibi üst seviyeli sorular sorar.	1	2	3	4	5
6. Matematiğin değişik alanları (örneğin; kesirler ve geometri, sayılar ve cebir) arasındaki bağlantıları görür.	1	2	3	4	5
7. Matematik problemlerindeki gerekli ve gereksiz bilgileri birbirinden ayırabilir.	1	2	3	4	5
8. Kavramları matematik terimleri ile açıklayabilir.	1	2	3	4	5
9. Dünyaya matematik penceresinden bakar.	1	2	3	4	5
10. Matematik ve günlük hayat arasında ilişki kurar.	1	2	3	4	5
11. Uzayda/3 boyutlu düşünme yeteneği vardır.	1	2	3	4	5
12. İşlemleri doğru yapma yeteneği vardır.	1	2	3	4	5
13. İşlemleri hızlı yapma yeteneği vardır.	1	2	3	4	5

14. Hemen çözemediği problemler için kuluçkaya (zihni o problemle meşgul olur) yatar.	1	2	3	4	5
15. Problemleri çözmek için yeni yollar üretir.	1	2	3	4	5
16. Bir probleme farklı çözümler önerir.	1	2	3	4	5
17. Matematik ile diğer bilim dalları arasında ilişki kurar.	1	2	3	4	5
18. Zorlayıcı problemleri çözmekten hoşlanır.	1	2	3	4	5
19. Matematik/sayısal testlerden yüksek not alır.	1	2	3	4	5
20. Birçok fikir, çözüm, açıklama v.s. üretir.	1	2	3	4	5
21. Belleği kuvvetlidir.	1	2	3	4	5
22. Formülleri ve işlemleri hatırlar.	1	2	3	4	5
23. Sıralı ve düzenli bir biçimde düşünür.	1	2	3	4	5
24. Matematiksel kavramları, prensipleri ve stratejileri anlar.	1	2	3	4	5
25. Yaratıcı düşünebilir.	1	2	3	4	5
26. Matematiğin gerçek dünyada nasıl kullanıldığını anlar.	1	2	3	4	5
27. Çözümlerini destekleyen sebepleri sunar.	1	2	3	4	5

Appendix C: Histograms

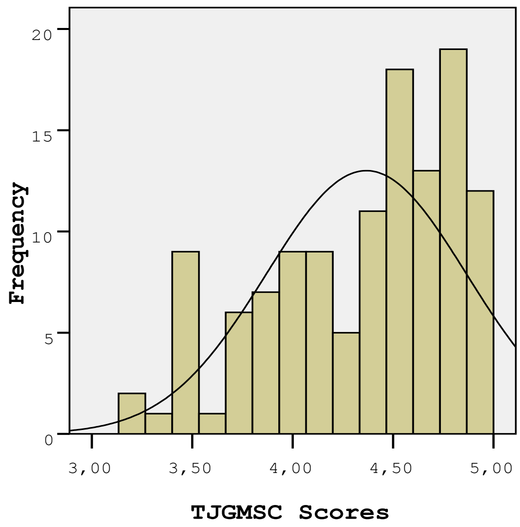

Figure C.1 Histogram of TJGMSC scores of female teachers for the dimension *school smart mathematics student*.

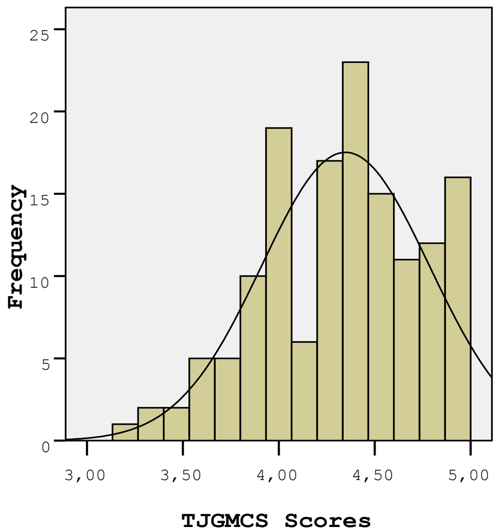

Figure C.2 Histogram of TJGMSC scores of male teachers for the dimension *school smart mathematics student*.

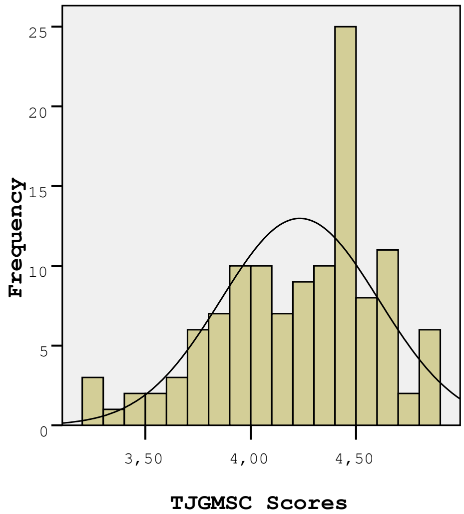

Figure C.3 Histogram of TJGMSC scores of female teachers for the dimension *mathematics perspective for the real world*.

