PREDICTORS OF CURRICULUM IMPLEMENTATION LEVEL IN ELEMENTARY MATHEMATICS EDUCATION: MATHEMATICS-RELATED BELIEFS AND TEACHER SELF-EFFICACY BELIEFS

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ABSTRACT

PREDICTORS OF CURRICULUM IMPLEMENTATION LEVEL IN ELEMENTARY MATHEMATICS EDUCATION: MATHEMATICS-RELATED BELIEFS AND TEACHER SELF-EFFICACY BELIEFS

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The aim of the current study was to investigate the degree to which teachers' mathematics-related beliefs, teacher self-efficacy beliefs, and teacher demographics (gender, years of teaching experience, year of teaching experience in the current school, participation to in-service training programs) predict curriculum implementation in elementary mathematics classrooms. The sample of the study consisted of 322 elementary mathematics teachers working in public schools located in three central districts of Ankara. Data were collected with a survey instrument which was consisted of four main parts, specifically (1) Curriculum Implementation Scale, (2) Mathematics-Related Belief Scale, (3) Turkish Version of the Teachers' Sense of Efficacy Scale, and (4) Teacher Demographics Form. To provide evidence for reliability and validity of scales, exploratory and confirmatory factor analyses were carried out and internal consistency reliability was generated for each subscale.

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Hierarchical multiple regression analysis indicated that teachers' mathematics-related beliefs (traditional and constructivist mathematics-related beliefs) and teacher self-efficacy for student engagement significantly contributed the extent of curriculum implementation. On the other hand, teacher demographics could not show a significant influence on the degree of curriculum implementation.

Keywords: Elementary Mathematics Education, Curriculum Implementation, Mathematics-Related Beliefs, Teacher Self-Efficacy Beliefs

ÖZ

İLKÖĞRETİM MATEMATİK EĞİTİMİNDE EĞİTİM PROGRAMLARI UYGULAMASININ YORDAYICILARI: ÖĞRETMENLERİN MATEMATİK HAKKINDAKİ İNANÇLARI VE ÖĞRETMEN ÖZYETERLİKLERİ

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Bu çalışmanın amacı, ilköğretim matematik eğitiminde öğretmenlerin matematik hakkındaki inançları, öğretmen özyeterlikleri ve öğretmen demografiklerinin (cinsiyet, öğretmenlik tecrübesi, şu anki okuldaki öğretmenlik tecrübesi, hizmet içi eğitim programlarına katılımı) eğitim programı uygulamasını ne ölçüde yordadığının belirlenmesidir. Çalışmanın örneklemini, Ankara'nın üç merkez ilçesindeki devlet okullarında çalışan 322 ilköğretim matematik öğretmeni oluşturmaktadır. Veriler, (1) Eğitim Programı Uygulama Ölçeği, (2) Matematik Hakkındaki İnançlar Ölçeği, (3) Öğretmen Özyeterlik Ölçeği ve (4) Kişisel Bilgi Formu bölümlerinden oluşan bir anket yardımıyla toplanmıştır. Çalışmada kullanılan ölçeklerin geçerlik ve güvenirliklerine kanıt sağlamak amacıyla açıklayıcı ve doğrulayıcı faktör analiz yöntemleri kullanılmış ve her bir alt boyut için iç tutarlılık güvenirliği hesaplanmıştır.

Hiyerarşik regresyon analizi sonuçları, öğretmenlerin matematik hakkındaki inançlarının (geleneksel ve oluşturmacı inançlar) ve öğrenci katılımına yönelik öğretmen özyeterliklerinin eğitim programı uygulamasını anlamlı derecede yordadığı saptanmıştır. Öğretmen demografiklerinin ise eğitim programının uygulanmasında anlamlı bir etkisinin olmadığı tespit edilmiştir.

Anahtar sözcükler: İlköğretim Matematik Eğitimi, Eğitim Programı Uygulaması, Matematik Hakkındaki İnançlar, Öğretmen Özyeterlikleri.

To two handsome men in my life,
Mehmet & A. Selim Kabaoğlu.

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LIST OF ABBREVIATIONS

CIS: Curriculum Implementation Scale
MRBS: Mathematics-Related Beliefs Scale
TSES: Teachers’ Sense of Efficacy Scale
TTSES: Turkish Version of Teachers’ Sense of Efficacy Scale
BoE: Board of Education.
MoNE: Ministry of National Education
NCTM: The National Council of Teachers of Mathematics
OECD: Organization for Economic Co-operation and Development

CHAPTER 1

INTRODUCTION

This chapter aims to present the basic motivation to conduct the current study in four sections. The first section explains the background of the study, the second section clarifies the purpose of the current investigation, and the third section presents the significance of the study in terms of current literature and educational practice. Finally, the last section lists the definitions for the key terms of the study.

1.1 Background of the Study

All societies in the world have experienced socio-cultural, economic, scientific, and technological changes continuously. Accordingly, changes in education systems seem inevitable since the education is the main way of adapting individuals to the changing conditions and requirements of the related time (Ersoy, 1997). Therefore, being open to evaluation and adjustment according to the varying needs of related age can be defined as the basic characteristic of educational programs (Güven & İşcan, 2006; Memnun, 2013). Parallel to this fact, pursuance of the improvement through the world context and structuring reform attempts according to the specific needs and conditions of the country seem crucial for continuous development and renewal of the society (Memnun, 2013).

Consistent to the improvement in information technologies such as Internet and World Wide Web in the late 1990s, current society refreshed its appearance during the transformation of industrial era into information era. Through this process, the characteristics of qualified citizens were also redefined as being reformist, democratic, creative, problem solver, collaborator, and community builder (Hargreaves, 1994). In that context, mathematics as one of the disciplines which enables individuals to enrich their competences in terms of critical thinking, reasoning, decision making, self-regulation, problem solving, and independent evaluation (Clarke, 2008; Forgasz & Leder, 2008; Ulubay, 2007) has a special role in shaping countries' futures. Moreover, Ersoy (1997) described effective and efficient mathematics education as one of the basic requirement of becoming information society.

Due to the changing views throughout the world, criticisms in mathematics education directed authorities to make several reformist attempts in the late 1950s (Polly, McGee, Wang, Lambert, Pugalee, & Johnson, 2013) and a crucial shift has started in mathematics education from teaching to learning. Consequently, constructivist view that places students at the center of education took the place of traditional views (Goldin, Rösken, & Torner, 2009). Changes in educational views also resulted in a deep transition in terms of content and instruction to improve conceptual understanding in mathematics (National Council of Teachers of Mathematics [NCTM], 2000). Mathematical understanding, the ability to use it and self-confidence or disposition toward mathematics mostly depended on teaching experiences that learners faced with in school (NCTM, 2000). Therefore, curricular reform and teachers as key actors have an important mission in the development of mathematics education.

Although constructivist approach in mathematics education started at the beginning of 1960s through the world, the sounds of its footsteps reached our country in the years following 2000s. Furthermore, the criticisms on the predominant behaviorist appearance of Turkish education system have reached to an alarming level at the beginning of 2000s. The failures in international evaluation platforms like Programme for International Student Assessment (PISA), Progress in International Reading Literacy Study (PIRLS), and Trends in International Mathematics and Science Study (TIMSS) also revealed the dramatic situation of Turkish education system (Eraslan, 2009) and forced the Ministry of National Education to take extended and immediate preventions to increase the quality of education. Then, as a response to critics on our education system, a nationwide elementary school curriculum reform was initiated in Turkey in 2005. This top-down reform movement included rigid steps in terms of educational goals, content, and instructional techniques and turned the main focus from content to student (Board of Education [BoE], 2005). Additionally, elementary mathematics curriculum was revised in 2013 but this revision was limited with organization of the content (BoE, 2013). Therefore, basic characteristics of 2005 mathematics program are still up-to-date.

In that extent, improvement of basic skills in terms of problem solving strategies, communication through mathematical language, critical thinking, decision-making, self-regulation, research, and technology was announced as the main necessities of the changing perspective in mathematics education by the Board of Education (2013). Furthermore, increasing student motivation towards mathematics learning and ensuring mathematical views in learners towards the events in their environment were taken as important focus in the new mathematical approach. Consequently, cooperative and student-centered instructional approaches were adopted in mathematics education to involve students in teaching-learning processes (Konur & Atlıhan, 2012). Therefore, a holistic approach in mathematics education, which ensures the connection of mathematical learning with real life and meets both the national and individual expectations in an acceptable level, has been tried to be reached through this way.

Although it seems as if the place of teachers became more passive since the focus shifted from teaching to learning, the fact is just the opposite. Current approach in mathematics education view teachers as conductors of an orchestra and assign the responsibility of constructing effective learning atmosphere (Manouchehri & Goodman, 1998). Based on that agreement, the role of teachers cannot be limited to delivering the program. Teachers are also expected to define, reinterpret, and improve the curriculum (Güven & İşcan, 2006).

The earlier trends in mathematics education mainly stress the cognitive aspect of learning and affective side is generally disregarded (Furingetti & Pehkonen, 2002). Most of the studies following the end of 1970s, on the other hand, specify that cognitive aspect does not mainly constitute the heart of learning (Op't Eynde, De Corte, & Verschaffel, 2002). Thus, current views in mathematics education are convinced about the importance of affective aspect in terms of beliefs, attitudes, and feelings (Leder & Forgazes, 2002) for educational processes. Exploration of affective factors in a deeper extent is important to realize learning-teaching processes and to enhance educational reforms.

Beliefs as one of the most important figures in affective domain are constructed through learning and social interactions according to specific desires, goals, and needs of personal identity (Furinghetti & Pehkonen, 2002), and play important roles in personal evaluations, justifications, and inferences. Their contributions to self-identity, harmony of the holder's world view and consistency of personal values or opinions shape the orientations in individuals' lives (Goldin, 2002). Especially in education, their influence ranges from classroom implications and student achievement to the success or failure of educational innovations (Goldin, Rösken, & Törner, 2009).

Findings in the literature persuaded that enhancing deeper mathematical understanding and respectively higher level of success is only possible through the changes in various beliefs of both students and teachers regarding mathematics and mathematics education (Goldin et al., 2009). Especially in education, transformation or extension of beliefs into more extended forms are evaluated as crucial to actualize planned and expected goals. Owing to the fact that educational goals demand a top-down personal development in terms of social aspects and affective structures, understanding the nature of beliefs is important since information about how beliefs are formed potentially provides us the way of understanding how they change (Chapman, 2002; Wilson & Cooney, 2002).In that context, analyzing beliefs in a detailed manner is an efficient way of grasping some basic clues to understand the reasons of ongoing problems related with mathematics education.

With the consensus in literature, researchers have accepted the existence of complex relations pattern between the teachers' internalized beliefs and their actual strategies for teaching (Aguirre, 2009). Teachers' views about main issues in education determine their plans at the level of classroom practices (Tan & Saw Lan, 2011). Similarly, their beliefs about teaching and learning influence how they value, evaluate, and implement the curriculum (Manouchehri & Goodman, 1998).Therefore, beliefs as filters that identify teachers' instructional methods and motivation to enact educational pedagogies (Polly et al., 2013) act an important role for the success of the program.

Furthermore, Baydar (2000) stated that successive teacher education programs could be only organized by taking the beliefs of teachers into consideration. Without considering teacher attitudes towards change, their evaluations on curricular reforms, and their mathematical world views, weaknesses of the programs could not be identified. Consequently, the required steps for the adaptation of prospective teachers to changing views in education could not be taken. Moreover, courses in teacher education programs should be organized in a more student-centered form and teaching practice courses should be increased since beliefs are formed according to personal experiences. By this way, prospective teachers should frequently experience the current approaches in education instead of learning only the underlying theories.

All in all, curriculum implementation is a multidimensional process which is influenced by several factors including characteristics of the reform, socio-cultural structure of the society, school environment, teacher characteristics (Fullan & Pomfret, 1997; Gredler, 1996; Ornstein & Hunkins, 2004). Comprehensive understanding of the implementation process is crucial for the effective management of reform attempts and it can be gained through the understanding of the unique and combined influence of related factors on the implementation process (Roehrig, Kruse, & Kern, 2007).Teachers, however, have a special standing among all these factors as conductors of the educational innovations (Fullan, 2007). More and more research studies have revealed that all reform movements in education will remain as a written document unless their arguments are actualized by teachers (Saylor, Alexander, & Lewis, 1981). Especially, teacher beliefs related with teaching and learning processes directly guide teachers' instructional decisions, the way they utilize from their pedagogical knowledge, and their classroom management strategies (Roehrig et al., 2007). Moreover, teacher self-efficacy beliefs, as strong predictors of teachers' choices and behaviors, have a great influence of teachers' position toward new ideas, their attitudes for teaching, and their instructional practices (Guskey, 1987). Eventually, the influence of teachers' mathematics-related beliefs and self-efficacy beliefs on curriculum implementation process was analyzed in the current study.

1.2 Purpose of the Study

The main aim of this research is to analyze the degree of implementations of new mathematics curriculum in the light of elementary teachers' mathematics-related beliefs and self-efficacy beliefs. For that purpose, mathematics-related beliefs (in terms of nature of mathematics, teaching and learning mathematics) and self-efficacy beliefs of elementary mathematics teachers will be determined. Moreover, the influence of several factors like gender of teacher, years of teaching experience, years of teaching experience in current school, and participation to in-service training programs, on instructional practices is also an interest of this study.

All in all, this study basically aimed to answer the following research question:

> To what extent do teachers' mathematics-related beliefs, teacher self-efficacy beliefs, and teacher demographics predict the extent of curriculum implementation in elementary mathematics classrooms?

1.3 Significance of the Study

Each reform in education is a product of huge effort and affects directly or indirectly all the people in the society (Ornstein & Hunkins, 2004). In other words, educational changes are not only concern of today's country but also shape its future. Therefore, each step related to education must be analyzed in detail and evaluated continuously. In that extent, it is worthwhile to analyze the current level of curricular practices and provide the necessary feedback about the consistency between intended and implemented curriculum in Turkey. By this way, authorities in education will be informed about the future of the program and further steps in improvement process will be supported consistently.

Although there are vast amount of research studies related to curriculum evaluation and teacher beliefs (in terms of nature of mathematics, teaching and learning mathematics, and self-efficacy) (Kayan, 2011), there is a gap in literature related with the relationship between teachers' beliefs and their curriculum implementation in Turkey. In that extent, the present study intends to construct a bridge between these two important research areas by exploring dynamic, interactive, and cyclical relationship (Edwards & Hensien, 1999). Furthermore, this research will provide some clues for the improvement of some courses in teacher education programs in terms of inner-readiness of teachers towards educational reforms. This will provide an important perspective to adjust both educational innovations for experienced teachers and training programs for adaptations of prospective teachers to high-level educational establishments (Sapkova, 2014). In that extent, the current study aims to contribute to the efficiency of curricular reforms in Turkey.

Recommendations for curriculum reform in mathematics education stress the meaningful experiences in mathematics (NCTM, 2000). Hence, teaching approaches, which emphasize conceptual understanding of mathematical facts, are becoming more popular day by day. Following the latter trends in educational views, teachers' role in organizing learning atmosphere is gaining more importance. Eventually, the beliefs, as filters determining teachers' decision, direct not only their response to mathematics education reforms but also students' mathematical learning and success or failure of educational programs (Goldin et al., 2009). Therefore, this study will also contribute to students' mathematical understandings indirectly by its contribution to curriculum improvement process, teacher training programs and teacher self-efficacy.

1.4 Definitions of Important Terms

Elementary School Mathematics Teachers: Mathematics teachers who teach students between 5^{th} and 8^{th} grades.

New Elementary Mathematics Curriculum: The mathematics education program prepared for classes between 5^{th} and 8^{th} grades in 2013, under the control of Ministry of National Education.

Belief: "Multiply encoded, internal cognitive/affective configurations to which the holder attributes truth value of some kind (e.g., empirical truth, validity or applicability)" (Goldin, 2002, p. 59)

Mathematics-Related Beliefs: Beliefs related with the nature of mathematics, learning mathematics, and teaching mathematics, which are constructed through the personal experiences with mathematics (Liljedahl, 2009).

Self-Efficacy: Beliefs about the personal competence “to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, P.3)

Teacher Self-Efficacy Beliefs: Teachers’ judgments on their capacity to carry out instructional tasks regarding classroom management, student engagement, and instructional strategies, efficiently (Tschannen-Moran, Woolfolk-Hoy & Hoy, 1998).

CHAPTER 2

LITERATURE REVIEW

This chapter is prepared to present an extended reviewed literature related to curriculum implementation, teachers' mathematics-related beliefs, and teacher self-efficacy beliefs. It starts with the detailed examination of the context of mathematics education in Turkey and the latest reform attempts in this field. Then, the structure and the role of teachers' mathematics-related beliefs and self-efficacy beliefs in the educational reforms are discussed. Finally, the chapter is ended with a brief summary of related literature.

2.1 A Brief Overview of Mathematics Education in Turkey

When the Turkish Republic was established in 1923, the basic problem related with education was the high rate of illiteracy within the society. Therefore, basic facilitations of the young state were provided for elementary schooling during those years (Gözütok, 2003). In that context, the first primary education program was put into practice in 1924 and the consequent reform movements were initiated in 1926, 1936, and 1948 respectively (Gelen & Beyazıt, 2007).

The main concerns of educational authorities until the end of 1940s were the fulfillment of the need for primary teachers and the rate of schooling in the society (Gelen & Beyazıt, 2007). Therefore, the basic goals of Turkish Education System in related time period can be summarized as the enhancement of basic reading, writing, and computing skills of citizens (Doğan, 2010). Moreover, the efficient utilization from basic economic resources of the country was also intended through the region-specific training programs in village schools (Gözütok, 2003). In that context, any specific reform attempt for mathematics education was not actualized in the first quarter term of the young republic due to the explained reasons. The revisions in mathematics education in those years could not go further than the adjustments of the content (Gözütok, 2003).

However, parallel to the rapid technological improvements throughout the world, the problems about science and mathematics education came into consideration in our country due to the need of profession in science and technology at the beginning of 1950s (Turgut, 1989). Having lack of qualified teachers in mathematics and science areas was defined as the most serious agenda of educational policies in those years (Ersoy, 1997). Furthermore, most of the teachers in related areas were employed in technical fields due to the technological improvements in the country and the need of schools was tried to be provided by people with different professions (Ersoy, 1997). Eventually, this fact also contributed to the qualified-teacher problem and making some innovations became inevitable for our education system during the end of 1950s. Parallel to this aim, some important steps were taken such as summer teacher training programs, bookmobiles, domestic production of educational materials, and preparing educational films (Turgut, 1989).

The establishment of Ankara Science High School in 1963 was accepted as a turning point for science and mathematics education in Turkey (Turgut, 1989). This school was considered as a center where projects for the improvement of science and mathematics education were developed and implemented. American educational programs for mathematics and science were adapted appropriately to our education system and course books were translated into Turkish (Çelenk, Tertemiz, & Kalaycı, 2000; Turgut, 1989). Furthermore, some of the laboratory equipments which were used in America were produced in Turkey with small changes and additionally, instructional movies were also translated. During the following years, curriculum evaluation processes were conducted by adapting the changes in the original forms of the programs (Ersoy, 1997).

Corresponding to these changes, training teachers as the implementers of the programs became the most regarded issue among educational authorities. After long evaluation and discussion processes, summer training courses were planned to educate teachers about basic content knowledge and instructional methods (Gözütok, 2003). The first trainers of these courses were selected from universities and those who succeeded in these training programs became the trainers of the following summer term. As a result of this circulation system, most of the teachers were prepared for new curricular changes in mathematics and science areas (Memnun, 2013).Consequently, pilot studies were conducted in nine high and elementary schools starting from the 1967-1968 education year and were evaluated during the following three years in detail (Ersoy, 1997; Turgut, 1989). Hence, the modern science and mathematics programs have begun to be conducted at the beginning of 1973-1974 education year in 100 high schools and 89 elementary schools (Turgut, 1989). At the end, the modern mathematics program was put in practice through all the schools in Turkey by the academic year 1976-1977 (Memnun, 2013). During all these years, teachers were trained in summer programs continuously. The end of 1970s became the years of political turmoil in Turkey and the education was interrupted in all levels due to the ascending ideological warfare between dissident students groups (Ersoy, 1997).

In the years following 1990s, the importance of international evaluation systems was understood through all over the world as the evaluation results can be used to monitor the deficiencies in education system and to design interventions accordingly (Eraslan, 2009). Programme for International Student Assessment (PISA) was accepted as one of the most popular and comprehensive international examinations, which enables countries to evaluate their education systems. The first participation of Turkey to PISA in 2003 became a milestone for the education system (Çelen, Çelik, & Seferoğlu, 2011; Eraslan, 2009). Detailed analysis of PISA results suggested some revisions in the mathematics program (Baki, 2003).

In overall, the expected level in the success of educational goals could not be actualized through all these program development efforts (Doğan, 2010; Gelen & Beyazıt, 2007; Memnun, 2013). Despite the placement of modern approaches and implementations like active learning, problem-solving skills, and cooperative learning in program agendas, they could not be utilized effectively in practice. Consequently, a top-down elementary school curriculum reform was initiated in 2005 in Turkey (Ministry of National Education [MoNE], 2006). Corresponding to these radical steps, the focus of education was proposed to be shifting from content-centered approaches to learner-centered approaches.

2.2 A New Page in Mathematics Education in Turkey

Although a great deal of effort was made for educational improvements from the first years of Turkish Republic, these attempts could not have gone further than partial and disconnected amendments which were far from being a holistic approach (Gelen & Beyazıt, 2007). Furthermore, the criticisms on the predominant behaviorist appearance of Turkish education system have reached to an alarming level at the beginning of 2000s (Baki, 2003). In addition, the relatively low performance in international evaluation platforms like Programme for International Student Assessment (PISA), Progress in International Reading Literacy Study (PIRLS), and Trends in International Mathematics and Science Study (TIMSS) revealed the dramatic position of Turkish education system (BoE, 2005).

The Board of Education (2005) explained the rationale for the necessity of a nationwide curricular reform movement based on the following reasons:

- recent advancements in science and technology,
- the changing views of teaching and learning processes,
- the need for the enhancement of educational quality,
- increasing rate of educational inequalities between and within schools,
- the need for a more sensitive educational approach towards democracy and economics,
- the need for the improvement of national and personal values in the context of global values.

Based on this perspective, the agenda of the 2005 elementary curriculum was announced in 2004 after a number of sequential meetings and discussions. Consequently, the pilot studies of the program were conducted during the academic year of 2004-2005. In the end, the new elementary education program, which was totally different from previous programs with its underlying philosophy, educational approach, and principles, has begun to be implemented in 2005.

The basic characteristics of the 2005 program can be described as the following (Board of Education, 2005; Doğan, 2010; Gelen & Beyazıt, 2007; Güven & İşcan, 2006):

- Student-centered educational approaches are accepted.
- Construction of knowledge is supported instead of memorization and alternative ways of learning.
- Not only the teaching but also learning is placed at the main focus of the curriculum.
- The role of teachers is redefined as a guide and facilitator.
- Participation and contribution of parents to the educational processes are valued.
- Cooperative instructional strategies are sustained.
- Alternative models for student assessment are suggested and process-oriented evaluation approaches are preferred over product-oriented approaches.
- Utilization from multiple resources and teaching methods is supported.
- Competencies in problem solving, critical thinking, creativity, communication, entrepreneurship, research, and technology are defined as the basic features of qualified person that the education aims to realize.

By this extended reform movement in education, the elementary mathematics curriculum has been revised based on the national and international studies in mathematics education, previous experiences in mathematics education in Turkey, and mathematics programs of some developed countries (MoNE, 2007). In that extent, the mathematical content was reorganized based on the developmental features of related grades and horizontal and vertical connections between different disciplines and within related mathematical branches (Baki, 2003). In the 2005 mathematics program, development of conceptual understanding through personal experiences and real-world situations in addition to the advancement in computational skills was determined as the basic goal in mathematics education (MoNE, 2007). In that extent, improvement of basic skills in terms of problem solving strategies, communication through mathematical language, critical thinking, decision-making, self-regulation, research and technology was announced as the main necessities of the changing perspective in mathematics education by the Board of Education (2013). Furthermore, increasing students' motivation towards mathematics learning and ensuring mathematical views in learners toward the events in their environment were considered as the important focus in the new mathematical approach. Consequently, cooperative and student-centered instructional approaches were adopted in mathematics education to involve students totally in teaching-learning processes (Konur & Atlıhan, 2012). Therefore, a holistic approach in mathematics education, which ensures the connectedness of mathematical learning with real life and meets both the national and individual needs in an acceptable level, has been aimed through this way.

The elementary mathematics curriculum was again revised in 2013 but this revision was limited to some adjustment in content. The extent of elementary mathematics education was updated to the grades between 5th and 8th by 2013 revision. Consequently, the organization of content was reconsidered and required adjustments were planned according to principles of 2005 reform (BoE, 2013). For instance, in 2005 mathematics program, the distinctions among the sign of integers were taught in 5th grade, the definition and basic characteristics of integers were taught in 6th grade and basic operations with integers were taught in 7th grade. By 2013 program, however, the concept of integers and basic operations with them are both integrated to the content of 6th grade mathematics to enable students to construct basic connections easily. Moreover, the process standards such as problem solving, reasoning, communication, and identifying connections were again stressed by 2013 mathematics program (BoE, 2013). All in all, the student-centered perspective of elementary mathematics education was again underlined by the arguments of 2013 revision.

2.3 Curriculum Implementation

A curriculum plan is not valuable unless it is utilized efficiently (Saylor, Alexander,& Lewis,1981). Due to this fact, the implementation of a curriculum becomes a basic concern for educational authorities. Ornstein and Hunkins (2004) defined it as the interaction process between the developers of the program and those who are responsible for actualizing it in order to change "individuals' knowledge, actions, and attitudes” (p. 299). In their view on the implementation, adjusting “personal habits, ways of behaving, program emphasis, learning spaces and existing curricula and schedules” (p.299) is the basic requirements of this process.

According to Gredler (1996), on the other hand, a deep understanding of curriculum implementation requires clarifications on both “the nature of the conceptual framework which the new program is derived from” and “the nature of the implementation process itself” (p.23). Since the conceptual framework of the program reveals key relations between the planned program and intended educational change, the lack of awareness about this field creates problems in identifying ambiguous and negative aspects of the process. Based on this view, Gredler (1996) stated the possible explanation for the failure of a program as not proper implementation of the program due to the fact that program elements are not defined explicitly.

Numerous arguments can be sequenced as the reasons behind the failures of educational reform efforts. However, the key factor with the consensus in literature is defined as the ignorance of educators, as designers of educational innovations about the school culture (Ornstein & Hunkins, 2004). For the success of a curricular effort, theoretical background of the reform movement and how related conceptions fit into the real-world situations should be regarded to organize the intended attempts. To comprehend the atmosphere and conditions in which the program is to be conducted, “structure of the organization, sacred traditions, power relationships and how members define themselves and their roles” (Ornstein & Hunkins, 2004, p.299) should be grasped by the implementers. Furthermore, details about the demographics of the community and its political, socio-cultural, and economic characteristics should be fed into the planning phase of the program to ensure its sensitivity toward the expectations and attitudes of the community (Fitzpatrick, Sanders, & Worthen, 2004).

Individuals participate to the process by doing their best work when they attribute value to the new program, when they visualize their contributions to students’ education, and when they feel pleasant about being involved (Oliva, 1997; Ornstein & Hunkins, 2004; Saylor et al., 1981). Based on this fact, teachers, administrators, curriculum planners, and other members of the process must be aware about the purpose of the curricular change, the roles of participants within the system, and the potential profits of the innovation (Fitzpatrick et al., 2004; Gredler, 1996). Accordingly, any attempt to change the educational process must be feasible, manageable, and rational to encourage all participants of the process to actualize the planned innovations (Ornstein & Hunkins, 2004).

Although planning is an essential part of successful implementation as it specifies required needs and resources for intended actions, the process could not be planned strictly (Morris & Fits-Gibbon,1978). Change is not an event, which is completed in a moment; rather, it is a process. Therefore, planning must be flexible to manage unexpected events occurred during the implementation phase and unplanned outcomes of the process (Ornstein & Hunkins, 2004). Moreover, the design of an educational reform should reflect the warnings of previous experiences (Fullan & Pomfret, 1997). Research studies on what worked and what did not work in the past must be handled during the planning phase of the movement and the extent of the change must cover the expectations of today and future.

2.3.1 Curriculum Implementation Studies in Turkey

With the implementation of student-centered mathematics programs, research studies have been conducted to analyze and to evaluate the program's outcomes from different perspectives. For this aim, changing views of teachers, students, administrators, and parents were considered and the efficiency of the program components (objectives, content, process, and evaluation) were discussed based on these findings. Results of these studies were crucial since they supported the necessary feedback for the improvement of the program and contributed the efficiency of educational reform efforts by declaring the weakest aspects of the program, which needed the immediate intervention. Furthermore, capturing main points in these research studies is important due to their contribution and guidance for the interpretation of the current study's results.

Confirming the above facts, Ulubay (2007) conducted a study with the aim of investigating the implementation process of 2005 elementary mathematics curriculum through the teachers' reports. Furthermore, the influence of several factors such as city of workplace, gender, years of experience, and number of students in the classroom on implementation process was examined in the study. The curriculum implementation scale was developed by the researcher after a deep analysis in literature and administered to 80 elementary mathematics teachers located in Ankara, Bolu, and Kocaeli. The implementation process was analyzed under three sub-dimensions: implementation of instructional methods, usage of necessary materials, and usage of recommended evaluation strategies based on teachers' responses. Descriptive statistics results of the study revealed that teachers' implementation of the methods and techniques proposed in 2005 program can be considered as high level while the usage of recommended materials and the evaluation techniques in 2005 curriculum were recorded as the average level. Utilization from recommended equipment was only affected significantly by the experience level as the condition did not change for the implementation of new instructional methods and evaluation strategies according to the parameters like gender, years of experience, and average student number in the classroom. Additionally, insufficiency of time, crowdedness of the classrooms, and the structure of the central examination system were mentioned as the main challenges for the implementation of student-centered curricular approaches by teachers.

In the study implemented by Orbeyi (2007), the main concern was to identify teachers' views on the changing education program. A survey instrument was developed by the researcher that aimed to obtain perceptions about the 2005 curriculum in terms of goals and objectives, content, teaching-learning process, and evaluation. Moreover, Orbeyi also examined the effects of some parameters like teacher education level, grade year of students, teaching experience, city, and participation to in-service training programs on the implementation process. Data were collected from 459 elementary school teachers working in Edirne, Çanakkale, and Eskişehir. Findings indicated that teachers rated the sufficiency of goal-objectives, content, and teaching-learning process components of the program at "agree" level, while they rated the level of utilization from required materials lower than the moderate level. Teacher views on goals and objectives and the content of the curriculum significantly differed with respect to grade level of students and the participation to the in-service training programs. It was mentioned in the study that teachers who were teaching first grade students and participated to in-service training programs reported a more positive attitude toward the goals and content parts of the curriculum. On the other hand, perceptions of evaluation approaches showed a significant variation on the basis of city that teachers located and participation to in-service training courses. Teachers who were working in Eskişehir and participated to the in-service training programs rated the evaluation approaches in the program in a more positive manner. Finally, there was no significant difference in the perceptions about teaching-learning processes.

Meşin (2008) conducted a study to investigate the problems and difficulties that teachers experienced during the implementation process of 2005 elementary school mathematics curriculum. The opinions of 124 elementary mathematics teachers working in Sakarya were obtained during the academic year 2006-2007. Results indicated that teachers reported a positive understanding through the whole program in general but they complained about some basic problems related with the implementation process. Insufficiency of time for instructional activities, crowdedness of the classrooms, limited and inadequate equipment in schools, challenges related with parents and administrations due to the their lack of knowledge about the curriculum, and lack of sufficient time for extended evaluation methods were the main problems reported by teachers as the implementers of the program.

Kay and Halat (2009) implemented a study to evaluate the 2005 mathematics curriculum from the parents' perspective. Furthermore, parent views on their children's changing responsibilities and new mathematics textbooks were also collected. Data were collected from 317 parents from different education levels during the academic year 2006-2007 in Afyonkarahisar. Results of the study revealed that there was a significant difference in the opinions on student roles and new mathematics textbooks by their education level. In other words, parents with bachelor degree were more concerned with the education of their children compared to the other parents and they evaluated the new instructional textbooks as inadequate. As an additional point, results revealed that parents from all education levels did not have adequate knowledge about the extent of the curricular reforms in mathematics.

Budak (2011) evaluated the 2005 mathematics teaching program using teacher views. In this extent, perceptions of 52 elementary mathematics teachers working in Erzincan were obtained during the 2009-2010 education year. Findings of the study revealed that teachers had positive views toward the curricular reforms in general and that student-centered approaches were defined as the strongest aspect of the curriculum. However, participants found the implementation process problematic due to the limited time for instructional activities. Moreover, teacher views regarding the curricular reforms were significantly affected by the years of experience; that is, experienced teachers evaluated the program in a more positive manner. On the other hand, findings did not differ significantly with respect to gender of teachers and class size.

Zakiroğlu (2012) conducted a study to investigate whether or not student expectations from the 2005 mathematics program were met. The instrument was developed by the researcher with the sub-dimensions as instructional process, teacher support, materials, evaluation procedures, the importance attributed to the subjects, and student-oriented approaches in the program. Data were collected from 1050 fifth grade students from eight primary schools located in Bağcılar and Bakırköy districts of İstanbul. Findings indicated that student expectations were met at the highest level in terms of teacher support and student-centered applications. However, their expectations were not satisfied at an adequate level about the instructional materials and evaluation strategies. Furthermore, student expectations significantly varied according to their economic level and gender.

Findings of aforementioned studies revealed that teachers, students, parents, and administrators evaluated the 2005 mathematics curriculum in a positive manner while they still have concerns toward the implementation of the changing educational approaches and their redefined roles through this complicated process. Confirming these concerns, insufficiency of time for instructional activities, crowdedness of the classrooms, ineffective in-service teacher training programs, lack of necessary materials and equipment in schools, absence of parents' and administrators' support due to the their lack of adequate knowledge about the curriculum, insufficient technological facilitations, inconsistent nature of central examination system with current curricular reforms, and teachers' resistance toward change in basic fields were reported by the researchers as main problems related with the implementation process (Budak, 2011; Doğan, 2010; Gelen & Beyazıt, 2007; Güven & İşcan, 2006; Kay & Halat, 2009; Konur & Atlıhan, 2012; Meşin, 2008; Orbeyi, 2007; Ulubay, 2007; Zakiroğlu, 2012).

2.3.2 Factors Influencing Curriculum Implementation

Due to the its multidimensional structure, curriculum implementation process is influenced by several factors ranging from characteristics of the reform, demographics and futures of the society, characteristics of the classroom (grade level, number of students, students' motivation level, discipline problems, etc.) to the teacher characteristics (years of experience, education level their views toward change etc.) (Fullan & Pomfret, 1997; Gredler, 1996; Ornstein & Hunkins, 2004). In her comprehensive review on the nature of implementation process, Fullan (2007) categorized these variables under three main titles which are (1) characteristics of innovation, (2) external factors, and (3) local characteristics. Effective management of reforms demands for a more detailed understanding of the process, which is possible through the understanding of the unique and combined influence of these factors on the implementation process (Roehrig, Kruse & Kern, 2007). Consequently, critics of these factors and their roles in reform processes will provide an extended point of view to realize this sophisticated phenomenon.

To begin with, basic characteristics of change that influence the implementation process can be stated as the need, clarity, complexity, and quality and practicality. First of all, the correspondence between an innovation and the prior needs of the institution or society is essential. For the success of reform efforts, major needs of the community must be integrated to the decision-making phase of the attempt (Fullan, 2007). Moreover, the people involved in the process should be convinced about the significance of the attributed value of change (Ornstein & Hunkins, 2004). Secondly, lack of clarity causes misunderstanding of the essential features of the program. Therefore, it is a serious impediment for the actualization of proposed form of the innovation. To enhance the efficiency of the developmental efforts, all elements of the program should be clearly specified (Ornstein & Hunkins, 2004). Complexity, moreover, refers to the difficulty and demanded zone of change by the reform movement (Fullan, 2007). Recent approaches in education call for large-scale and ambitious reform attempts, which are possible only through complex projects (Roehrig et al., 2007). Then, complexity is an essential aspect of the reform, which promises to make a considerable difference in terms of development whereas it also demands more effort and greater understanding on the structure of change (Fullan, 2001). Finally, the quality and practicality of the project have a significant mission for the success of the innovation. In fact, quality and practicality of change is closely related with the prior three factors. What is more is, the capacity of the individuals to bring about required changes is not individually sufficient; to reach large-scale changes the process must be supported by high quality instructional materials and technological facilities (Fullan, 2007). For a qualified and practical reform attempt, significance of the addressed need, clarity of the program elements, and ambitious goals should be combined with quality in equipment

External factors include technology, faculties of education, Ministry of Education, government, and community (Fullan, 2007). Most of the educational policies arise from the public concerns in terms of the insufficiency of education system to meet current needs of the society (Ornstein & Hunkins, 2004). What determine the priority and content of educational reforms, however, are the political forces (Roehrig et al., 2007). Hence, society and political instructions have a direct influence on the extent and structure of innovations. Moreover, the quality of relationship between the government agencies and the implementers of the program is the basic parameter, which determines the future of the reform (Fullan, 2007). Besides that, faculties of education have direct contribution to the quality of implementation through their responsibilities like monitoring the process, providing feedbacks, and supplying required guidance (Fullan, 2007).

Local factors, finally, refer to organization or setting the implementation process is carried out, parents, principals and teachers (Fullan, 2007). The schools are the center of change but reform movements demand for a more complicated organization constructed by all elements of school environment (Fullan & Pomfret, 1997). The principal as one of the main actors of this organization, “is the person most likely to be in a position to shape the organizational conditions necessary for success, such as the development of shared goals, collaborative work structures and climates, and procedures for monitoring results" (Fullan, 2007, p. 96). Principals' responsibilities, accordingly, range from whether the change process is handled seriously to providing psychological and technical support for teachers (Fullan, 2001). In addition, strong parent-school relationship is also an essential requirement of successful implementation process (Gredler, 1996; Ornstein & Hunkins, 2004).