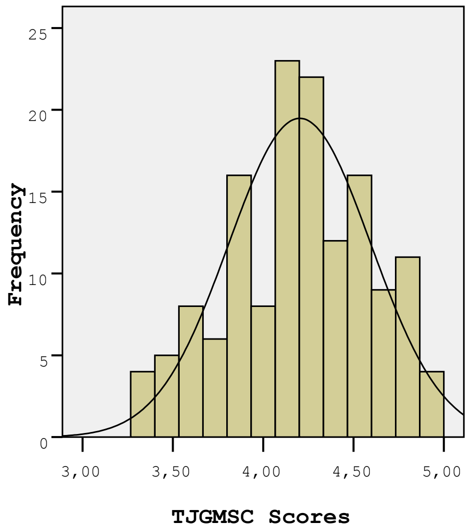

Figure C.4 Histogram of TJGMSC scores of male teachers for the dimension *mathematics perspective for the real world*.

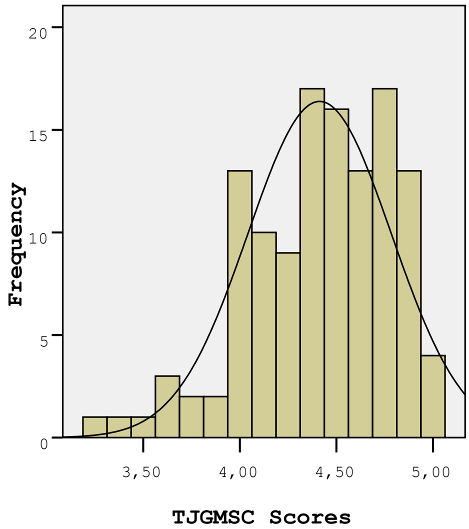

Figure C.5 Histogram of TJGMSC scores of female teachers for the dimension *creative probroblem solver*.

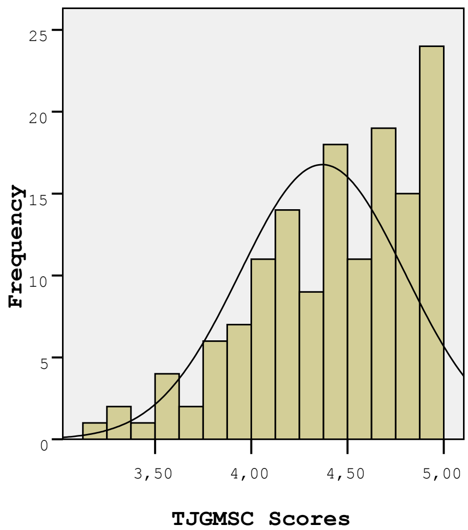

Figure C.6 Histogram of TJGMSC scores of male teachers for the dimension *creative problem* solver.

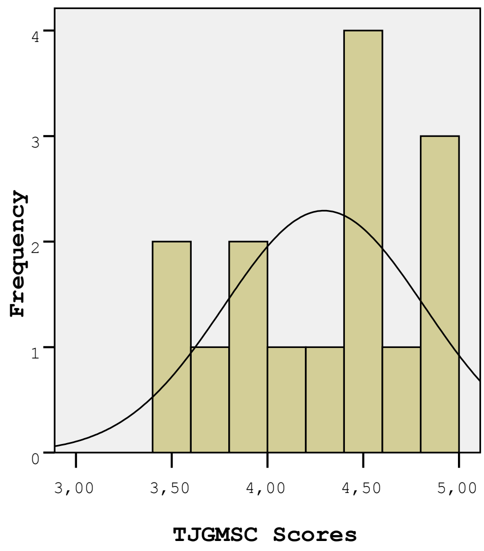

Figure C.7 Histogram of TJGMSC scores of teachers experienced 1-5 years for the dimension *school smart mathematics student*.

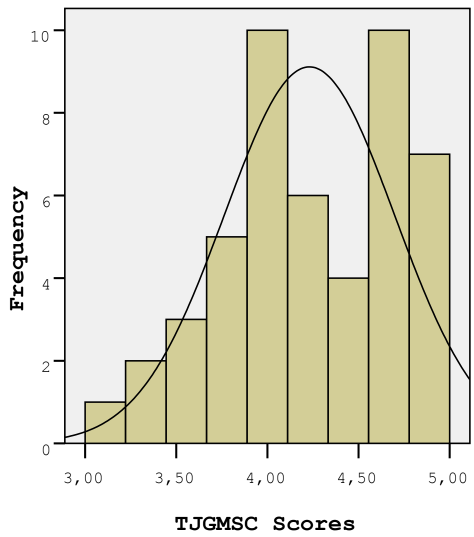

Figure C.8 Histogram of TJGMSC scores of teachers experienced 6-10 years for the dimension *school smart mathematics student.*

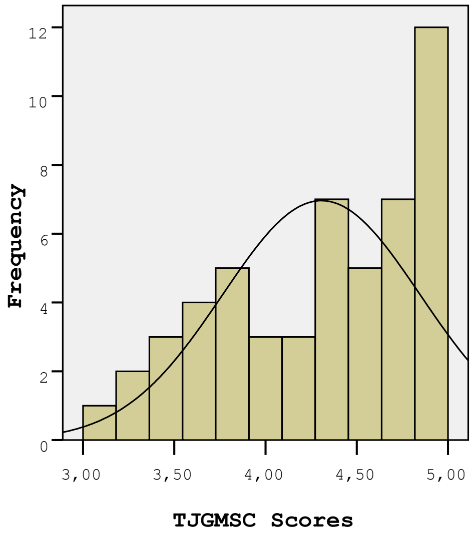

Figure C.9 Histogram of TJGMSC scores of teachers experienced 11-15 years for the dimension *school smart mathematics student*.