Teachers, on the other hand, have a special standing among all these variables as the implementers of any educational innovation. Research studies revealed that all reform movements in education would remain as a written document, unless their principles were implemented by teachers (Saylor et al.,1981). Especially, their beliefs about their role in educational developments significantly influence their classroom practices. The beliefs related with teaching and learning processes directly guide teachers' instructional decisions, the way they will utilize from their pedagogical knowledge, and classroom management skills (Roehrig et al., 2007). Correspondingly, curriculum implementation process will be analyzed from teachers' perspective in the current study. Teacher beliefs due to their crucial roles in personal evaluations, justifications, and inferences (Goldin, Rösken, & Törner, 2009), will be examined specifically as important predictors of curricular practices.

2.4 Belief: A Messy Construct

Numerous writers defined the concept of belief differently and still there is not an agreement on the scope and basic characteristics of beliefs in research literature. Parallel to this point, Pajares (1992) explained belief as a messy construct and presented the terms like "attitudes, values, ideologies, perceptions, conceptions, judgments, perspectives, and opinions" as the most confused ones with beliefs. As a common view in literature, the confusion on definition of belief is not counterproductive since beliefs have a flexible and accommodating structure (Goldin et al., 2009). Furthermore, Törner (2002) characterized this disagreement as "fruitful," since these ongoing discussions provide a deep understanding on structure and roles of beliefs. As Pajares (1992) mentioned "The most fruitful concepts are those to which it is impossible to attach a well-defined meaning" (p.308). In that context, mysterious aspect of beliefs can be presented as the basic reason behind its popularity in educational research literature.

The lack of consistency about the boundaries of defining beliefs revealed different understandings on this issue. Although there existed consistency about the basic structure of them, the literature provided new dimensions with the contribution of each definition. Table 2.1 presents a comparison of definitions of belief along with its basic characteristics.

Table 2.1

Basic Definitions of Belief and Their Characteristics.

Author	*Definition*	*Basic Characteristics*
Richardson (2003, p.2)	Psychologically held understandings, premises, or propositions about the world that are felt to be true.	• Subjective and disputable. • Validity issue is concerned by personal criteria.
Goldin (2002, p.59)	Multiply encoded, internal cognitive/affective configurations to which the holder attributes truth value of some kind (e.g., empirical truth, validity, or applicability).	• Subjective and disputable. • Attribution of truth value depends on configurations of personal logic. • Dynamic and flexible structure.
Sigel (1980)	Experience-driven mental constructs.	• Subjective. • Configurations of personal evaluations. • A social construct.
Ernest (1989)	An individual’s conceptions, values, ideologies, dispositions and philosophies of life.	• Varying degree of conviction. • Influenced by social interactions. • Determine the position of individuals through the life.

Belief systems consist of personal evaluation, hypotheses, expectations, and conscious or unconscious perceptions through the events (Green, 1971). Indeed, individuals have natural tendencies to construct and improve beliefs, which serve their needs, desires, and goals. Consequently, beliefs are shaped according to socio-cultural environment and can be stated as products of social life (Op't Eynde, De Corte, & Verschaffel, 2002). On the other side, beliefs and prior knowledge are the main actors who organize the interactions between their holders and social environments. In that extent, a reciprocal connection exists between beliefs and social context. Beliefs structure the stream of our lives while they are nourished from the consequences of social interactions. Therefore, an ongoing evaluation and development process is inevitable for belief systems.

The continuous evaluation process for belief systems eventually creates some biases in perceptions of human beings. Inconsistency between the rationales behind prior and current belief structures may be defined as the signal, which starts the changing process in belief systems. Indeed, dissatisfaction about the existing beliefs is accepted as the main reason for replacement or readjustment of belief structure. Dissatisfaction is only possible when existing beliefs are challenged or assimilation of them into existing systems is impossible (Goldin et al., 2009). Psychologically each belief system tries to reach a equilibrium and for that reason, the beliefs which create dissatisfaction are explicated profoundly according to personal rationales (i.e., needs, desires, and goals) (Op't Eynde et al., 2002). During that process, prior knowledge and earlier beliefs intervene and thus the desired stabilization of belief system is constituted.

2.4.1 The Structure of Beliefs

Especially in education, transformation or extension of beliefs into more extended forms are evaluated as crucial to actualize planned and expected goals. As educational goals intend to improve personal capabilities in terms of social, affective, and cognitive domains, change in belief systems of individuals is a vital requirement of educational processes. Parallel to this fact, understanding the structure of beliefs is important since knowledge about how beliefs are formed potentially provide us the way of understanding how they change (Chapman, 2002; Wilson & Cooney, 2002). For that reason, explaining some basic terms related with the structure of beliefs will be worthwhile for an extended view on this issue.

Belief structure may be explained as the central term to realize the nature of beliefs and refers to “a set of mutually consistent, mutually reinforcing or mutually supportive beliefs and warrants in the individual, mainly cognitive but often incorporating supportive affect” (Goldin, 2002, p.64). The rationale behind the acceptance of a belief may be shared or not with social concerns and the structure of a belief mainly represents the complex personal, internal configurations (Goldin, 2002). In fact, each belief is not isolated from other beliefs and constitutes a part of the structure of mutually reinforcing beliefs. Belief systems, in a parallel manner, are “socially or culturally shared belief structures that are sufficiently broad to warrant the term” (Goldin, 2002, p.64). Being shared does not necessitate the correctness or validity; the truth attribution is at only personal level and reflects only the results of individual evaluation. Finally, warrants of a belief can be explained as the justifications or reasons for the truth attribution to a belief (Goldin, 2002). Direct observations, logical inferences during comparisons with earlier beliefs, deduction from observations, indirect reports, and concerns of authority can be considered as the basic sources of personal warrants. Psychologically some warrants can be stronger than others and consequently, the level of plausibility of warrants determine the stability of related belief or belief systems.

According to Mencken, “people will believe what they want to believe” and beliefs, which are constructed through learning and social interactions according to specific desires, goals, and needs, reflect personal identity (cited in Furinghetti & Pehkonen, 2002). The contributions of beliefs to self-identity, the holder’s world view, and consistency of personal values or opinions can be evaluated as psychological functions of beliefs (Goldin, 2002).

Green (1971) summarized the basic dimensions of a belief system as quasi-logicalness, psychological centrality, and cluster aspect. In a similar approach, Thompson (1992) clarifies basic distinctive characteristics of beliefs as the degree of conviction and clustering structure. Quasi-logicalness can be explained as personal logic that organizes the connections between beliefs in a system. In that context, the logical structures of the holders can be analyzed through their belief systems. The quasi-logical structure groups beliefs as primary and derivative ones. Primary beliefs are mostly related with the main focus while derivative ones are generally connected with subsequences of this issue. For instance, believing the importance of student-centered instruction is primary while believing the importance of class discussions and cooperative learning in education is a derivative belief.

Psychological centrality refers to the level of conviction that a belief holds. According to the degree of psychological strength, Green (1971) identified beliefs as central and peripheral. Central beliefs represent high level of conviction and consequently, they are more resistant to change. Peripheral ones, on the other hand, carry a lower degree of psychological strength and they are more close to change. Logical primacy and psychological centrality present the "orthogonal" dimensions of a belief system (Thompson, 1992). Then, being logically primary and psychologically peripheral or being logically derivative or psychologically central can be possible for a belief at the same time.

Finally, beliefs are structured in clusters and interaction among these groups is at the minimum level (Richardson, 2003). This clustering property blocks the cross-fertilization among different belief systems and enables to have conflicting and incompatible beliefs at the same time (Green, 1971). Inconsistency between belief systems can be removed by only comparing them one by one and analyzing the conflicts in detail (Green, 1971). Realizing this characteristic of beliefs is crucial to understand their improvement and changing processes.

2.4.2 Beliefs, Knowledge, and Values

According to Thompson (1992), one of the reasons for the vague structure of beliefs is the difficulty of identifying distinctions between beliefs and knowledge. There exists a close relation between these two terms and teachers frequently use the term ‘‘knowledge’’ while they are talking about their beliefs (Thompson, 1992). Moreover, the necessity of searching for the characterization of these two terms is still an arguable issue in research literature; some of the authors stress that studying how teacher beliefs and knowledge influence their experiences is more valuable than identifying the distinctions between knowledge and belief (Thompson, 1992). However, since beliefs shape teachers' plans of classroom practices and influence how they value curriculum and identify instructional methods (Manouchehri &

Goodman, 1998; Polly et al., 2013; Tan & Saw Lan, 2011), understanding this concept in an extended view will support the reliability of findings in literature related with beliefs and contribute to educational improvements in a more realistic manner. In that extent, the basic distinctions between knowledge and belief can lead a more accurate picture for the nature of beliefs. With the consensus in literature, the distinctive characteristics of beliefs can be mentioned as the following (Furinghetti & Pehkonen, 2002; Goldin, 2002; Green, 1971; Op't Eynde et al., 2002; Richardson, 2003; Thompson, 1992; Törner, 2002):

1. They present varying degrees of conviction.
2. They are consensual.
3. There is not an agreement about their evaluation or judgment.
4. A belief is not in a total independence from other beliefs.
5. Beliefs are placed in clusters.
6. The argument behind the adoption of beliefs and knowledge is different.

The first characteristic refers to the psychological centrality aspect (being central or peripheral). Believing something strongly is possible whereas knowing something in that way is not logical. Therefore, the different level of conviction is not an issue for knowledge.
Another distinctive characteristic of beliefs is that they are consensual. In their nature, they are subjective and disputable (Thompson, 1992). According to Furinghetti (2002), the world around us continuously sends messages and we reach some conclusions on different phenomena based on our perceptions and experiences about these signals. Indeed, our beliefs are composition of these conclusions. Moreover, due to the ongoing comparison of beliefs with new experiences and other individuals' beliefs, they are in a continuous evaluation process and change is possible for them at any time (Furinghetti & Pehkonen, 2002). The terms such as certainty or truth mostly refer to knowledge while beliefs are not related with validity issue.

Parallel to the second distinction for beliefs, an epistemic warrant is not expected for their correctness (Richardson, 2003). Beliefs are evaluated as true by their holders and do not need to be judged in the same manner by a community. Beliefs are mainly what someone believes as true, regardless of what others think, agree or not. Knowledge, however, depends on an epistemic standing and requires evidence to warrant their acceptance (Richardson, 2003). From an epistemological perspective, belief can be identified as an individual construct while knowledge refers to a social construct (Op't Eynde et al., 2002).

According to Green (1971), relevant to the quasi-logical structure of beliefs, derivative ones are strictly connected to the subsequence of primary beliefs. In that extent, a belief cannot exist in a total independence from other beliefs. Knowledge, on the other hand, is concerned with its own specific logical validity.

Finally, clustering property specifically belongs to the structure of beliefs (Green, 1971; Richardson, 2003; Thompson, 1992). Clustering aspect enables to have inconsistent and conflicting beliefs at the same time in different belief systems (Green, 1971). However, inconsistency among various knowledge structures cannot be an issue since they are filtered from validity and certainty concerns and constructed in a logical manner. As a conclusion, the explanations for the earlier five distinctive features of beliefs identify the rationale behind the last characteristic. The basic differences in terms of level of conviction, validity issues, subjectivity or objectivity and connective structures necessitate the distinction between the arguments of the beliefs and knowledge.

There is also tendency among researchers to use "values" as synonym with beliefs. The basic distinction between these two terms is, indeed, mainly psychological (Goldin, 2002). Values refer to what is considered as good, worthy and desirable. In that context, attribution of some kind of truth to value is not an issue. However, sometimes a value statement can gain truth through its validation by religion, authority or social consensus and it can be evaluated as a belief in that particular context (Goldin, 2002). Values, as one of the main motivators in people lives, shape personal judgment on the meaning of life, criteria for being right or wrong and description of a good person (Thomson, 1992; Törner, 2002). Therefore, values can construct a partial basis for beliefs and influence them through the all life processes.

2.5 Beliefs in Mathematics Education

The earlier trends in mathematics education mainly stress the cognitive aspect of learning and the affective side is generally disregarded (Furingetti & Pehkonen, 2002). Most of the studies following the end of 1970s, on the other hand, specify that cognitive does not mainly constitute the affective dimension of learning (Op't Eynde et al., 2002). Current views in mathematics education are convinced about the importance of affective aspect in terms of beliefs, attitudes, and feelings (Leder & Forgazes, 2002) for educational processes. Examining affective factors in a deeper extent is important to realize learning-teaching processes and to enhance educational reforms.

Beliefs as one of the most important figures in the affective domain play important roles in personal evaluations, justifications, and inferences. Especially in education, their influence ranges from teachers' views on classroom implications, student achievement to the success or failure of educational innovations (Goldin et al., 2009). Consequently, it can be argued that beliefs determine the future of education in an important extent. More and more researchers are persuaded that enhancing deeper mathematical understanding and respectively higher level of success is only possible through the changes in various beliefs of both students and teachers (Goldin et al., 2009).

The function of beliefs in current educational trends is clarified as reducing and structuring information to assimilate them into constrained patterns (Törner, 2002). Since the capacity of human beings is limited to perception and information processes, beliefs' role seems as crucial to enhance limited learning capacity. In that context, analyzing beliefs in a detailed manner will provide some basic clues to understand the reasons of ongoing problems related with mathematics education.

Beliefs are mainly considered as "one's mathematical world view" (Schoenfeld, 1985, p.44) by mathematics educators and research studies on mathematics have primarily concentrated on teacher beliefs about nature of mathematics, learning of mathematics, and teaching of mathematics (Aguirre, 2009). On the other hand, beliefs related with mathematics cannot be limited by one of these three dimensions

(Törner, 2002) and the combination of these three aspects reflects the realistic picture of an individual's beliefs on mathematics (Liljedahl, 2009).

Beliefs related with nature of mathematics criticize mathematics as a discipline and refer to "conscious or subconscious concepts, meanings, rules, mental images, and preferences concerning mathematics" (Thompson, 1992, p.132). Views on the origins of mathematical concepts, characteristics of mathematical tasks, connections between empirical world and mathematics, roles of mathematics in daily life, and its perceived utility may be concerned in that extent (Op't Eynde et al., 2002).

According to Dionne (1984), mathematics can be considered from one or combination of three different perspectives and namely they are: traditional, formalist, and constructivist. Törner (2002), on the other hand, interprets these perspectives as toolbox aspect, system aspect, and process aspect of mathematics respectively. Beliefs about mathematics as a composition of rules, facts, formulas and procedures refer to toolbox aspect. Mathematics is evaluated as a set of unrelated, absolute but utilitarian rules and procedures in this level (Earnest, 1989).System view of mathematics is interested in logical structure of proofs, precise definitions, and consistency of mathematical language (Liljedahl, 2009). In this aspect, mathematics is perceived as "static but unified body of knowledge which is discovered, not created" (Earnest, 1989, p.10). In the last aspect, mathematics refers to a continually expanding domain through the constructive efforts where the logical connections between concepts are important (Törner, 2002).

Beliefs about learning mathematics mainly concern with the productive or counterproductive perspectives in learning mathematics (Op't Eynde et al., 2002). Consistent with the aspects of Törner (2002), beliefs on learning mathematics can be grouped in three levels. In the first level, learning is basically the performance of using formulas, facts, and procedures (Thompson, 1992). In the second level, the ability to use mathematical language and to complete proofs in an accurate manner is valued as mathematical understanding. Finally, the last level consists of rigorous efforts to re-construct mathematics through creating specific rules, proofs, and formulas (Liljedahl, 2009).

Views on effective instructional strategies reflect the beliefs on teaching mathematics and teachers' perspectives about their roles, students' responsibilities, goals of mathematics program, and appropriate instructional or pedagogical approaches can be considered in this field (Op't Eynde et al., 2002; Thompson, 1992). In fact, teacher's place in education is strictly related with his or her approaches to learning processes (Furinghetti & Morselli, 2009). The role of teacher may be defined as: active production or passive submission of knowledge (Earnest, 1989). Between these two extremes of views on learning, Earnest (1989) defines the roles of teachers under three titles. Teacher as a *facilitator*, encourages students' active participation and enhance their understandings through problem solving. The main focus of a teacher as an *explainer* is to promote conceptual understanding and for this aim, clarifying logical structures of mathematical concepts is accepted as crucial. Finally, teacher as an *instructor* focuses on students' mathematical performances through computation and accomplishing student skills to mastery level is evaluated as the primary goal of instruction (Furinghetti & Morselli, 2009).

2.5.1 Models for Mathematics-Related Beliefs

Up to now, three different aspects of mathematics related beliefs have been criticized in detail. However, to portrait the whole picture, dynamic and cyclic connections between these three domains should be clarified. In that extent, four popular models in mathematics education literature will be discussed. Hence, the multi-dimensional connections between beliefs on nature of mathematics, learning mathematics, and teaching mathematics may be identified.

The first model was developed by Kuhs and Ball (1986) after a deep analysis in literature related with philosophy of mathematics, pedagogical approaches, and teaching-learning processes. The main focus of this model is on teaching mathematics based on the underlying theories of mathematics learning. General views in that extent are grouped into four domains; (i) content-focused with an emphasis on performance,(ii) content-focused with an emphasis on conceptual understanding, (iii) classroom-focused, and (iv) learner focused perspectives. The basic characteristics of each domain are summarized in Table 2.2.

Table 2.2

Characteristics of Kuhs and Ball's Model.

Domains	*Related Beliefs*	
Content-Performance	Nature of Mathematics	Mathematics is a composition of absolute facts, rules and procedures.
	Learning	Demonstrating performance on the skills determined by curricular objectives at mastery level.
	Teaching	Content should be organized and presented hierarchically by considering students' levels.
	Role of Teacher	Demonstrating and explaining basic procedures.
	Role of Student	Listening and practicing by following teacher's methods.
Content-conceptual Understanding	Nature of Mathematics	Mathematics is a static body of knowledge, which deals with facts and their logical structures.
	Learning	Identifying logical connections among mathematical concepts.
	Teaching	Content and instructional activities should be organized according to the structure of mathematical subjects
	Role of Teacher	Explaining the underlying rationales for mathematical procedures.
	Role of Student	Criticizing mathematical concepts through problem solving processes.
Classroom-focused	Nature of Mathematics	*It is not specified for this domain.*
	Learning	*It is not specified for this domain.*
	Teaching	Instructional activities should be structured clearly.
	Role of Teacher	Directing instructional activities, monitoring students and providing necessary feedbacks.
	Role of Student	Completing the assigned task according to the directions of teacher.
Learner-focused	Nature of Mathematics	Mathematics is a dynamic and expanding discipline through inquiry and invention.
	Learning	Individual construction of mathematical concepts.
	Teaching	Instruction should be organized and structured to enhance students' active involvement in doing mathematics.
	Role of Teacher	Challenging students by presenting interesting questions and encouraging them to participate discussions.
	Role of Student	Evaluating the sufficiency of their own thinking.

The second model is constructed by Ernest (1989).In this model, beliefs about nature of mathematics are classified in three groups: (i) instrumentalist view, (ii) Platonist view, and (iii) problem-solving view. The main focus of the model is on nature of mathematics. Learning and teaching are described according to this perspective. Table 2.3 presents the main points proposed by this model.

Table 2.3

Characteristics of Ernest's Model

Views	*Related Belief*	
Instrumentalist View	Nature of Mathematics	Mathematics is a set of unrelated but utilitarian facts, rules and procedures.
	Teaching	Transmission of mathematical knowledge.
	Learning	Linear progress through memorization and practice of mathematical procedures.
Platonist View	Nature of Mathematics	Mathematics is a static but structured body of knowledge which is a product of discovery.
	Teaching	Instructional activities should support students' conceptual understanding.
	Learning	Improvement of mathematical skills at mastery level.
Problem-solving View	Nature of Mathematics	Mathematics is an unfinished, dynamic, and expanding field of creation.
	Teaching	Facilitating students' understanding by challenging them by various interesting questions.
	Learning	Construction of personal understanding through critical thinking processes.

Thompson (1991) developed a framework on mathematical beliefs after a five-year study with five in-service and seven pre-service mathematics teachers. She grouped mathematical beliefs in three levels and determined basic characteristics of each level as summarized in Table 2.4.

Table 2.4

Characteristics of Thompson's Model.

Levels	*Related Beliefs*	
Level 0	Nature of Mathematics	Mathematics is utilization of arithmetic skills in daily life.
	Learning	Memorization of rules without identifying logical connections.
	Teaching	Improving students' arithmetic skills.
	Role of Teacher	Demonstrating procedures in an exploratory way.
	Role of Student	Practicing extensively the demonstrated procedures.
Level 1	Nature of Mathematics	Mathematics is composition of fact and procedures with the logic behind them.
	Learning	Realizing logical structures of concepts and relationships among mathematical procedures.
	Teaching	Organizing instructional tasks to clarify isolated sets of mathematical facts and procedures.
	Role of Teacher	Making necessary justifications.
	Role of Student	Putting effort to understand the rationale behind procedures.
Level 2	Nature of Mathematics	Mathematics is worthwhile with the relationships between mathematical concepts and ideas.
	Learning	Generating mathematical ideas and personal justifications of them based on reasoning and proof.
	Teaching	Developing learners' reasoning through inquiry and investigation.
	Role of Teacher	Guiding and facilitating students' understanding through well-organized pedagogical strategies.
	Role of Student	Active involvement in doing mathematics processes.

Another model was proposed by Lindgren (1996) based on a study in Finland about the mathematical beliefs of pre-service mathematics teachers. Parallel to Thompson's model, Lindgren (1996) categorized beliefs in three hierarchical groups: rules and routines, discussion and games, and open approach. The basic characteristics of Lindgren's framework are presented in Table 2.5.

Table 2.5

Characteristics of Thompson's Model.

Levels	*Related Beliefs*	
Rules and Routines	Nature of Mathematics	Mathematics is a body of knowledge that consists of definitions, rules and facts.
	Learning	In learning, extensive practice of mathematical procedures is important.
	Teaching	In teaching, routine problems, which are solved through similar methods, should be used.
	Role of Teacher	Role of Teacher is basically maintaining the order of the classroom.
	Role of Student	Mastering basic skills of calculation.
Discussion and Games	Nature of Mathematics	Mathematics is structured by facts, procedures and rationales behind them.
	Learning	In learning, individual efforts are crucial.
	Teaching	In teaching, different learning games should be appreciated.
	Role of Teacher	Organizing active classroom discussions.
	Role of Student	Cooperating with their classmates during classroom activities.
Open Approach	Nature of Mathematics	Mathematics is a dynamic field where same results can achieved through different approaches.
	Learning	In learning, mathematical thinking strategies should be utilized.
	Teaching	In teaching, various opportunities for students to apply their knowledge should be provided by using verbal problems.
	Role of Teacher	Encouraging students to find and analyze different strategies to solve problems.
	Role of Student	Formulating problems and then solving them.

2.5.2 Studies on Mathematics-Related Beliefs in Turkey

Beliefs in mathematics education became a popular research area in Turkish context in the end of 1990s. Most of research studies were conducted to develop a valid and reliable Turkish mathematics related belief scales and to investigate related beliefs of both in-service and pre-service teachers and students.

To begin with, to investigate the mathematics-related beliefs of prospective mathematics teachers, Kayan (2011) developed "Mathematics-Related Belief Scale

(MRBS)” based on a deep review of the literature. To provide validity and reliability evidence, data were collected from 584 preservice mathematics teachers from ten different universities in Ankara, Bolu, Balıkesir, İzmir, Burdur, Gaziantep, Samsun, and Van. Furthermore, the effects of gender and year level on beliefs were also examined in the study. Results suggested that MRBS is a promising tool to measure beliefs of teachers in terms of nature of mathematics, learning mathematics, and teaching mathematics. In addition, gender was reported as a influential factor on mathematics-related beliefs while year level was not. Female teachers expressed a more constructivist view towards mathematics comparing to their male colleagues.

Hacıömeroğlu (2012) aimed to adapt “Mathematical Belief Instrument (MBI)” developed by Peterson, Fennema, Carpente, and Loef (1989) into Turkish. For the adaptation process, the original form of the scale was translated into Turkish. The items of Turkish form were examined by a committee, which was consisted of two mathematics teachers and two experts from teacher education programs. The final form of the instrument was administered to 301 third and fourth year prospective primary-school teachers. Findings indicated that the adapted form of MBI could be used to measure mathematics-related beliefs of pre-service primary-school teachers in Turkish context.

Baydar (2000) conducted a study to investigate prospective mathematics teachers’ beliefs on nature of mathematics and teaching of mathematics. Data were collected from 79 fourth-year students in mathematics education departments of Middle East Technical University (METU) and Gazi University through a six-point scale developed by the researcher. Beliefs of students from METU and Gazi University were compared and the influence of gender on beliefs was explored. The main conclusion of the study was that prospective teachers in Gazi University had more traditional view on teaching and this difference was explained by the duration of teaching practice in real classroom situations as a student teacher. In addition, any significant difference was not reported by gender. Baydar (2000) stated that appropriate teacher education programs could be organized by taking the beliefs of teachers into consideration. Moreover, Baydar suggested that the number of teaching practice courses should be increased as beliefs are formed with personal experience.

A qualitative study was conducted by Haser (2006) to examine the mathematics-related beliefs of pre-service mathematics teachers. Twenty students from second, third, and fourth grades in elementary mathematics teacher education program participated to the study. Data were analyzed according to the year in the program. Findings revealed that beliefs of prospective teachers represented a more traditional standing and beliefs did not show a significant difference across the year in the program. Based on the results, Haser (2006) concluded that teacher education programs had a limited influence during the formation of students' mathematics-related beliefs.

Another qualitative study with prospective teachers was conducted by Sinan and Akyüz (2012). They examined 181 fourth year prospective elementary mathematics teachers' beliefs about teaching mathematics. With that purpose, it was requested from students to write down their views to these questions: (1) What is the role of students? (2) What is the role of teachers? (3) How should be the teaching? (4) How should be evaluation done? (5) How should be interaction among students? (6)How should be interaction between students and teacher? Furthermore, six participants were selected based on their answers and a semi-structured interview was conducted with them with the same questions. The analysis of the responses revealed that their beliefs about teaching mathematics were more close to the traditional perspective and that they did not seem to embrace the current changes in the educational program. According to the researchers, courses in teacher education programs should be organized in a more constructivist framework and prospective teachers should frequently experience the current approaches in education instead of learning only the underlying theories.

Moreover, Paksu Duatepe (2008) investigated the mathematics-related beliefs of in-service teachers. Data were collected from 324 teachers from different fields: 40 mathematics teachers, 52 science teachers, 195 primary-school teachers, and 37 preschool teachers. 20-items self-report questionnaire was utilized as the instrument. Findings of the study indicated that teachers' mathematical beliefs were more close to the traditional views whereas they considered their perspectives as modernist. Most of them still evaluated mathematics as a combination of rules and procedures instead of a dynamic, continually expanding field of creation and invention.

Additionally, results revealed that gender did not have a significant effect on teachers' beliefs while mathematics teachers reflected a more traditional position comparing to other branches.

Uçar and Demirsoy (2010) implemented a qualitative study to analyze the relationship between elementary mathematics teachers' beliefs and their teaching practices. For this aim, three elementary mathematics teachers' classes were observed for six hours and observations were analyzed according to dialogues during the course, classroom atmosphere, instructional tasks, and evaluation processes. Furthermore, teachers' beliefs in terms of nature of mathematics, learning mathematics, and teaching mathematics were investigated through a semi-structured interview. Results indicated that beliefs of teachers were more close to the constructivist approaches while their instructional preferences indicated the traditional approach. Authors noted the inconsistency between beliefs and teaching practices of teachers.

2.6 Self-Efficacy Beliefs

Perceived self-efficacy, as defined by Bandura (1997), is "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p.3). It is characterized as a future-oriented judgment about the level of competence people expect to present in a particular situation (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). This belief enables individuals to exercise a measure of control over their feelings, actions, thoughts, and motivation through cognitive, affective, motivational, and selection processes (Bandura, 1994; Pajares, 1997; Zimmerman, 1995).

According to Zimmerman (1995), there are basic characteristics of self-efficacy construct, which represent its uniqueness. Firstly, self-efficacy beliefs reflect people's judgment about their competencies to perform rather than the actual skills and knowledge they possessed. Secondly, they are multidimensional and connected with distinct domains of functioning. Thirdly, self-efficacy beliefs are task- and situation-specific. For example, one's judgments on his or her efficacy in chemistry can differ from his or her efficacy in mathematics or other fields. Finally, the level of self-efficacy beliefs is determined based on a mastery criterion for performance, instead of a normative criterion.

In his comprehensive review on self-efficacy beliefs, Bandura (1986) stated that the possessed knowledge and skills are not always good predictors of performance rather beliefs about capabilities direct the ways of behaving. More importantly, efficacy beliefs guide individuals on how they will use their knowledge and skills in a particular context. Furthermore, efficacy beliefs are strong determinants of the level of effort people put forth, the persistence towards obstacles, and resilience in the face of failures (Henson, 2001; Pajares, 1997; Tschannen-Moran et al., 1998; Zimmerman, 1995). People with high sense of efficacy regard difficult tasks as challenges to be accomplished instead of dangers to be avoided. Consequently, they prefer more challenging goals for themselves and declare a strong commitment to them. Their confidence is not easily weakened after the failures since they attribute failure to insufficient effort rather than deficient ability (Pajares, 1997; Zimmerman, 1995). People with low sense of efficacy, on the other hand, approach events with a narrow vision, which attribute failure to their incapability and decrease the motivation while fostering anxiety and stress level. Therefore, self-efficacy beliefs are important predictors of the level of success by their strong influence on behaviors (Henson, 2001; Pajares, 1997).

Creating beliefs on personal efficacy is based on a complex process of self-appraisal through selection, interpretation, and integration of information from multiple sources (Oettingen, 1995). Bandura (1997) specifies the main sources of information that people use in developing their sense of efficacy as mastery experiences, vicarious experiences, verbal persuasion, and psychological arousal. Mastery experiences, as the most influential source of efficacy beliefs, enable individuals to transfer their previous experiences into present situations. The difficulty of past actions, the amount of expended effort, and the success and failure motives provide the required feedbacks for the construction of efficacy judgments. Successes contribute to the improvement of the sense of efficacy while failures weaken it. Especially, frequent early failures have the most adverse influence on self-efficacy beliefs if people already construct a strong sense of personal efficacy (Çapa-Aydın, Uzuntiryaki-Kondakçı, Temli, & Tarkın, 2013; Zimmerman, 1995).

Actions of other people can also influence the formation of self-efficacy beliefs. By observing the successes and failures of others, people may transmit knowledge, skills, and strategies for the development of their competencies (Oettingen, 1995). Especially when the perceived similarity of social models is high, the observer's sense of efficacy is influenced more by vicarious experiences (Bandura, 1997). As another source of self-efficacy beliefs, verbal persuasion may affect the direction that one's life will take in a great extent (Pajares, 1997). Effectiveness of persuasion relies on the credibility, expertise, and attractiveness of the persuader. In general, it is more difficult to strengthen perceived efficacy beliefs by encouragement than to undermine such beliefs by negative persuasion (Bandura, 1986, 1997). Finally, psychological reactions such as the level of arousal, depression, anxiety, and stress form the fourth source of efficacy beliefs. People can judge their competencies based on the emotional state they experience through an action. Positive moods are considered as the signs of personal efficacy whereas depressed moods are viewed as the representatives of inefficacy.

2.6.1 Self-Efficacy Beliefs and Related Constructs

To better understand the nature of efficacy beliefs, clarifying their distinctiveness from closely related concepts about the self such as perceived self-competence, self-concept, and outcome expectancy is needed (Henson, 2001).

Perceived self-competence, as one of the most confused constructs with self-efficacy, is defined as "an intrinsic drive to feel competent" in White's (1959, as cited in Zimmerman, 1995, p.215) effectance theory. Although perceived self-competence also reflects judgments about personal capability, it differs from self-efficacy beliefs in several important aspects (Bandura, 1986). First of all, self-efficacy points out an acquirable system of self-beliefs, while self-competence is an expression of an inner drive. Furthermore, personal efficacy beliefs are measured in terms of personal abilities required to master varying degrees of challenges through changing contexts and domains. Evaluation of perceived competence, on the other hand, depends on normative criteria. Thereby, self-efficacy beliefs refer to a more comprehensive evaluation on self (Pajares, 1997).

Despite the differences among the conceptual frameworks of self-efficacy and self-concept beliefs are often overlooked, they are clearly different according to Bandura (1986). Efficacy beliefs are the contextual judgments on personal competence to organize and execute behaviors required for desired outcomes, whereas self-concept refers to a more comprehensive self-assessment which incorporates all types of knowledge and evaluative feelings related to the self.

Finally, outcome expectancy corresponds to the estimations for likely consequences of behaviors (Bandura, 1986). According to Bandura (1986), expected outcomes mostly rely on the judgments of the accomplishment level. Consequently, outcome expectation does not have the power of predicting the consequences independently since efficacy beliefs also have a considerable influence on the outcomes.

2.7 Teacher Self-Efficacy Beliefs

Teacher self-efficacy is defined as teachers' beliefs in their capacity to perform instructional activities effectively to enhance student performance (Tschannen-Moran et al., 1998). Efficacy beliefs, as a motivational construct, direct teachers' behaviors in classroom, their position towards new ideas, and their attitudes for teaching (Guskey, 1987). Therefore, efficacy beliefs of teachers have attracted the interest of researchers extensively since 1980s, due to its crucial role in educational processes (Çapa-Aydın et al., 2013).

As noted earlier, sense of efficacy is a context-dependent judgment and may change according to the varying conditions. Consistently, teacher efficacy beliefs are characterized as both context- and subject-specific (Henson, 2001). Teacher may evaluate themselves as less able with different learner groups or in other subject domains. Moreover, contextual variables in terms of school culture and organization, may exhibit an important influence in the construction of teachers' sense of efficacy (Bandura, 1997). Especially, four main factors specified as collaboration with their colleagues, positive feedbacks on their performance, active parent involvement, and school-wide coordination for students' development, significantly contribute to the teachers' efficacy beliefs. Conversely, excessive workload, insufficient salaries, low status, poor morale, and lack of recognition are found as strong determinants of lower level of teacher efficacy (Bandura, 1997; Henson, 2001; Tschannen-Moran et al., 1998).

According to Gibson and Dembo (1984), teacher self-efficacy beliefs, as the strongest predictors of their choices and behaviors, have a powerful influence on the amount of effort they put for teaching, the goals they set, their persistence in the face of challenges, and their enthusiasm. Teachers with high sense of efficacy are open to reforms, more willing to implement new methods and materials, and tend to present great deal of planning and organization, through their search for the better ways of teaching (Tschannen-Moran et al., 1998). Greater efficacy motivate and encourage teachers to be less critical on students' mistakes, to provide enriched types of feedback for students' improvement and to work with students who have problems (Gibson & Dembo,1984).

The requirements such as active student involvement, flexible nature of instruction, process-oriented assessment and collaboration with parents and administrators, of the constructivist approach can be fulfilled by efficacious teachers due to their explained features (Bandura, 1997). Furthermore, active engagement of students in learning activities fosters their educational competencies, which in turn increase their achievement level (Zimmerman, 1995). Consequently, teacher efficacy is a significant determinant of student achievement (Pajares, 1997). High teacher efficacy gives rise to high students' sense of efficacy and achievement, which in turn leads to subsequent increases in teacher efficacy. Beyond academic achievement, teacher efficacy also affects students' attitudes towards school and content of instructions (Zimmerman, 1995).

2.7.1 Studies about Teacher Self-Efficacy Beliefs

In the late 1970s, teacher self-efficacy beliefs have gained a growing interest among the educational researchers due to its potential for understanding teachers' behaviors (Fives & Buehl, 2010; Gibson & Dembo, 1984; Tschannen Moran et al., 1998). Consequently, teacher efficacy became a popular research field with a rich historical background in literature during the 1980s. Despite its significant role in educational processes, it was characterized as an "*elusive construct"* which is difficult to measure adequately (Tschannen-Moran & Woolfolk Hoy, 2001). Therefore, common tendencies among studies in this field can be categorized as the extent of their influence on teachers' performance and development of an adequate measurement scale for teacher self-efficacy (Coladarci, 1992; Fives & Buehl, 2010). In that context, introducing basic orientations in teacher efficacy studies is useful due to its contribution for the reliability of the findings of the present study.

For example, Philippou and Christou (2002) examined primary school teachers' efficacy beliefs for teaching mathematics. Data were collected from 157 primary teachers through a five-point Likert type scale developed by Gibson and Dembo (1984). Moreover, 18 of the participants were interviewed about their mathematics teaching experiences, their concerns and their evaluations for the efficiency of pre-service programs. Findings revealed that primary teachers evaluated themselves competent to teach mathematics and their senses of efficacy for teaching continuously increase after a considerable decline at the beginning of their career. In addition, pre-service programs make a considerable influence on the level of teacher self-efficacy.