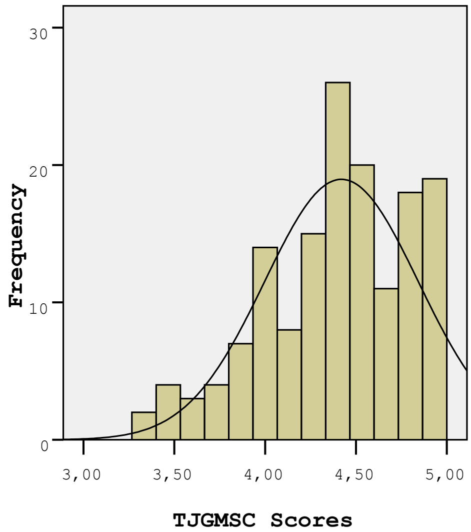

Figure C.10 Histogram of TJGMSC scores of teachers with experience above 15 years for the dimension *school smart mathematics student*.

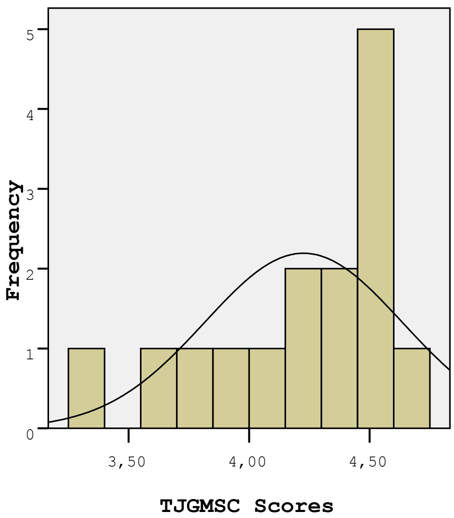

Figure C.11 Histogram of TJGMSC scores of teachers experienced 1-5 years for the dimension *mathematics perspective for the real world*.

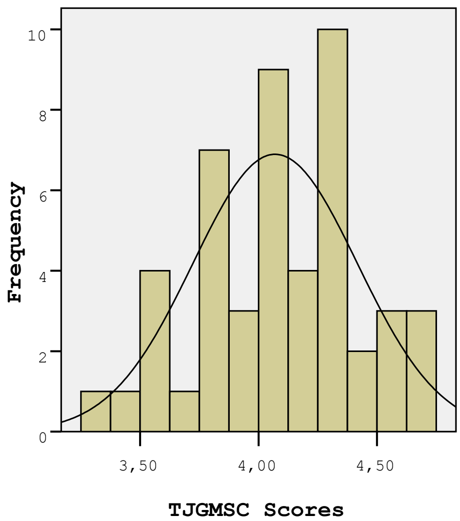

Figure C.12 Histogram of TJGMSC scores of teachers experienced 6-10 years for the dimension *mathematics perspective for the real world*.

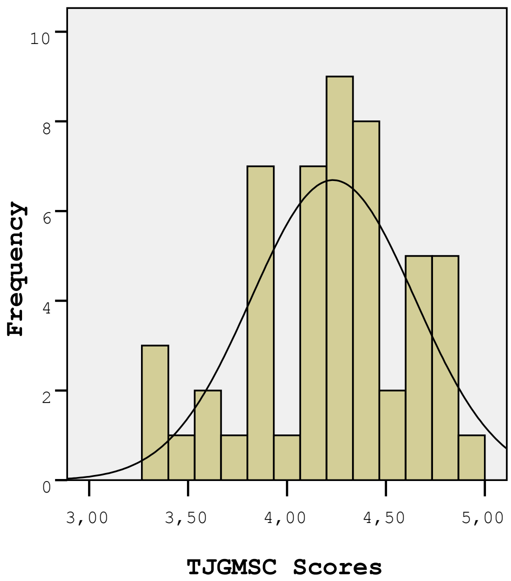

Figure C.13 Histogram of TJGMSC scores of teachers experienced 11-15 years for the dimension *mathematics perspective for the real world*.

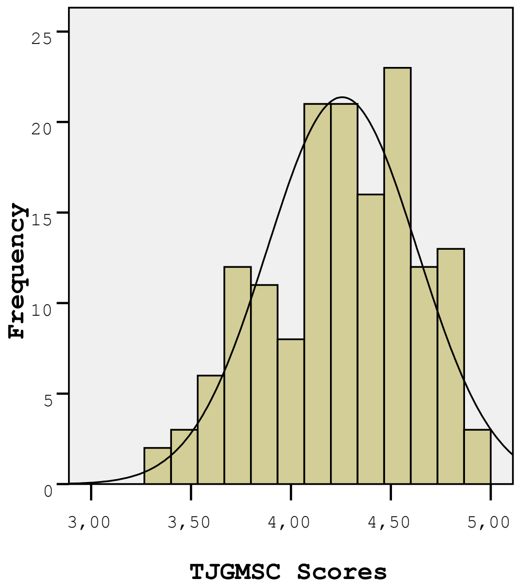

Figure C.14 Histogram of TJGMSC scores of teachers with experience above 15 years for the dimension *mathematics perspective for the real world*.