Swars, Daane, and Giesen (2006) performed a study with the aim of investigating the relationship between the elementary pre-service teachers' mathematics anxiety level and their efficacy beliefs. Data were collected from 28 pre-service elementary teachers from a southeastern university in United States. To examine pre-service teachers' efficacy beliefs, *the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI)* developed by Enochs, Smith, and Huinker (2000) was selected. Mathematics anxiety level of teachers, on the other hand, was measured through *the Mathematics Anxiety Rating Scale (MARS)* developed by Richardson and Suinn (1972). The researchers also conducted a semi-structured interview to four of the participants to gain an in-depth view for teachers' self-efficacy beliefs and the influence of their mathematics anxiety on their sense of efficacy. Findings revealed that there exists a moderate and negative relationship among the pre-service teachers' mathematics anxiety level and their self-efficacy. In other words, pre-service elementary teachers with lower levels of mathematics anxiety generally evaluate themselves as more capable to teach mathematics effectively. Similarly, Gresham (2009) carried out a study to analyze the relationship between mathematics teachers' self-efficacy beliefs and their mathematics anxiety. Participants were 156 pre-service elementary mathematics teachers from a university in the southwest region of United States. Parallel to the research design of Swars et al. (2006), Gresham (2009) administered *the Mathematics Teaching Efficacy Beliefs Instrument (MTEBI)* and *the Mathematics Anxiety Rating Scale (MARS)*. Moreover, the researcher interviewed with 10 pre-service teachers who got the highest scores in MARS and 10 pre-service teachers who had the lowest scores in MARS. Consistent to the results of Swars et al. (2006), findings of the study pointed out a negative and significant relationship between teacher self-efficacy beliefs and their mathematics anxiety level. Teachers with higher sense of efficacy for teaching had a lower level of mathematics anxiety while teachers with lower sense of efficacy for teaching presented a higher level of mathematics anxiety.

The study conducted by Bates, Latham, and Kim (2009) examined the predictive value of pre-service mathematics teachers' teaching efficacy beliefs and mathematics self-efficacy beliefs on their mathematical performance. Data were collected from 89 pre-service mathematics teachers from a mid-western university. Findings indicated that there existed a positive correlation among teaching efficacy and mathematics self-efficacy. Pre-service teachers who expressed higher efficacy to perform mathematics were more confident in their teaching competencies. More importantly, both mathematics self-efficacy and teaching efficacy had a considerable influence on pre-service teachers' mathematical performance.

2.7.2 Studies on Teacher Self-Efficacy Beliefs in Turkey

Based on the increasing popularity of teacher self-efficacy beliefs in educational research, several studies were also conducted in Turkish context. Especially, by the growing importance of teachers' role in changing educational views, researchers were convinced about the importance of affective aspects of teachers like efficacy beliefs (Şan, 2014). Development and adaptation efforts for measurement scales and investigation of the predictive value of efficacy beliefs on the success of educational innovations have formed the core of related studies (İşler, 2008).

In the study performed by Dede (2008), the major goal was to identify mathematics teachers' self-efficacy beliefs. *Science Teaching Efficacy Beliefs Instrument (STEBI)* developed by Riggs and Enochs (1990) was adapted into mathematics teaching context by the researcher. The final version of the instrument was applied to randomly selected 60 mathematics teachers working in different elementary and high schools in Sivas. Findings indicated that the adapted form of STEBI was a valid and reliable instrument to assess teacher self-efficacy beliefs. In addition, the level of teachers' sense of efficacy was determined as adequately high and any significant difference in efficacy beliefs was found by school type.

İşler (2008) performed a study to analyze primary teachers' and mathematics teachers' self-efficacy beliefs for the implementation of new mathematics curriculum. In that context, two-section survey instrument was utilized to collect data. The first part of the instrument was adapted from *the Teachers Assessment Efficacy Scale (TAES)* developed by Wolfe, Viger, Jarvinen, and Linksman (2007) to Turkish by the researcher. The second part was *the Turkish Version of the Teachers' Sense of Efficacy Scale (TTSES),* adapted by Çapa, Çakıroğlu, and Sarıkaya (2005). 696 primary teachers and 105 elementary mathematics teachers located in Mersin, Eskişehir, Bolu, Ankara, and İstanbul participated to the study. According to results, primary teachers had a higher level of efficacy for teaching mathematics compared to mathematics teachers. Moreover, teachers with 11 and more years of experience were found to have higher level of self-efficacy, providing evidence for the effect of mastery experience on self-efficacy. No significant contributions of gender and class size were observed.

Gür (2008) conducted a study with the purpose of examining the predictors of teachers' sense of efficacy during the academic year 2006-2007. A total of 383 mathematics, primary, and science teachers working in Çankaya district of Ankara, participated to the study. Data were collected through *the Turkish Version of the Teachers' Sense of Efficacy Scale*. Results highlighted that satisfaction with performance made a significant contribution to efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management, whereas parental support and teaching materials had a considerable influence on only efficacy for student engagement. Gender, teaching field, and years of experience, on the other hand, did not show a significant effect on teachers’ sense of efficacy.

In the study carried out by Bursal (2009) pre-service elementary teachers’ teaching efficacy for mathematics and science teaching was analyzed. *The Science Teaching Efficacy Belief Instrument (STEBI)* and *the Mathematics Teaching Efficacy Belief Instrument* improved by Enochs, Smith, and Huinker (2000) were selected as the data collection instruments. 127 senior pre-service elementary teachers from a central-Anatolian university participated to the study. Findings revealed that both pre-service elementary mathematics and science teachers had adequate level self-efficacy for teaching. Moreover, high school major of the participants was determined as a significant predictor of teaching efficacy for elementary level. Pre-service teachers with mathematics-science high school major exhibited significantly higher level of efficacy for teaching comparing to pre-service teachers with other majors. Additionally, gender was reported as a non-significant predictor of teaching efficacy.

Ünlü and Ertekin (2013) conducted a study with the aim of investigating the relationship between mathematics teaching efficacy and mathematics self-efficacy of pre-service elementary mathematics teachers. The *Mathematics Teaching Efficacy Beliefs Instrument* developed by Dede (2008) and the *Mathematics Self-Efficacy Belief Scale* developed by Umay (2002) were utilized to collect data. Data were gathered from 144 pre-service elementary mathematics teachers from Aksaray University. Findings indicated a significant positive relationship between mathematics teaching efficacy and mathematics self-efficacy. That is, pre-service teachers who believed themselves to perform mathematics successfully presented a higher sense of efficacy for teaching. Moreover, both mathematics teaching efficacy and mathematics self-efficacy of participants were reported to be high.

Finally, Şan (2014) tried to determine the prospective mathematics teachers’ sense of efficacy for planning and organizing instruction. The sample of the study consisted of 111 fourth-year students selected from faculty of education and faculty of science in İnönü University. Data collection instrument was developed by the researcher as a check list with 121 items. Results of the study revealed that prospective mathematics teachers' sense of efficacy for planning and organizing instruction was at adequate level. Moreover, pre-service mathematics teachers from faculty of education showed a higher level efficacy for teaching than the pre-service teachers from faculty of science.

2.8 Summary of Literature Review

Curriculum implementation refers to an interaction process among the designers of the programs and the people who are responsible for implementing. Due to the complicated nature of the process, curriculum implementation is influenced by several factors. Among these variables, however, teachers have a special standing, which stems from their crucial role for the success of the reform efforts. Based on this fact, teacher characteristics have gained a growing interest among the educational researchers since the beginning of 1970s.

Especially teacher beliefs attracted a strong interest of researchers since beliefs influence teachers' instructional decisions, their positions towards new ideas, and their attitudes towards teaching to a great extent. Moreover, as frequently stressed in the literature, enhancing deeper mathematical understanding and respectively higher level of success is only possible through the changes in various beliefs of both students and teachers. Therefore, analyzing structure of beliefs in a detailed manner is worthwhile since knowledge about how beliefs are formed potentially provides us the way of understanding how they change and provides new perspectives to understand the reasons of ongoing problems related with mathematics education.

Studies on teacher beliefs in mathematics education presented a common tendency in two sub-fields, which are teachers' mathematics-related beliefs and self-efficacy beliefs. Mathematical beliefs of teachers are analyzed in terms of nature of mathematics, learning mathematics, and teaching mathematics in literature. As more and more researchers are persuaded, these beliefs have a considerable influence on teachers' practices of curriculum. Sense of efficacy, as the other strong predictor of teacher behaviors, has a powerful influence on the amount of effort they put for teaching, the goals they set, their persistence in the face of challenges, and their enthusiasm. Consequently, the success of educational reforms is closely related with teachers' judgments about mathematics and their efficacy to enhance students' performance.

Beliefs in mathematics education became a popular research area in Turkish context in the end of 1990s and their popularity increased through the curricular reform attempts accomplished in 2005. After the enforcement of 2005 elementary mathematics curriculum, numerous studies were conducted to investigate the complex relationship between teacher beliefs and the extent of curriculum implementation. In overall, findings indicated that Turkish mathematics teachers have a more constructivist approach towards educational processes and follow the major premises of the current program during their classroom practices.

CHAPTER 3

METHOD

This chapter presents the method of the study. The research design, research variables, and research questions are clearly introduced. Then, sufficient explanation is provided for sampling strategy, sample of the study, data collection instrument, data collection procedures, and analysis procedures, utilized in the current study. This section is finalized with discussion on the limitations of the study.

3.1 Research Design

The design of this study was predictive correlational research, which is one of the common forms of quantitative researches. The main focus in predictive correlational studies is to identify predictive relationships between variables without manipulating them (Fraenkel, Wallen, & Hyun, 2012).Consistent with that aspect, the purpose of this study was to examine the role of elementary mathematics teachers' mathematics-related beliefs, teacher self-efficacy beliefs, and teacher demographics in predicting the extent of curriculum implementation.

The dependent variable of the current study was the extent of the curriculum implementation of elementary mathematics teachers consistent with the principles highlighted by the Ministry of Education. In this study, curriculum implementation refers to teachers' reported practices of instructional methods proposed in 2005 and 2013 curriculums.

The independent variables of the study were teachers' mathematics-related beliefs, teacher self-efficacy beliefs, and teacher demographics. *Mathematics-related belief*s of teachers were examined under two sub-dimensions specified as traditional beliefs and constructivist beliefs. *Teacher self-efficacy beliefs*, moreover, were analyzed in terms of efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management. Finally, *teacher demographics* included gender, years of experience, and participation to in-service training programs.

3.2 Research Question

This study aimed to answer the following research question:

> To what extent do teachers' mathematics-related beliefs, teacher self-efficacy beliefs, and teacher demographics predict the extent of curriculum implementation in elementary mathematics classrooms?

3.3 Participants of the Study

All elementary mathematics teachers working in Ankara constituted the target population of this study. Due to the limitations in terms of time and financial resources, on the other hand, the accessible population of the study was determined as the elementary mathematics teachers working in three districts of Ankara, namely Etimesgut (N=229), Çankaya (N=319), and Yenimahalle (N=266). The study was followed in only public schools to control possible differences stemming from implemented mathematics programs.

Convenience sampling methodology was utilized for sample selection. Elementary schools, in which high number of mathematics teachers are employed, were identified according to information presented on schools' websites. In addition, schools close to these schools were also determined. By this way, 75 elementary schools were chosen. Data were collected from 328 mathematics teachers working in these schools and voluntarily participating to the study. Six of the cases included missing data on either the dependent variable or the majority of the items of the independent variables; therefore, they are excluded from the data analysis. After this elimination, the sample of the study eventually consisted of 322 elementary mathematics teachers (with 39.6% return rate).The sample size was acceptable considering the statistical analyses performed in the study.

3.3.1 Participants' Characteristics

The sample of this study consisted of 322 volunteer elementary mathematics teachers working in Etimesgut (*n*=105, 32.6%), Çankaya (*n*=105, 32.6%), and Yenimahalle (*n*=112, 34.8%) districts of Ankara. Female teachers with 68.9 % (*n*=222) outnumbered the male teachers (*n*=100, 31.1%). In terms of participants' age, teachers between 30 and 39 years old (*n*=147, 45.7%) constructed the majority among other participants. Teachers experience year ranged from 1 to 36 with an average 16.18 (*SD*=8.87). Teachers with experience years between 11 and 20 represented the majority of the participants while teachers with experience years between 1 and 5 were placed in the minority part. In consistence, teachers' experience year in their current schools ranged from 1 to 33 (*M*=3.96, *SD*=4.56). Furthermore, 54.3% of teachers (*n*=175) participated to in-service training programs after 2005 as 45.7% of teachers (*n*=147) did not attend in program. Table 3.1 summarizes teacher demographics.

Table 3.1

Participant Teachers' Profile

Variable	*f*	%
Gender		
Male	100	31.1
Female	222	68.9
District		
Etimesgut	105	32.6
Çankaya	105	32.6
Yenimahalle	112	34.8
Age		
22-25 years old	10	3.1
26-29 years old	30	9.3
30-39 years old	147	45.7
40-49 years old	84	26.1
50 and higher years old	51	15.8
Years of teaching experience		
1-5 years	29	9
6-10 years	67	20.8
11-20 years	138	42.9
21-30 years	49	15.2
Higher than 30 years	39	12.1
Participation to in-service training programs		
Yes	175	54.3
No	147	45.7

To analyze the working conditions of teachers, factors such as class size, student success level in mathematics, student motivation to learn mathematics, and level of discipline problems in classes were regarded. Findings revealed that majority of teachers (*n*=122, 37.9%) were working in classrooms that included students between 26 and 30. Only three of teachers (0.9%) were teaching classrooms with lower than 15 students. Participants were asked to rate the level of student success in mathematics on a three-point scale from low to high. Majority of responses (71.7%) were at “medium” level, while 9.9% at “low” level and 18.3% at “high” level. Additionally, participants were asked to rate the level of student motivation to learn mathematics. Distribution was similar with student success distribution in that majority (64.3%) rated as “medium,” whereas 10.9% evaluated their student motivation to learn mathematics as “low” and 24.8% as “high.” Finally, they were asked to rate the frequency of discipline problems encountered in school on a three-point scale. Half of the participants (50%) reported that the discipline problems were at “medium” level. Approximately 36% indicated that it was “low” and 14.3% of teachers responded it as “high.” Table 3.2 presents the participants’ working conditions.

Table 3.2

Participants’ Working Conditions

Variables	*f*	%
Class size		
15 and less students	3	0.9
16-20 students	11	3.4
21-25 students	70	21.7
26-30 students	122	37.9
31-35 students	83	25.8
More than 35 students	33	10.2
Student success level		
Low	32	9.9
Medium	231	71.7
High	59	18.3
Student motivation level		
Low	35	10.9
Medium	207	64.3
High	80	24.8
Frequency of discipline problems		
Low	115	35.7
Medium	161	50
High	46	14.3

3.4 Data Collection Instrument

In this study, the data were collected through a survey instrument, which was composed of four main parts and clearly they were:

1. Curriculum Implementation Scale (CIS).
2. Mathematics-Related Belief Scale (MRBS).
3. Turkish Version of the Teachers' Sense of Efficacy Scale (TTSES).
4. Demographics Information Form

Curriculum Implementation Scale was developed by Ulubay (2007) to investigate the extent of curriculum implementation by elementary mathematics teachers. The original form of the scale was designed as three-section questionnaire with 49 items. The first section was named as "Learning-Teaching Process Questionnaire" (LTPQ) and contained 17 items asking about the implementation of new instructional methods. The second section included seven items related with the usage of necessary materials during teaching process and it was called as "Material Usage Questionnaire." The final part of the scale was consisted of 21 items regarding the usage of new evaluation techniques and it was labeled as "Evaluation Techniques Questionnaire." The overall scale was designed as a 5-point rating scale ranging from "never" (1) to "always" (5).

In current study, only the first section (LTPQ), which consisted of 17 items about the implementation of new instructional methods, was utilized to investigate the degree of curriculum implementation in mathematics classrooms. Sample items are "Relating mathematical learning with daily life" (Item 10) and "Making logical inferences" (Item 13).Moreover, since the instrument was designed for 6th grade mathematics teachers, judgments of three elementary mathematics teachers and mathematics education professors from METU were taken about the generalizability of the scale for the other grades in elementary level. In the light of expert comments and recommendations, the scale was applied to elementary mathematics teachers. Cronbach alpha coefficient was reported as 0.82 by Ulubay (2007).

Mathematics-Related Belief Scale was constructed by Kayan (2011) with the purpose of identifying mathematics teachers' beliefs about nature of mathematics, learning mathematics, and teaching mathematics. It was developed as a 5-point Likert type scale ranging from “strongly disagree” (1) to “strongly agree” (5) and consisted of 32 items. Kayan (2011) reported that exploratory factor analysis carried out with 242 pre-service mathematics teachers revealed two factors for the scale, namely “Constructivist Beliefs” and “Traditional Beliefs.” Sample item from Constructivist Belief is “Mathematics is basically the usage of arithmetic skills in daily life” (Item 3) and sample item from Traditional Belief is “Mathematics teachers should demonstrate the procedures as mathematical knowledge” (Item 8).Kayan (2011) reported that Cronbach alpha coefficients were .84 and .74 for Constructivist Beliefs and for Traditional Beliefs, respectively.

Turkish version of the Teachers’ Sense of Efficacy Scale was developed by Tschannen-Moran and Woolfolk-Hoy (2001) and adapted by Çapa, Çakıroğlu, and Sarıkaya (2005).The scale has two forms: the short form with 12 items and the long form with 24 items. The instrument was designed with a 9-point rating scale ranging from “Nothing (1)” to “A Great Deal” (9). In this study, long version of the scale was preferred to make a more comprehensive analysis on teachers’ sense of efficacy. Factor analysis conducted by Tschannen-Moran and Woolfolk-Hoy yielded three different factors for the scale: efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management. Confirmatory factor analysis conducted by Çapa, Çakıroğlu, and Sarıkaya also provided supporting results for the factorial structure of the original instrument. Sample item from each factor is as follows:

- How much can you do to help your students to value learning? (Item 9, from efficacy for student engagement)
- To what extent can you gauge student comprehension of what you have taught? (Item 10, from efficacy for instructional strategies)
- How much can you do to get children to follow classroom rules? (Item 13, from efficacy for classroom management)

Çapa et al. (2005) reported that Cronbach alpha coefficient for the overall scale was reported as .93 with .82, .86, and .84 for efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management, respectively.

Finally, the last section of the data collection instrument was prepared to collect data about teacher demographics and working conditions. More specifically, *Demographic Information Form* asked participants to report information about themselves (age, gender, years of experience, and participation to in-service training programs) and their working conditions (class size, student success level, student motivation level, and frequency of discipline problems in class).

3.4.1 Validity and Reliability Analyses of the Curriculum Implementation Scale

Exploratory factor analysis was performed based on the data gathered from 322 mathematics teachers to analyze the factor structure of the Curriculum Implementation Scale (CIS). For this aim, principal axis factor analysis with direct oblimin rotation was utilized due to the violation in multivariate normality of data and correlated nature of factors.

Two initial conditions of factor analysis were specified as adequate sample size and moderate relationships between factors. These were checked through Kaiser-Meyer-Olkin (KMO) and Barlett's tests. Adequacy of sample size was verified by KMO value of .85 (Field, 2013). Besides, Barlett's test of sphericity, χ^2 (136) = 1931.88, $p < .000$, indicated that correlation matrix is appropriate for running factor analysis (Field, 2013).

Kaiser recommended retaining all factors with eigen values greater than 1. Based on this criterion, four factors were extracted for this data set. However, since Kaiser's criterion is likely to overestimate the number of factors, Field (2013) insistently advised the Cattell's scree plot test for the sample size greater than 200. Then, with the reference of inflexion point of the scree plot in Figure 3.1, one factor was determined as the strong contributor of the variance in the data set.

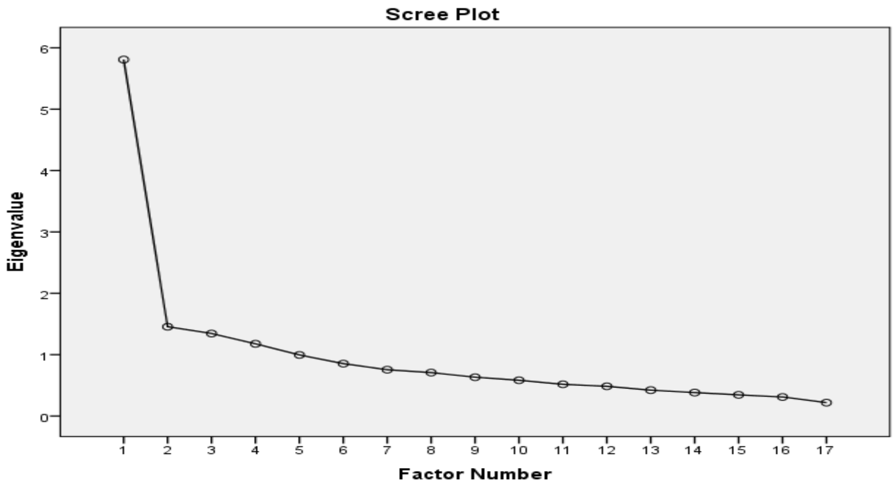


Figure 3.1 Scree Plot of Curriculum Implementation Scale

Findings revealed that 34.17% of the variance in data was explained by one-factor structure of the scale. Moreover, as an evidence for the reliability of the scale, Cronbach's alpha value was calculated as .88. Table 3.3 illustrates the factor loadings of items and Cronbach's alpha values if item deleted.

Table 3.3

Factor Loadings and Cronbach's Alpha Values If Item Deleted for CIS.

Items	Factor Loading	Cronbach's Alpha If Item Deleted
Item 7	.64	.87
Item 16	.63	.87
Item 10	.62	.87
Item 11	.61	.87
Item 9	.59	.87
Item 6	.59	.87
Item 8	.58	.87
Item 15	.57	.87
Item 14	.55	.87
Item 17	.54	.87
Item 4	.52	.87
Item 3	.51	.87
Item 12	.50	.87
Item 5	.49	.87
Item 1	.48	.87
Item 13	.45	.87
Item 2	.40	.88

Note. Cronbach's Alpha for Entire Measure is .88 (n=322).

3.4.2 Validity and Reliability Analyses of Mathematics-Related Belief Scale.

In order to provide evidence for the construct validity of the Mathematics-Related Belief Scale, exploratory factor analysis was conducted through principal factor analysis with direct oblimin rotation based on the responses of 322 mathematics teachers. For this data set, Kaiser-Meyer-Olkin measure of sample adequacy was found as .82, which fell into the range of being “great” (Field, 2013).Bartlett’s test of sphericity was significant (χ^2 (325) = 2526.58, p < .000). Then, the data were suitable for factor analysis.

As scree plot test provides fairly reliable results for determining the number of factors in the samples consisted of more than 200 participants (Stevens, 2002 as cited in Field, 2013), factor extraction of this data was determined regarding the reference of the inflexion point in the scree plot (Figure 3.2). Consequently, two factors were identified as the most contributors of the variance in this data set.

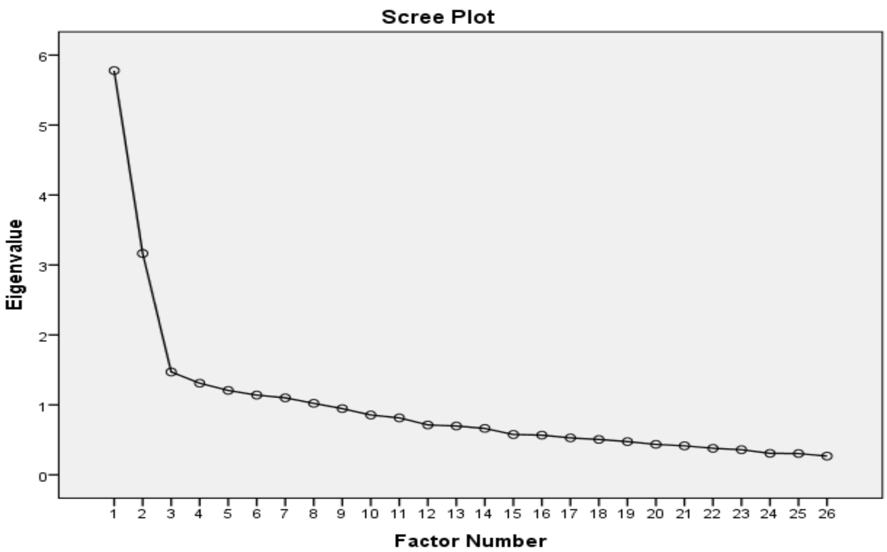


Figure 3.2 Scree Plot of the Mathematics-Related Belief Scale.

According to Stevens (2002, as cited in Field, 2013) factor loading greater than .298 is acceptable for a simple size of 300. Based on this reference, item 3 (.293), item 13 (.176), item 28 (.263), item 29 (.216), item 30(.153), and item 32(.284) were eliminated from the scale. Furthermore, item 31 was also eliminated since it did not significantly load to any of the factors. Then, the final version of the scale was consisted of 25 items, loading to two factors. Items 1,2,5,11,12,14,15,16,17,18,19,20,22,24,25,26,27, and 29 were manifested under the factor "Constructivist Belief" (CB) which accounted for 22.23% of the variance, while the second factor, namely "Traditional Belief" (TB), was consisted of items 4,6,7,8,9,10,21, and 23, accounting for 12.17% of the variance. In total, 34.40% of the variance in this sample was explained by these two factors. Items and their factor loadings were presented in Table 3.4.

Table 3.4

Foctor Loadings of the Mathematics-Related Belief Scale's Items.

	Factor Loading	
Items	Constructivist Belief	Traditional Belief
Item 17	**.66**	-.02
Item 16	**.64**	.00
Item 18	**.63**	.08
Item 25	**.61**	.10
Item 27	**.60**	.06
Item 19	**.55**	.14
Item 24	**.55**	.13
Item 2	**.54**	-.00
Item 26	**.54**	.03
Item 1	**.50**	-.02
Item 11	**.49**	.15
Item 12	**.46**	.06
Item 15	**.43**	-.08
Item 14	**.40**	.13
Item 20	**.39**	.26
Item 5	**.34**	.26
Item 22	**.34**	.27
Item 8	-.25	**.64**
Item 23	-.14	**.61**
Item 7	-.41	**.52**
Item 21	-.12	**.52**
Item 10	-.15	**.49**
Item 4	.11	**.46**
Item 9	.05	**.46**
Item 6	-.38	**.45**
Eigen values	5.78	3.17
% of Variance	22.23	12.17

Note. Extraction Method: Principal Axis Factoring. Rotation Method: Direct Oblimin.

In addition, Cronbach's alpha coefficients were calculated as .85 and .77 for CB and TB factors, respectively. Each item also revealed high or moderate correlation with the corresponding factor, as a confirmation for the internal consistency of the scale. Table 3.5 illustrates the item-total correlations and Cronbach's alpha if item deleted values.

Table 3.5

Item Total Correlations and Cronbach's Alpha If Item Deleted Values for MRBS.

Items	Item Total Correlation	Cronbach's Alpha If Item Deleted
Items of CB		
Item 1	.46	.84
Item 2	.51	.84
Item 5	.35	.85
Item 11	.47	.84
Item 12	.43	.84
Item 14	.40	.85
Item 15	.37	.85
Item 16	.57	.84
Item 17	.59	.84
Item 18	.57	.84
Item 19	.52	.84
Item 20	.39	.85
Item 22	.35	.85
Item 24	.50	.84
Item 25	.57	.84
Item 26	.49	.84
Item 27	.54	.84
Items of TB		
Item 4	.33	.77
Item 6	.48	.75
Item 7	.55	.73
Item 8	.61	.72
Item 9	.34	.77
Item 10	.48	.75
Item 21	.44	.75
Item 23	.54	.74

Note. Cronbach's Alpha Values for CB, and TB are .85, and .77 respectively.

3.4.3 Validity and Reliability Analyses of Turkish Version of the Teachers' Sense of Efficacy Scale

In order to check out the three-factor structure proposed by Çapa et al. (2005) of the Turkish Version of the Teachers' Sense of Efficacy Scale, confirmatory factor analysis was conducted through AMOS 4.0 (Analysis Moment of Structure).To evaluate the goodness of fit of the model, chi-square, comparative fit index (CFI), non-normed fit index (NNFI), and root mean square error of approximation (RMSEA) values were examined. Although the analyses revealed a significant chi-square value of 823.513, CFI value of .98 and NNFI value of .98 met the criteria for a good-fit model since they were higher than .95 (Byrne, 2010). Additionally, the RMSEA value of .08 corresponded to the moderate fit range recommended by Browne and Cudeck (1993). Therefore, the three-factor structure presents an acceptable fit to the data collected in the present study.

Furthermore, each item revealed a significant contribution to existing factor structure with estimations ranging from .65 to .57 for efficacy for student engagement (ESE), from .74 to .48 for efficacy for instructional strategies (EIS), and from .77 to .49 for efficacy for classroom management (ECM). Besides, correlation between proposed three factors of the scale ranges from .85 to .76. Figure 3.3 presents the standardized estimates of the analysis.

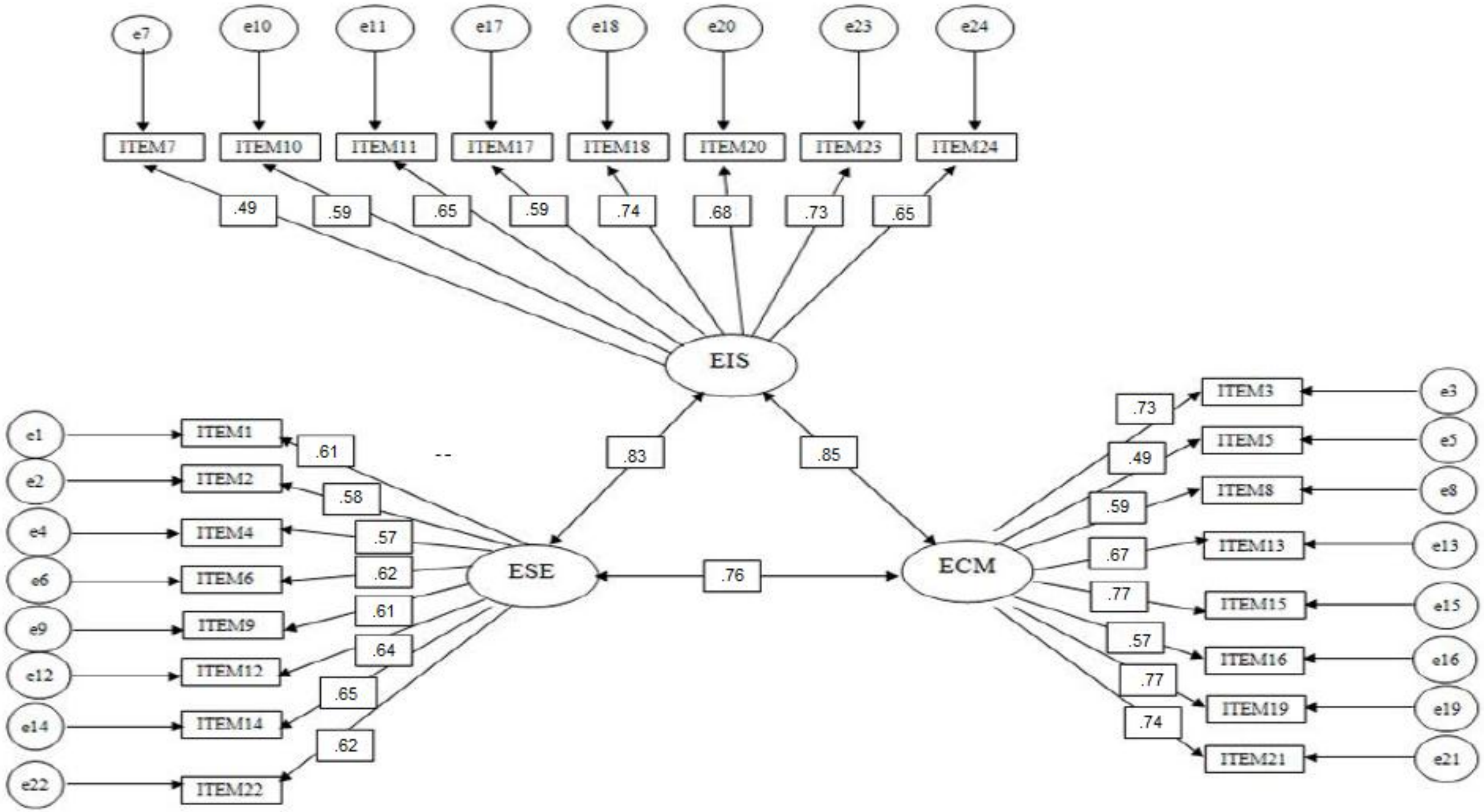


Figure 3.3 Confirmatory Factor Analysis of Turkish Teachers' Sense of Efficacy Scale

Note. ECM: Efficacy for Classroom Management; EIS: Efficacy for Instructional Strategies; ESE: Efficacy for Student Engagement.

For reliability of the scale, Cronbach's alpha values were computed. As an evidence for the internal consistency of the scale, the Cronbach's alpha values were found as .83, .84, and .86 for ESE,EIS, and ECM respectively. Correlation of each item with the corresponding factor was also moderately high (above .40) as an indicator of being an efficient component of related factor. Table 3.6 demonstrates item-total correlations and Cronbach's alpha if item deleted values for each factor.

Table 3.6

Item Total Correlations and Cronbach's Alpha If Item Deleted Values for TTSES.

Items	Item Total Correlation	Cronbach's Alpha If Item Deleted
Items of SE		
Item 1	.58	.80
Item 2	.52	.81
Item 4	.53	.81
Item 6	.56	.80
Item 9	.54	.81
Item 12	.55	.81
Item 14	.61	.80
Item 22	.51	.81
Items of IS		
Item 7	.44	.84
Item 10	.52	.83
Item 11	.60	.82
Item 17	.53	.83
Item 18	.69	.81
Item 20	.63	.82
Item 23	65	.82
Item 24	.59	.83
Items of CM		
Item 3	.69	.83
Item 5	.44	.86
Item 8	.52	.85
Item 13	.62	.84
Item 15	.70	.83
Item 16	.50	.86
Item 19	.72	.83
Item 21	.68	.83

Note. Cronbach's Alpha Values for SE, SI, and CM are .83, .84, and .86 respectively.

3.5 Data Collection Procedures

At the beginning of data collection process, the required permissions from METU Human Subjects Ethics Committee and Ministry of National Education were obtained as conformity of the current study to the principles of the ethical practice. For confidentiality issue, data were collected anonymously. Voluntary participation was taken as the basic fundamental of data collection process and all participants were explicitly informed about the purpose and the content of the study.

Data collection process was carried out within three months during the spring semester of 2014-2015 academic year. Mathematics teachers did not accept to fill in surveys immediately because of their busy workload. Since teachers could not be observed during completion of surveys, it was assumed that they responded to the each item in an honest and accurate manner without regarding social desires.

3.6 Data Analysis

In order to answer the research question, multiple regression analysis which enable researcher to predict outcome variable from several predictor variables (Field, 2013), was carried out. In this study, the outcome variable was specified as the extent of teachers' curriculum implementation and intended to be predicted by nine predictive variables, which are teacher demographics, mathematics-related beliefs, and self - efficacy beliefs. Categorical variables, analyzed in the present study, were only gender and participation to in-service training programs. Since both of them had two levels, any coding procedure was not applied. Continuous variables of the analyses were identified as years of teaching experience, years of teaching experience in the current school, constructivist mathematics beliefs, traditional mathematics beliefs, efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management.

Tabachnick and Fidell (2013) suggested the appropriate sample size for multiple regression as above 50+8m, where m refers to number of predictors. For this study, adequacy of sample size for multiple regression was confirmed since the lower limit of advised sample size corresponded to 122. Moreover, the assumptions of multiple regression analysis (normality, multicollinearity, homoscedasticity, linearity, and independent errors) were checked before conducting the required analyses.

Hierarchical regression method was preferred in this study to manipulate the entry order of predictors. In literature, the common form of ordering the variables relies on good theoretical reasoning (Field, 2013; Tabachnick & Fidell, 2013). Consistently, mathematics-related beliefs and teacher self-efficacy beliefs were entered into the model after controlling for teacher demographics during regression analysis, due to their significance in predicting the degree of curriculum implementation.

3.7 Limitations of the Study

A self-report survey instrument was utilized to collect data in the current study. Therefore, there exist some limitations stemming from the nature of the self-report survey. First of all, the main assumption in this study is that teachers reflect their real thoughts in an honest and accurate way. However, teachers may not understand the items of the instrument in the intended form by its developers or they can reflect their behaviors in ways they want to act, instead of their real performance. Furthermore, responses in teacher self-reports may be also distorted due to ego enhancement, guilt, denial, or social desirability (Ross, McDougall, & Hogaboam-Gray, 2003).

Secondly, this study is limited to the perceptions of mathematics teachers about the curriculum implementation process. Real classroom practices of teachers and the quality of teacher-student interactions cannot be reflected accurately in that extent. Furthermore, teachers were not observed while they were filling the instrument. Hence, any unexpected event during that process may distort teachers’ responses. Additionally, due to the changing school environment, location threat may also influence teachers’ thoughts in a particular extent.

The third limitation stems from the sampling strategy and poses a threat for the external validity. The target population of the study is restricted to the elementary mathematics teachers working in three districts of Ankara. Moreover, convenience sampling methodology which is not based on randomization was utilized due to the same restrictions. Because of these reasons, the generalizability of the findings is limited to those teachers with the similar characteristics of research sample.

Finally, predictive correlational research design was used in this study. The main focus in predictive correlational studies is to identify predictive relationships between variables without manipulating them (Fraenkel et al., 2012).Hence, causal inferences cannot be drawn based on the research findings.

CHAPTER 4

RESULTS

This chapter aims to present research findings regarding the predictors of the extent of elementary mathematics teachers' curriculum implementation. In the first part, descriptive statistics concerning dependent and independent variables are introduced. Then, the assumptions of multiple regression analysis are presented. The chapter is concluded with the findings of hierarchical multiple regression analyses.

4.1 Results of Descriptive Statistics

Analyzing descriptive statistics findings is important to visualize the general picture of teachers' judgments in terms of (1) the extent of curriculum implementation, (2) their sense of efficacy for instructional strategies, for student engagement, and for classroom management, and (3) mathematics-related beliefs concerning traditional and constructivist approaches in education. As teacher demographics (gender, age, years of experience, and participation to in-service training programs) and school environment (class size, motivation and success levels of students, and level of discipline problems) were presented in sample characteristics section (Section 3.5), they were not discussed in this part. Table 4.1 illustrates descriptive statistics for curriculum implementation, teachers' mathematics-related beliefs, and their self-efficacy beliefs.

Table 4.1

Descriptive Statistics for Curriculum Implementation Level and Teacher Beliefs.