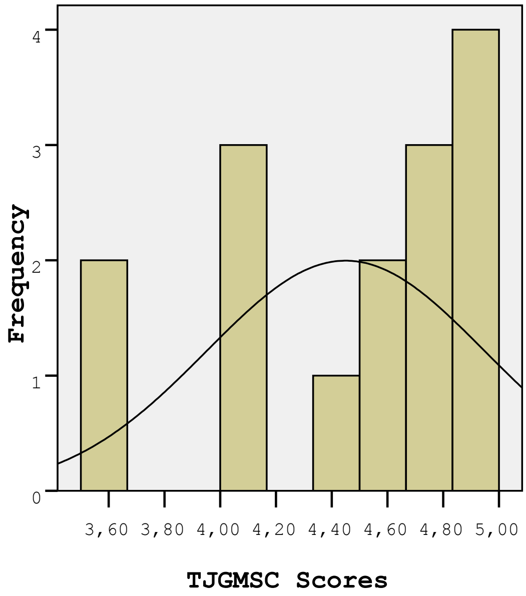

Figure C.15 Histogram of TJGMSC scores of teachers experienced 1-5 years for the dimension *creative problem solver*.

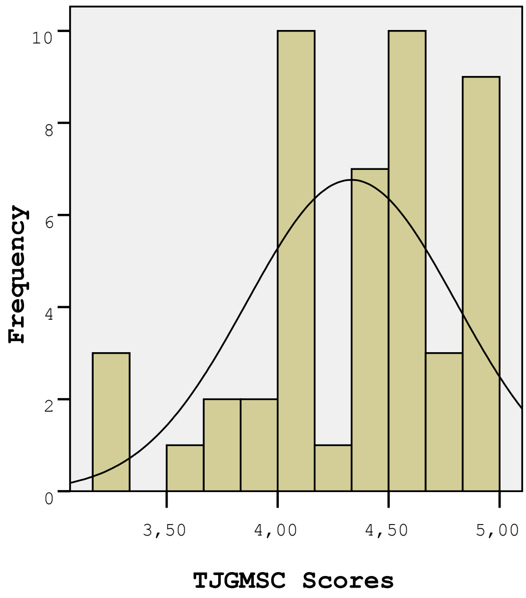

Figure C.16 Histogram of TJGMSC scores of teachers experienced 6-10 years for the dimension *creative problem solver*.

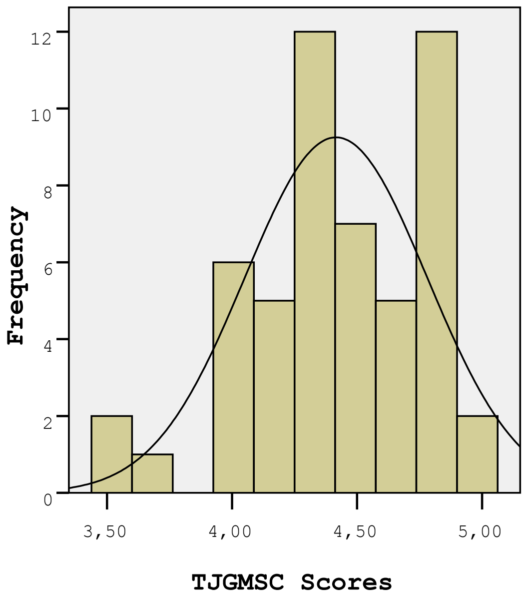

Figure C.17 Histogram of TJGMSC scores of teachers experienced 11-15 years for the dimension *creative problem solver*.

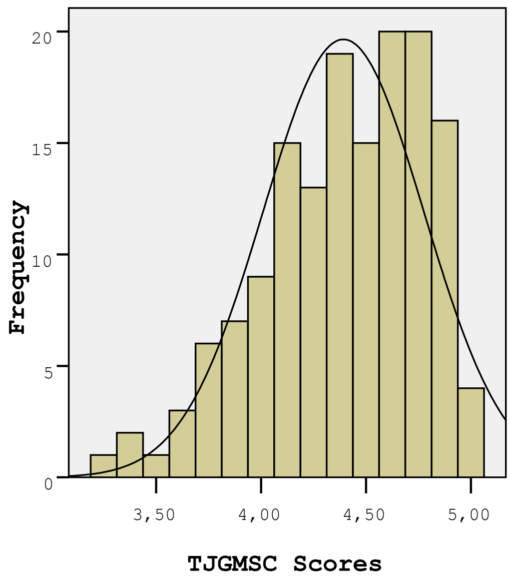

Figure C.18 Histogram of TJGMSC scores of teachers with experience above 15 years for the dimension *creative problem solver*.

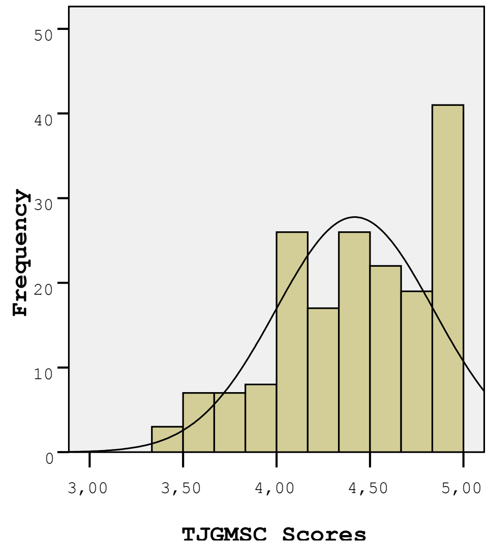

Figure C.19 Histogram of TJGMSC scores of elementary teachers for the dimension *school smart mathematics student*.

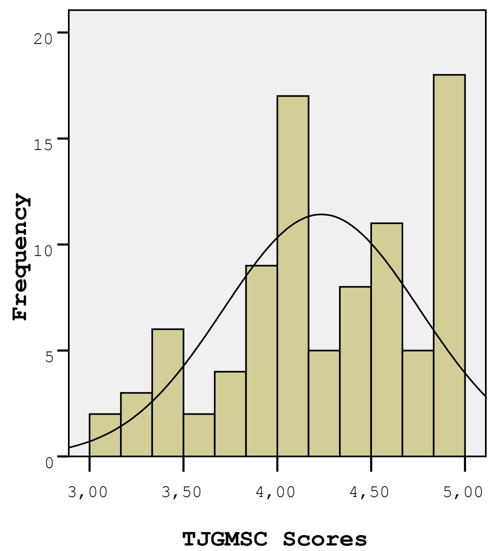

Figure C.20 Histogram of TJGMSC scores of elementary mathematics teachers for the dimension *school smart mathematics student*.

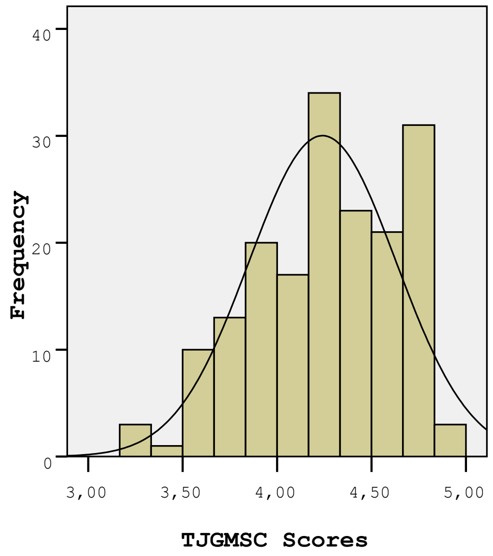

Figure C.21 Histogram of TJGMSC scores of elementary teachers for the dimension *mathematics perspective for the real world*.

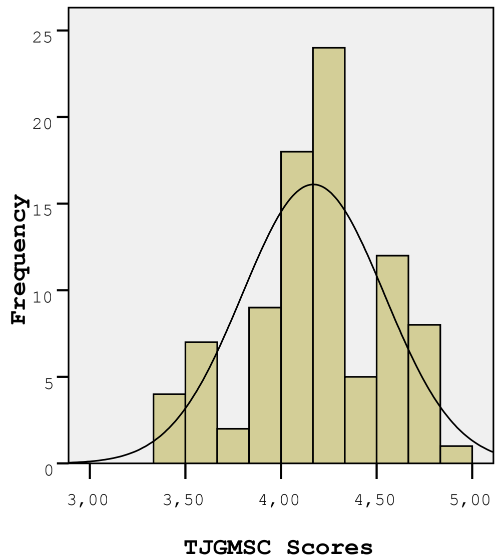

Figure C.22 Histogram of TJGMSC scores of elementary mathematics teachers for the dimension *mathematics perspective for the real world*.

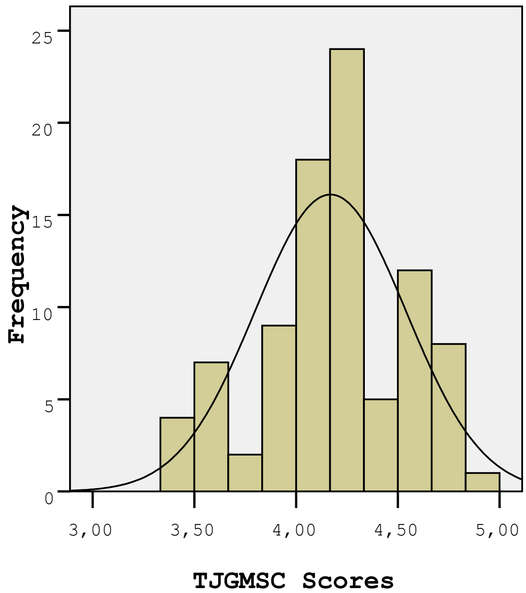

Figure C.23 Histogram of TJGMSC scores of elementary teachers for the dimension *creative problem solver*.

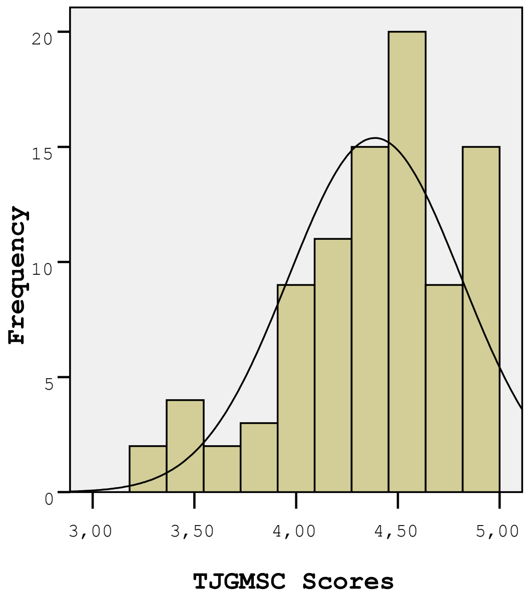

Figure C.24 Histogram of TJGMSC scores of elementary mathematics teachers for the dimension *creative problem solver*.