Variable	*M*	*SD*
Curriculum implementation	3.96	0.46
Traditional mathematics-related beliefs	3.19	0.70
Constructivist mathematics-related beliefs	4.38	0.37
Efficacy for student engagement	6.64	0.87
Efficacy for instructional strategies	7.33	0.86
Efficacy for classroom management	7.25	0.88

According to results, the implementation level of major principles in present elementary mathematics curriculum (*M*=3.96, *SD*=0.46) was evaluated as "high," regarding the criterion (*M* value above 3.41) proposed by Ulubay (2007). For this dimension, the highest mean score (*M*=4.44, *SD*=0.65) was computed for item 2,"Explaining the solution of a problem and related procedures," while the lowest mean score (*M*=3.43, *SD*=0.81) was computed for item 1, "Demonstrating a problem by the help of a table or a graph."

In terms of teachers' mathematics-related beliefs, the constructivist belief factor presented a relatively higher mean score (*M*=4.38, *SD*=0.37) comparing to the traditional factor (*M*=3.19, *SD*=0.70). At the item level, participating elementary mathematics teachers showed the most agreement with the item18 (*M*=4.62, *SD*=0.58), "Students should have the possibility to experience that the same result can be achieved in different ways" in the constructivist factor. The most reported disagreement, however, was revealed on the item 7 (*M*=2.24, *SD*=1.13), "Textbook should be followed to teach mathematics without considering the relevancy of the concepts" in traditional domain, by mathematics teachers.

Concerning teachers' sense of efficacy, descriptive statistics indicated that elementary mathematics teachers evaluated themselves as relatively more efficacious in instructional strategies (*M*=7.33, *SD*=0.86) than in classroom management (*M*=7.25, *SD*=0.88) and student engagement (*M*=6.64, *SD*=0.87). On a 9-points rating scale, mean scores for teacher efficacy corresponded to the higher end of the scale. Among the all items of the instrument, the greatest mean value (M=7.89, SD=1.09) was calculated for an item in efficacy for instructional strategies factor, which was item 7, “How well can you respond to difficult questions from your students?” On the other hand, item1 (“How much can you do to get through to the most difficult students?”) from the efficacy for student engagement factor, was rated as the lowest mean value.

4.2 Results of Multiple Regression Analyses

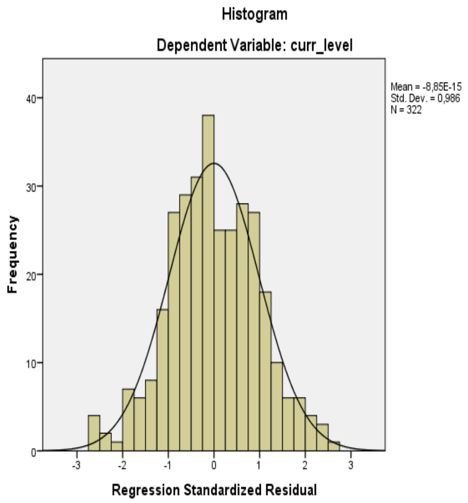
In the current study, a hierarchical multiple regression analysis was carried out to investigate the extent of curriculum implementation from several predictors including teacher self-efficacy beliefs, mathematics-related beliefs, and teacher demographics. The entry order of the predictor variables was determined according to their theoretical background. Teachers’ mathematics-related beliefs and self-efficacy beliefs were entered after teacher demographics, based on their theoretical significance in the literature. More specifically, the predictor variables were entered into the equation in three blocks in the following order:

1. Teacher demographics: gender, years of teaching experience, years of teaching experience in the current school, and participation to in-service training programs
2. Mathematics-related beliefs: traditional mathematics-related beliefs and constructivist mathematics-related beliefs.
3. Teacher self-efficacy beliefs: efficacy for instructional strategies, efficacy for student engagement, and efficacy for classroom management.

4.2.1 Assumptions of Multiple Regression Analysis

The assumptions of multiple regression analysis were checked before conducting the analyses. In that context, (1) normality of errors, (2) linearity, (3) homoscedasticity, (4) independence of errors, (5) outliers, and (6) multicollinearity were examined.

Normality assumption refers to the normal distribution of errors in the model. To check this assumption, both the histogram (Figure 4.1) and the probability plot (P-P plot) of residuals (Figure 4.2) were observed. As the normal curve in histogram revealed an acceptable form and residuals in the probability plot were distributed closely to the 45-degree line, normality assumption was deemed to be satisfied. In addition, the linearity assumption, which is indicated by a straight-line showing the relation between predictors, was checked by examining the residuals scatterplot. Since any problematic case was observed in scatterplot, it was concluded that there was no violation for linearity assumption.



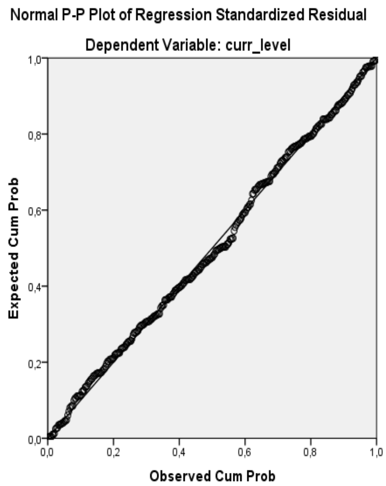


Figure 4.1 Histogram of Errors

Figure 4.2 P-P plot of Errors

As another assumption, homoscedasticity was concerned. To meet this assumption, the variance of the error term should be same for each level of the predictor variables. When the scatterplot of residuals was examined, no apparent pattern of residuals was observed, indicating that homoscedasticity assumption was ensured.

Independence of errors requires that residual terms should be uncorrelated for any two observations. Durbin-Watson coefficient was utilized to test this assumption. As proposed by Field (2013), a test value less than 1 or greater than 3 created a correlation between residuals, showing violation of this assumption. However, values closer to 2 are considered as tenable. In this study, independence assumption was not violated due to Durbin-Watson value of 1.97.

Outliers were checked to be aware of the possible biases in the results due to influence of outliers on the values of estimated regression coefficients (Field, 2013). For this aim, firstly the partial scatter plots of residuals were generated and no obvious outlier was observed on the plots. Secondly, the cases with absolute standardized residual value greater than 2 and 2.5 were examined. The percentage of the cases with standardized residual values above 2 was found as 4.3%, which was less than 5%, as required. Moreover, the percentage of the cases with standardized residual values above 2.5 was 0.09%, also less than the cut point, which is identified as 1% (Field, 2013). Any case with a standardized residual value above 3 is observed. Finally, the Cook's distances were investigated. The largest value was found as .06, which is below 1. Hence, findings indicated that there were no outliers in this data set.

Finally, to meet the requirement of "no multicollinearity," there should be no perfect linear relationship among two or more predictive variables (Huck, 2012). High correlation between predictors makes it difficult to assess the individual importance of a variable since it becomes impossible to conclude the unique estimates of the regression coefficients. Examining multicolllinearity herein was carried out through two ways. Firstly, correlation matrix was examined for a preliminary look for multicollinearity and to see if there existed a high correlation (above .80) between any two predictors. The correlation matrix showed that, all correlation coefficients were below .80, ranging from .00 to .54. Secondly, variance inflation factor (VIF) and tolerance statistics were examined. For this data set, all VIF scores (between 1.09 and 2.90) were below 10 and all tolerance scores (between .35 and .92) were above .10 (Huck, 2012). Therefore, both of investigations revealed no multicollinearity.

4.2.2 Intercorrelations among Predictors and Their Relation to Dependent Variable

Before running regression analysis, intercorrelations among predictors and their relationship with the dependent variable were examined. Correlation matrix is presented in Table 4.2.

Table 4.2

Intercorrelations for Curriculum Implementation Level and Predictor Variables

Variable	1	2	3	4	5	6	7	8	9
Curriculum implementation level	-.02	.10*	.03	-.10*	.15*	.47*	.31*	.41*	.27*
Predictor variables									
1. Gender	--								
2. Years of teaching experience	--	--							
3. Years of teaching experience in the current school	--	.40*	--						
4. Participation to in-service training programs	.03	-.19*	-.10	--					
5. Traditional mathematics-related beliefs	.10	.32*	.08	-.01	--				
6. Constructivist mathematics-related beliefs	.01	.00	-.10	-.07	-.12*	--			
7. Efficacy for instructional strategies	.03	.03	-.02	-.15*	-.02	.37*	--		
8. Efficacy for student engagement	-.01	.05	-.02	-.15*	.11	.30*	.70*	--	
9. Efficacy for classroom management	-.04	.01	-.02	-.15*	-.04	.34*	.77*	.67*	--

*p< .05

Findings indicated that there existed a positive and statistically significant relationship between the extent of curriculum implementation and teacher self-efficacy (in terms of student engagement, instructional strategies, and classroom management), traditional mathematics-related beliefs and constructivist mathematics-related beliefs. These findings indicated that as teacher self-efficacy beliefs and mathematics-related beliefs increase, the degree of implementation of current curriculum increases as well, or vice versa. In addition, there was a significant positive relationship between teaching experience and the degree of implementation.

Regarding with the intercorrelations among the predictor variables, the most significant and positive association was observed between the factors of teacher self-efficacy beliefs. Constructivist mathematics related beliefs, moreover, were found as significantly and positively correlated with each domain of teacher efficacy. In addition, a significant and negative relationship was observed among traditional and constructivist approach of mathematical beliefs.

4.2.3 Regression Analysis Results for Curriculum Implementation Level

In this study, hierarchical multiple regression analysis was conducted to investigate to what extent the independent variables predicted the curriculum implementation level. Table 4.3 presents the results.

Table 4.3

Hierarchical Multiple Regression Analysis Results for Curriculum Implementation Level

Variable	*B*	*SEB*	β	sr^2	*R*	R^2	ΔR^2
Step 1: Teacher demographics					.14	.02	.02
Gender	-.06	.05	-.06	.00			
Years of teaching experience	.00	.00	.03	.00			
Years of teaching experience in the current school	.01	.01	.06	.00			
Participation to in-service training programs	-.02	.05	-.02	.00			
Step 2: Mathematics-related beliefs					.52	.27*	.25
Traditional mathematics-related beliefs	.10	.03	.15*	.02			
Constructivist mathematics-related beliefs	.54	.06	.43*	.15			
Step 3: Teacher self-efficacy beliefs					.58	.34*	.06
Efficacy for instructional strategies	-.00	.04	-.01	.00			
Efficacy for student engagement	.17	.04	.31*	.04			
Efficacy for classroom management	-.04	.04	-.08	.00			

*p< .05

In first step, the predictive value of the teacher demographics in terms of gender, years of teaching experience, years of teaching experience in the current school, and participation to in-service training programs were examined. Findings revealed that teacher demographics did not significantly predict the extent of curriculum implementation, $F(4, 317) = 1.586$, $p > .05$. This model only explained 2% of variance in curriculum implementation level. According to these results, teaching experience or other demographics did not have a significant influence on the extent of curriculum implementation.

In second step, after teacher demographics were controlled, mathematics-related beliefs significantly contributed to explaining the degree of curriculum implementation, $F(6, 315) = 19.681$, $p < .05$. This model accounted for an additional 25% of the variance in this data set. Constructivist mathematics-related belief made the highest unique contribution of 15% to the whole explained level of variance. On the other hand, traditional mathematics-related belief was also evaluated as a significant contributor of the results through accounting alone 2% of the variance. These results revealed that mathematics teachers who sustained both more constructivist and traditional approach toward mathematical beliefs were more likely to implement the major premises of the current mathematics program.

In last step, after teacher demographics and mathematics-related beliefs were controlled, teacher self-efficacy beliefs significantly predicted the extent of curriculum implementation $F(9, 312) = 17.440$, $p < .05$. This model explained an additional 6% of the variance in the extent of curriculum implementation. Among the dimensions of self-efficacy beliefs, only efficacy for student engagement was significant through an individual contribution of 4% to the total explained level of variance. Efficacy for instructional strategies and efficacy for classroom management, on the other hand, were not significant. Consequently, it can be concluded that teachers who evaluated themselves as more efficacious in student engagement area, implemented the present curriculum in a higher extent.

In overall, results of hierarchical multiple regression analysis indicated that the linear combination of teacher demographics, mathematics related beliefs, and teacher self-efficacy beliefs explained a total of 34% of the variance in the extent of curriculum implementation. Moreover, constructivist mathematics-related beliefs, traditional mathematics-related beliefs, and efficacy for student engagement were specified as the statistically significant contributors of the total explained variance level in this data set. Among these three independent variables, constructivist mathematics related beliefs accounted for the greatest portion of the explained variance by 15%. It was followed by efficacy for student engagement (4%) and traditional mathematics related beliefs (2%) based on their unique contributions to the results. Interestingly, any of the teacher demographics including gender, teaching experience, and participation to in-service training programs were not found to be significant.

4.3 Summary of the Research Results

Firstly, descriptive statistics indicated that the degree of curriculum implementation at elementary level in mathematics classrooms was identified as the "high," which was very close to the intended level by the current mathematics program (Ulubay, 2007). In addition, elementary mathematics teachers evaluated their efficacy to engage students, manage classrooms, and to use instructional strategies as relatively high on a nine-point rating scale. Moreover, participating elementary mathematics teachers held a more constructivist view towards mathematical judgments about its nature, teaching mathematics, and learning mathematics whereas they did not totally reject the traditional approaches.

According to regression analysis, teacher demographics did not alone have a considerable influence on predicting the extent of curriculum implementation. Mathematics-related beliefs and teacher self-efficacy beliefs, on the other hand, had a unique and significant effect on the extent of curriculum implementation. When the contribution of teacher demographics was controlled, teachers who have both traditional and constructivist mathematics-related beliefs and who perceived a higher level of efficacy for student engagement, were more likely to implement the present mathematics curriculum.

CHAPTER V

DISCUSSION

In this chapter, findings of the present study are interpreted in relation to the previous studies. Next, implications of the study for practice are explained. Finally, suggestions for future studies are presented.

5.1 Summary of the Results

The current study was conducted with the aim of investigating the influence of teacher demographics (gender, years of teaching experience, years of teaching experience in the current school, and participation to in-service training program), teachers' mathematics-related beliefs (traditional mathematical beliefs and constructivist mathematical beliefs), and teacher self-efficacy beliefs (efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management) on the extent of curriculum implementation in elementary mathematics classrooms. Data were collected from 322 elementary mathematics teachers through a four-section survey instrument which was consisted of (1) Curriculum Implementation Scale, (2) Mathematics-Related Belief Scale, (3) Turkish Version of the Teachers' Sense of Efficacy Scale, and (4) Demographics Information Form.

Findings of descriptive statistics indicated that elementary mathematics teachers' degree of curriculum implementation was at high level. In addition, they follow relatively a more constructivist perspective towards mathematical beliefs whereas they did not totally reject the traditional perspective. Moreover, their judgments on their competency in terms of student engagement, instructional strategies, and classroom management pointed out a relatively high level sense of efficacy. Multiple regression analysis showed that teachers' mathematics-related beliefs and teacher self-efficacy beliefs (more specifically, efficacy for student engagement) were strong predictors of the curriculum implementation level. Teachers who were more constructivist in their mathematical views about the nature of mathematics, teaching mathematics, and learning mathematics and who had a higher sense of efficacy for student engagement were more likely to implement major premises of the current mathematics curriculum. Interestingly, traditional mathematics-related belief was also found to be significant. Teacher demographics, on the other hand, did not have considerable effect on the degree of curriculum implementation.

5.2 Discussion of the Research Results

Firstly, the implementation degree of present mathematics curriculum was reported as "high" level in consistence with the findings of Ulubay (2007). That is to say, elementary mathematics teachers reported that they use various types of methods suggested by current curriculum to support student learning (Ulubay, 2007). Moreover, this result also confirmed the findings of Bulut (2006) and Türk (2011), which indicated the frequent usage of new methods and techniques proposed in the present mathematics curriculum by teachers. This conclusion can be interpreted in two ways. Teachers may have reported what they actually did in the classroom and reflected the real phenomena or they may have stated what they desired to do instead of their real accomplishments. Due to the limitations stemming from the self-report inventories, reliability of teachers' responses can be questionable to some extent. Teachers' evaluation on their performance may change according to their understanding of what the term ''implementation'' refers to and the specified criteria for the efficient accomplishment of an educational activity. As the present study was mainly grounded on the assumption that teachers report their judgments in an honest and accurate manner, the high degree of constructivist curriculum implementation can be interpreted as the actual reflection of real classroom practices.

In terms of predictive value of parameters, mathematics-related beliefs and self-efficacy beliefs were determined as the significant contributors of the extent of curriculum implementation while teacher demographics did not show a considerable effect on teachers' implementation of present curriculum. Among these variables, mathematics-related beliefs were assigned as the strongest predictor of the extent of curriculum implementation. This finding was consistent with a noticeable number of studies in literature (e.g., Aguirre, 2009; Goldin, Rösken, & Törner, 2009; Guskey, 1987; Pajares, 1997; Sapkova, 2014; Thompson, 1992). For the development of mathematics education, reform attempts in the context of curricular modifications are far more than adjusting the content or revisions in textbooks (Goldin et al., 2009).A set of approaches, ideas, and practices comes together to form a central organizer of the action. The main educational changes can be realized through the efforts of teachers. Consistently, a set of complex relationships exists between the mathematics-related beliefs and teachers' plans for practices (Aguirre, 2009; Goldin et al., 2009; Kayan & Haser, 2013; Sapkova, 2014; Thompson, 1992).Indeed, mathematical beliefs of teachers behave as the representative of teachers' intentions of actions and manage a crucial role for the successful implementation of reforms in mathematics education (Aguirre, 2009).

Findings of the study indicated that elementary mathematics teachers adopted a more constructivist view towards the nature of mathematics, learning mathematics, and teaching mathematics. This result has a great deal of support from the findings of previous studies conducted in the field (Kayan, 2011; Leder & Forgasz, 2002; Lloyd, 2002; Türk, 2011; Uçar & Demirsoy, 2010; Wilson & Cooney, 2002). More importantly, constructivist mathematical beliefs were determined as the strongest predictor of the degree of teachers' curriculum implementation in consistence with the arguments of Leder and Forgazes (2002), Monouchehri and Goodman (2001), Sapkova (2014), Thompson (1992), and Törner (2002). In other words, teachers who follow a more constructivist approach towards the nature of mathematics and teaching-learning process are more likely to follow the major principles of the current curriculum. Teachers holding constructivist beliefs facilitate students' inquiry, value student-generated ideas, provide opportunity for learners to solve problems through their own efforts, and emphasize the active involvement of learners to the construction of mathematical ideas (OECD, 2009). In constructivist view of mathematics teaching, students and their needs are put at the core of instruction and student-centered instructional methods are preferred (Sapkova, 2014). Based on these facts, the highly considerable influence of constructivist beliefs on the implementation of present student-centered program was not an unexpected finding.

On the other hand, an interesting finding of the current study was the ongoing prevalence of traditional mathematical beliefs among teachers and the considerable influence of traditional perspectives on the extent of curriculum implementation. The prevalence of traditional mathematics related beliefs among teachers might be explained by the nature of beliefs. As frequently stressed in the literature, beliefs are structured in clusters and interaction among these groups is at the minimum level (Richardson, 2003).This clustering property blocks the cross-fertilization among different belief systems and enables to have conflicting and incompatible beliefs at the same time (Green, 1971). The study conducted by Green (1971) also revealed that pre-service mathematics teachers held traditional and constructivist beliefs simultaneously due to the clustering property of the belief systems.