Appendix D: Boxplots

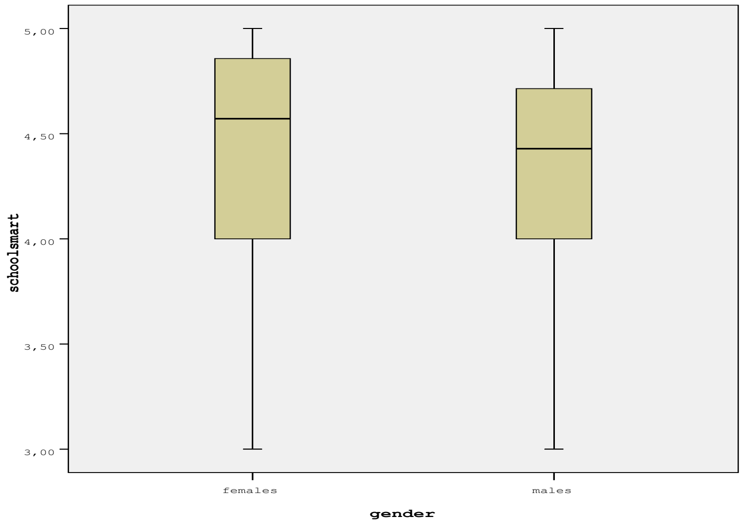

Figure D.1 Boxplot for the dependent variable *school smart mathematics student* with respect to gender.

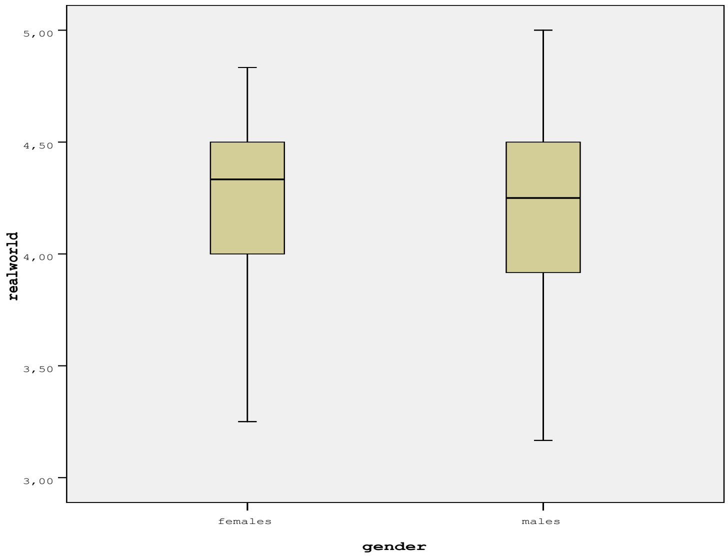

Figure D.2 Boxplot for the dependent variable *mathematics perspective for the real world* with respect to gender.

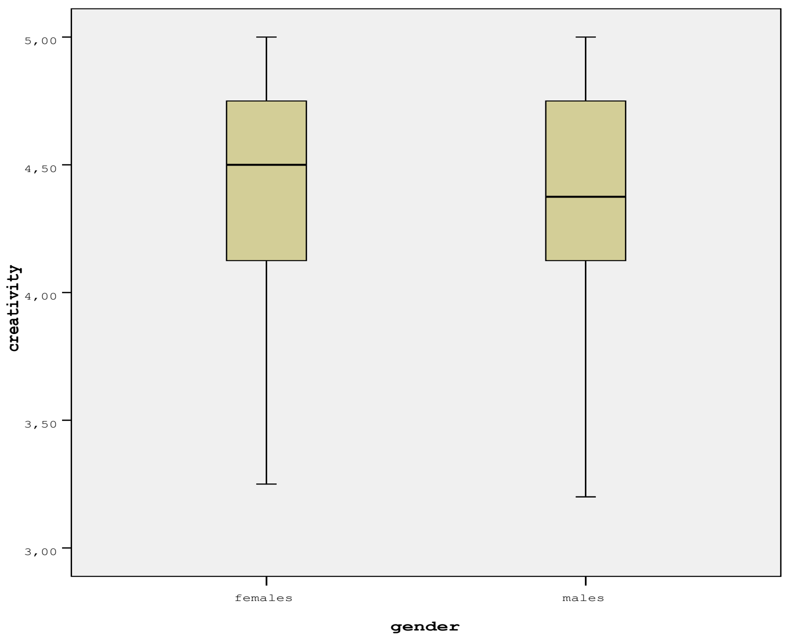

Figure D.3 Boxplot for the dependent variable *creative problem solver* with respect to gender.

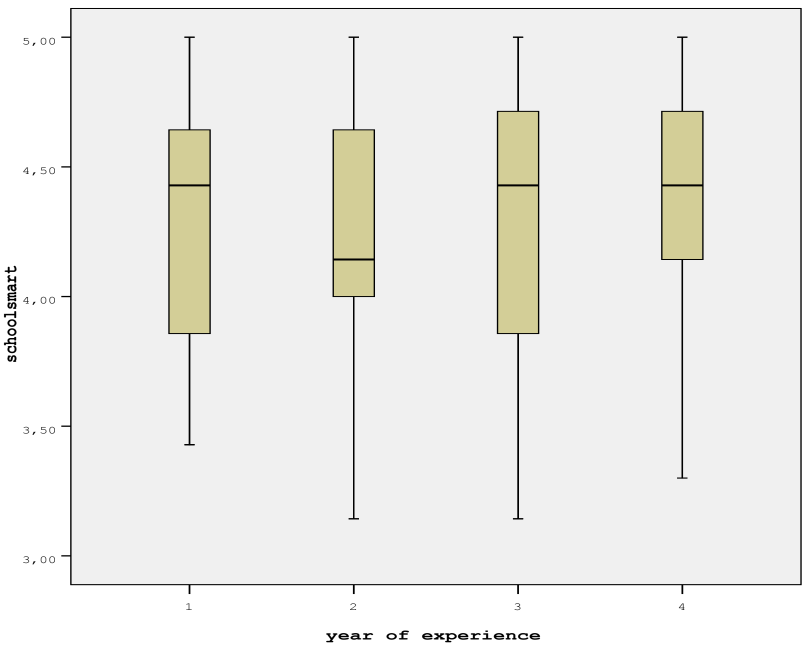

Figure D.4 Boxplot for the dependent variable *school smart mathematics student* with respect to year of experience.

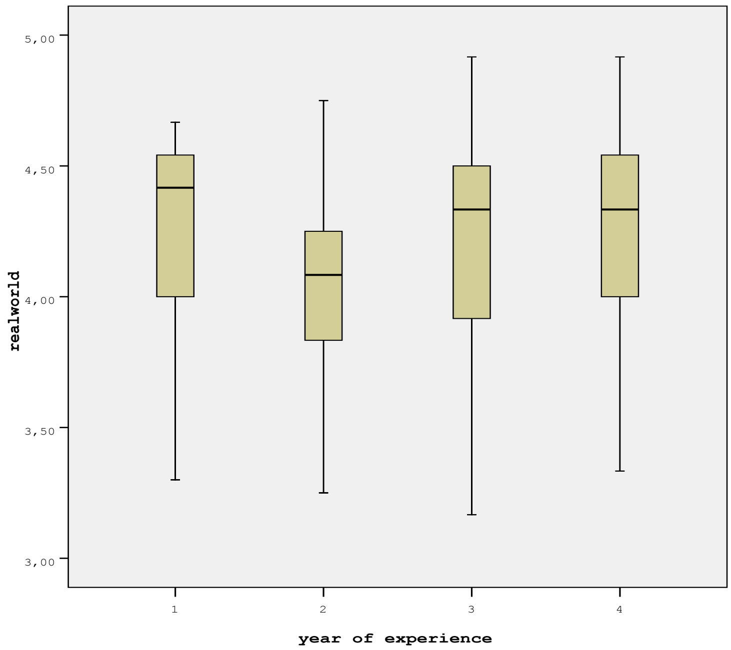

Figure D.5 Boxplot for the dependent variable *mathematics perspective for the real world* with respect to year of experience.

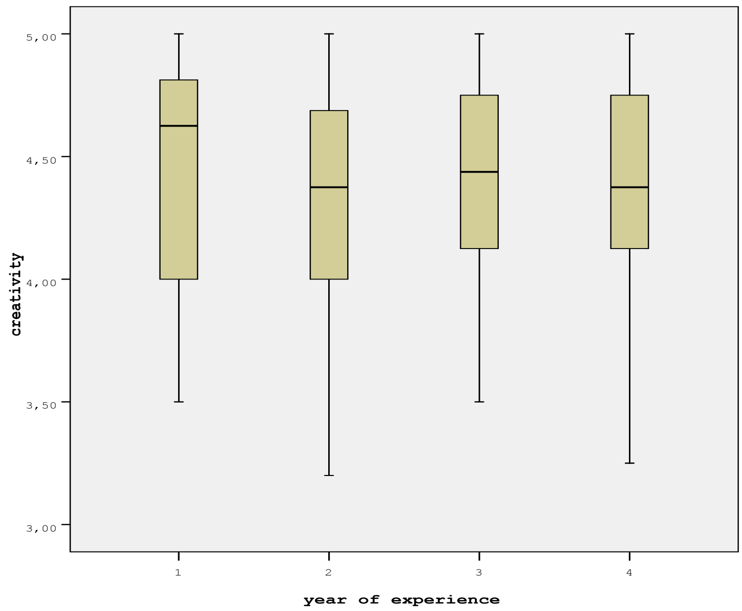

Figure D.6 Boxplot for the dependent variable *creative problem solver* with respect to year of experience.

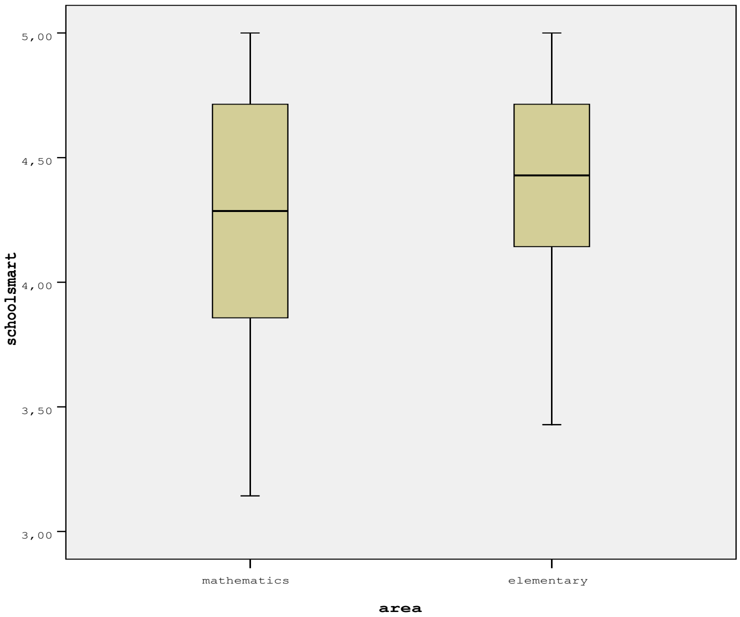

Figure D.7 Boxplot for the dependent variable school smart mathematics student with respect to area of teaching.

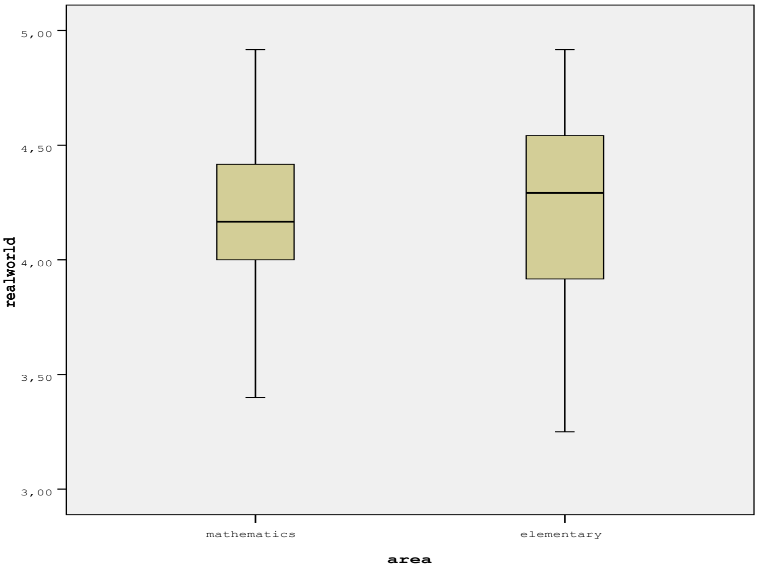

Figure D.8 Boxplot for the dependent variable *mathematics perspective for the real world* with respect to area of teaching.

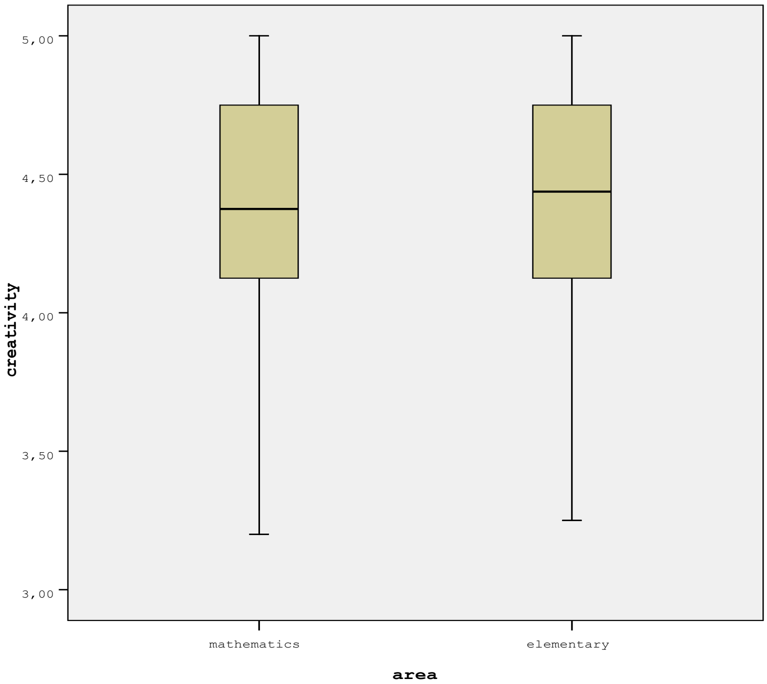

Figure D.9 Boxplot for the dependent variable *creative problem solver* with respect to area of teaching.

Appendix E: Tez Fotokopisi İzin Formu

TEZ FOTOKOPİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ☒

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : TÜTÜNCÜ
Adı : SUMEYRA
Bölümü : İLKÖĞRETİM FEN VE MATEMATİK EĞİTİMİ

TEZİN ADI (İngilizce) : ELEMENTARY TEACHERS' AND ELEMENTARY MATHEMATICS TEACHERS' PERCEPTIONS OF MATHEMATICALLY GIFTED STUDENTS

TEZİN TÜRÜ : Yüksek Lisans ☒ Doktora ☐

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın. ☐
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullancılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır. ☐
3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☒

Yazarın imzası .... Tarih ....