In addition, with the changing perspectives in mathematics education, a noticeable dissatisfaction existed in terms of teacher beliefs about nature of mathematics, learning mathematics, and teaching mathematics (Goldin et al., 2009; Thompson, 1992; Törner, 2002; Wilson & Cooney, 2002). Teachers' pre-existing traditional views were challenged by modern approaches in mathematics education and consequently, a replacement or readjustment process was started for belief structures. In fact, each belief system tries to reach equilibrium and the beliefs, which create dissatisfaction, are profoundly criticized according to personal rationales (i.e., needs, desires, and goals) (Op'tEynde et al., 2002). During that process, prior knowledge and earlier beliefs intervene and thus the desired stabilization of belief system occurs. On the other hand, the absolute transformation of belief systems does not occur immediately and can take longer time than expected. In congruence with that fact, concurrent existence of traditional and constructivist beliefs may have originated from the continuing process of change in mathematics-related beliefs.

Another interesting finding was the significance of both constructivist and traditional mathematics-related beliefs in predicting the extent of curriculum implementation. In fact, all the educational theories intersect somewhere, they feed each other and they cannot be separated totally (Combs, Popham, & Hosford, 1977; Dembo, 1981). Each theory was born based on the deficiencies of the previous one and this ongoing relationship supports the continuity of educational improvements. Then, there is not a certain distinction among educational approaches since varying conditions and changing needs require the implementation of various techniques and materials suggested by different theories (Combs et al., 1977). Consistent with this argument, several constructivist items in the Mathematics-Related Belief Scale also held some traditional aspects and vice versa. For instance, item 22, in the constructivist factor, “Students should put effort to understand the justification of the mathematical procedures” was not an argument totally rejected by traditional views. Likewise, item 9, in traditional factor, “Students should practice extensively to learn mathematics” also stressed a common judgment for permanent learning that was also accepted in most of the constructivist classrooms. Therefore, the stated association between traditional mathematics-related beliefs and curriculum implementation might be regarded as tenable in that context. In overall, each theory has both advantages and disadvantages; here the crucial issue is to know how to get benefit from each theory and use them appropriately. As Don Snygg said: “Sometimes you can sell more papers by shouting louder on the same corner, but sometimes you will do much better by moving to another corner” (as cited in Combs et al., 1977,p.57).

The other distinctive result of the study was the significant influence of teacher self-efficacy beliefs on curriculum implementation level. This finding has a strong standing in literature through the contributions of numerous researchers (e.g., Bandura, 1997; Gibson &Dembo, 1984;Guskey, 1987;Henson, 2001; Pajares, 1997; Tschannen-Moran et al., 1998; Zimmerman, 1995).In Turkish context, several studies also existed which confirmed the related finding (Çakıroğlu, 2008; Dede, 2008; İşler, 2008). Efficacy beliefs, as a motivational construct, guide teachers on how they should utilize from their knowledge, skills, and experiences in a particular context. Thereby, teachers’ sense of efficacy enhances their actions in classroom, their position towards new ideas, and their attitudes toward teaching to a considerable extent (Guskey, 1987). Therefore, it was expected to find a significant relationship between teacher self-efficacy beliefs and level of present curriculum implementation.

Moreover, results highlighted that teachers with higher sense of efficacy were more likely to actualize the basic arguments of the student-centered curriculum. As frequently mentioned in literature, teacher self-efficacy beliefs, as the significant predictors of their preferences and behaviors, have a powerful influence on the amount of effort they put for teaching, the goals they set, their persistence towards obstacles, their resilience to failures, and their enthusiasm (Gibson & Dembo, 1984; Henson, 2001; Pajares, 1997; Tschannen-Moran et al., 1998; Zimmerman, 1995).In accordance with this fact, teachers with high sense of efficacy are advocates of reform attempts, more willing to experience new methods and materials, and tend to present a great deal of planning and organization for the accomplishment of intended educational goals (Tschannen-Moran et al., 1998).

Furthermore, efficacious teachers evaluate problems as challenges to be accomplished and do not give up to struggle with them easily. Accordingly, they put high-level goals for themselves and show a strong commitment to them. Their confidence is not easily weakened even faced with failures as they attribute failure to insufficient effort rather than deficient ability (Pajares, 1997; Zimmerman, 1995).Conversely, teachers with low sense of efficacy approach events with a narrow vision and avoid experiencing the changing views in education. They attribute failure to their incapability and decrease their motivation through this way while fostering anxiety and stress level. Hence, efficacious teachers can be regarded as the effective implementers of current curriculum as the basic demands of student-centered approaches like active involvement of learners, flexible nature of instruction, process-oriented and eclectic aspects of assessment, and collaboration with parents can be met only by teachers with high sense of efficacy (Bandura, 1986, 1997).

Although teacher self-efficacy was determined as the significant predictor of curriculum implementation level, not all dimensions but only efficacy for student engagement was responsible for a considerable influence on the reported extent of elementary mathematics teachers’ curriculum implementation. Efficacy for classroom management and efficacy for instructional strategies were not significant. In the study conducted by Çobanoğlu (2011), similar results were obtained in terms of teacher efficacy for classroom management. This part of the result can be explained by independence of management skills from instructional capabilities demanded by current approaches. Handling with students’ disruptive behaviors and ensuring the continuity of instruction are not among the interest of student-centered teaching views. Instead of that, major premises of student-centered approaches regard the implementation process as a more complicated phenomenon than the simple transmission of knowledge. Curriculum implementation, in these views, refers to the actualization of the educational innovations through the changes in learners' knowledge, actions, attitudes, and perceptions (Ornstein & Hunkins, 2004). Hence, being an efficient classroom manager does not provide to be an effective implementer of curriculum in this context. In addition, reports of the participant teachers of this study showed that they in general have been working in classrooms where students' success and motivation levels were at least medium level and the frequency of discipline problems was not high. In other words, their working conditions did not require high level classroom management skills. Accordingly, relationship between the teachers' classroom management skills and reported degree of curriculum implementation may not be actually reflected to the results.

What is more on this result is the ineffective role of efficacy for instructional strategies on the extent of curriculum implementation. The studies conducted by Budak (2011), Meşin (2008), and Ulubay (2007) indicated that elementary mathematics teachers mostly appreciated the active involvement of learners, individual construction of knowledge, and cooperative nature of instruction in current education program. However, they continued to perform traditional methods while they defined themselves as modernist (Meşin, 2008). Moreover, most of the items in *the Curriculum Implementation Scale*, utilized in the present study, mostly examined the teachers' effort for active involvement of learners and their contribution to students' construction of knowledge. Therefore, teachers' efficiency to use new methods and techniques suggested by the present mathematics curriculum may not be investigated actually.

Finally, findings of the study revealed that teacher demographics including gender, years of teaching experience, years of teaching experience in the current school, and participation to in-service training programs did not make a considerable contribution to teachers' curriculum implementation degree. This result showed parallelism with the findings of Budak (2011), Meşin (2008), and Türk (2011).

5.3 Implications for Practice

The major goal of this study was to contribute to the improvement process of mathematics program by informing authorities about several factors that significantly influence the implementation process. Results of the study indicated that teachers who adopted a more constructivist view for mathematics related beliefs are more likely to perform major premises of the present mathematics curriculum. Moreover, teacher self-efficacy beliefs have a great influence on the extent of teachers' curriculum implementation. Finally, as an unexpected result, participation to in-service teacher training programs do not have a significant predictive value on the extent of curriculum implementation nor does the teaching experience. In the light of these conclusions, following implications for practice can be drawn from the present study.

To begin with, teachers as the main actors for the success of an educational innovation should be more active in the design process of the reform movements (Manouchehri & Goodman, 1998). Their views and opinions should be regarded more seriously. Especially, teachers' mathematics-related beliefs, as the strongest predictor of curriculum implementation degree, should be examined extensively and the ways to encourage such beliefs should be investigated. Teacher beliefs towards teaching and learning influence how they evaluate, value, and implement the curriculum (Manouchehri & Goodman, 1998). Hence, both teacher education programs and in-service training programs should take the teacher beliefs at the center to ensure the adaptation of prospective and experienced teachers to high-level educational reforms. Courses in teacher education programs should be designed in a more constructivist framework. Moreover, teaching practice courses in these programs should be increased and allow prospective teachers to experience current approaches in education more frequently since beliefs are formed based on personal experiences (Furinghetti & Pehkonen, 2002).

Secondly, teachers with higher sense of efficacy implement the curricular activities closer to the intended level. For the success of educational reforms, teacher self-efficacy beliefs should be encouraged. For instance, four basic factors specified as collaboration with colleagues, positive feedback on the performance, active parent involvement, and school-wide coordination for student development significantly contribute to teachers' sense of efficacy whereas excessive workload, insufficient salaries, low status, poor morale, and lack of recognition were found to result in a considerable decrease in teacher self-efficacy beliefs (Bandura, 1997; Henson, 2001; Tschannen-Moran et al., 1998). Therefore, especially authorities in education should make some adjustments in teachers' working conditions in terms of insufficient salaries, social rights, and their inadequate authority in educational processes. In addition, administrators should provide a supportive school environment to enhance teachers' sense of efficacy. Collaboration in all members of schools and parent involvement to educational activities should be encouraged in that context.

Finally, as an unexpected result, in-service teacher training programs do not have a considerable influence on teachers' implementation level. This point should cause basic concerns for educational authorities as the in-service training programs are the basic way of adapting in-service teachers to educational innovations. The content of these programs should be reconsidered and revision attempts should be designed by regarding teacher beliefs. It should not be disregarded that each reform in education is the product of huge efforts and financial resources and it is condemned to be just a written document unless teachers implement properly (Saylor et al., 1981).

5.4 Recommendations for Future Studies

As any other study, the current study was performed with basic limitations stemming from selected research design, sampling strategy, data collection instrument, and data collection procedures. Due to this fact, findings of the study are required to be supported by additional evidences provided by the future attempts in this field.

First of all, the present study was restricted by nine predictor variables to analyze the degree curriculum implementation. However, curriculum implementation is a more complex phenomenon, which cannot be highlighted through nine factors influencing it. Therefore, this study can be replicated by including alternative variables such as graduate degree of teachers, socio-economic backgrounds of students, level of principal support, teacher workload, and parental involvement and support. Moreover, the curriculum implementation process was evaluated based on only teacher self-report in present study. The opinions of curriculum developers, teachers, students, principals, and parents might be analyzed and interpreted in order to assist the improvement of mathematics curriculum to a greater extent.

Secondly, because of feasibility issues, the sampling strategy of this research was preferred as convenience sampling method, which was not based on randomization. Moreover, the participants of the study were limited by teachers working in three districts of Ankara. These present a threat for the generalizability of the results. Therefore, this study should be replicated with a random sample from different regions of Turkey

Thirdly, the curriculum implementation process in this study was examined based on the elementary mathematics teachers' self-reports. In other words, this study was grounded on the assumption that teachers reflected their classroom practices in an honest and accurate way. However, as frequently stated in literature, self-report responses may be distorted by ego enhancement, guilt, denial or social desirability (Ross, McDougall, & Hogaboam-Gray, 2003). Therefore, future studies should use various data collection methods like direct observation and interview, which are more likely to reflect what teachers exactly do in their classrooms.

Furthermore, factor analysis for the Mathematics-Related Beliefs Scale did not yield consistent results with the original form of the instrument. More importantly, the developer of the instrument also stated the basic problems related with the factorial structure of the scale. Future studies should be conducted to test the factorial structure of the questionnaire. In addition, the analysis of mathematics-related beliefs in terms of nature of mathematics, teaching mathematics, and learning mathematics can lead to a new direction to understand the influence of teachers' mathematical beliefs on the curricular practices. In other words, future efforts should focus on different perspectives in mathematics-related beliefs. Going one step further, studies to investigate the sources of these beliefs can be performed to highlight the complicated nature of this phenomenon.

In addition, results of the current study indicated that participation to in-service training programs did not make a significant contribution to the implementation level of new mathematics curriculum. As most of the teachers are trained for educational reform attempts through this way, the quality of in-service training programs is crucial. Parallel to this fact, further studies should examine the content of such programs and explore the reasons behind this finding.

Finally, the present study was carried out at a single-point in time. Longitudinal research design can be preferred in future studies to evaluate the predictive value of several parameters (like teacher self-efficacy beliefs and mathematics-related beliefs) on curriculum implementation degree over time.

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APPENDICES

APPENDIX A : Data Collection Instrument

Değerli meslektaşlarım,

Çankaya Cumhuriyet Mesleki ve Teknik Anadolu Lisesi'nde matematik öğretmeni olarak görev yapmaktayım. Ayrıca, Orta Doğu Teknik Üniversitesi'nde yüksek lisans öğrencisiyim. Bu anket, sizlerin değişen ilköğretim matematik programının uygulanmasına yönelik görüşlerinizi, özyeterlik ve matematik hakkındaki inançlarınızı öğrenmek amacıyla uygulanmaktadır. Araştırma tamamen bilimsel kriterler çerçevesinde yürütülecek olup, kimlikleriniz çalışmanın herhangi bir kısmında sorgulanmayacaktır. Sonuçların gerçekçi ve geçerli olabilmesi için soruları içtenlikle ve eksiksiz cevaplamanız önem taşımaktadır.

Katkılarınız için şimdiden teşekkür ederiz.

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BÖLÜM I
Matematik Eğitim Programı Uygulama Anketi

Matematik öğretirken, öğrencilerinizden aşağıdaki davranışları ne sıklıkla yapmalarını istiyorsunuz? Her bir madde için görüşünüzü en iyi tanımlayan seçeneği, ilgili rakamı işaretleyerek belirtiniz.

		Hiçbir zaman	Nadiren	Bazen	Sıklıkla	Her zaman
1.	Bir problemde yer alan verileri tablo veya grafik ile gösterme.	1	2	3	4	5
2.	Problemlerin cevaplarını ve işlem basamaklarını açıklama.	1	2	3	4	5
3.	Problem çözerken ortaya koyduğu fikirlerinin arkasındaki sebepleri açıklama.	1	2	3	4	5
4.	Problemin sonucunu tahmin etme ve tahminin doğruluğunu kontrol etme.	1	2	3	4	5
5.	Matematiksel düşüncelerini ifade ederken somut model, şekil, resim, grafik, tablo vb. temsil biçimlerini kullanma.	1	2	3	4	5
6.	Matematik hakkındaki düşüncelerini açık bir şekilde sözlü ve yazılı ifade etme.	1	2	3	4	5
7.	Günlük dil ile matematiksel ifade ve sembollerin anlamlarını dile getirme.	1	2	3	4	5
8.	Matematik hakkında konuşma, yazma, tartışma ve okuma.	1	2	3	4	5

		Hiçbir zaman	Nadiren	Bazen	Sıklıkla	Her zaman
9.	Yaptıkları işlemleri ilgili kavramlarla ilişkilendirme.	1	2	3	4	5
10.	Öğrendiklerini günlük hayatları ile ilişkilendirme.	1	2	3	4	5
11.	Öğrendiklerini diğer derslerle ilişkilendirme.	1	2	3	4	5
12.	Öğrendiklerini matematikte diğer konular ile ilişkilendirme.	1	2	3	4	5
13.	Mantığa dayalı çıkarımlarda bulunma.	1	2	3	4	5
14.	Probleme ilişkin çözüm yollarını ve cevapları savunma.	1	2	3	4	5
15.	Matematiksel bir durumu analiz ederken örüntü ve ilişkileri kullanma.	1	2	3	4	5
16.	Matematikteki örüntü ve ilişkileri analiz etme.	1	2	3	4	5
17.	Tahminde bulunma.	1	2	3	4	5

BÖLÜM II
Matematik Hakkındaki İnançlar

Lütfen aşağıda yer alan ifadeleri değerlendirerek ilgili rakamı işaretleyiniz.

		Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
1.	Öğrencilerin matematiksel kavramları anlayabilmeleri için bu kavramların oluşum sürecine katılmaları gerekir.	1	2	3	4	5
2.	Öğretmenin, öğrencinin aktif olduğu sınıf tartışmasını oluşturması matematik eğitiminde önemlidir.	1	2	3	4	5
3.	Matematik, temelde aritmetik becerilerin günlük hayatta kullanımıdır.	1	2	3	4	5
4.	Matematik bilgisi olgular, kurallar ve işlemlerden oluşur.	1	2	3	4	5
5.	Matematik öğretiminin amacı öğrencilerin matematiksel kavramları araştırarak akıl yürütmelerini geliştirmektir.	1	2	3	4	5
6.	Matematik öğretirken öğrencilerin işlemsel becerilerini artırmak için, kuralların arasındaki ilişkilerin kurgulanması yerine kurallar ezberletilmelidir.	1	2	3	4	5
7.	Matematik öğretiminde konular arasındaki mantıksal ilişkiden çok ders kitabındaki sıra takip edilmelidir.	1	2	3	4	5
8.	Matematik öğretmeni işlemleri matematiksel bilgi olarak göstermelidir.	1	2	3	4	5
9.	Matematiği öğrenmek için öğrenciler çok soru çözmelidir.	1	2	3	4	5
10.	Matematikte, bir bilgi eğer kitap veya öğretmen tarafından anlatılmışsa kesinlikle doğrudur.	1	2	3	4	5
11.	Matematik dersinde matematiksel düşünmenin önemi vurgulanmalıdır.	1	2	3	4	5
12.	Matematik öğretiminde öğretmenler matematiksel oyunlardan da yararlanmalıdır.	1	2	3	4	5

		Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
13.	Matematik eğitiminde öğrencilerin daha önce karşılaşmadıkları şekilde problemleri mümkün olduğunca sık sormak gerekir.	1	2	3	4	5
14.	Matematik dersinde bir kavram problem durumları da yaratılarak öğretilebilir.	1	2	3	4	5
15.	Matematikte hala üretilebilecek yeni bilgiler vardır.	1	2	3	4	5
16.	Öğrenciler matematiksel problemleri kendileri oluşturma ve çözme fırsatına sahip olmalıdır.	1	2	3	4	5
17.	Matematik öğretiminde görsel ve somut gösterimler, materyaller mümkün oldukça sık kullanılmalıdır.	1	2	3	4	5
18.	Öğrenciler aynı sonuca farklı yollardan ulaşabilme fırsatına sahip olmalıdır..	1	2	3	4	5
19.	İspat ve genelleme matematik öğretimi sürecinin önemli bir parçasıdır.	1	2	3	4	5
20.	Matematik öğretiminde materyal ve somut gösterimleri kullanmanın amacı öğrencilerde olumlu tutum geliştirmektir.	1	2	3	4	5
21.	Matematik öğretiminde, konu sonunda problem çözerken öğretmenin öğrettiği basamaklar sırasıyla izlenmelidir.	1	2	3	4	5
22.	Öğrenciler matematik dersinde kullanılan işlemlerin sebeplerini anlamak için çaba harcamalıdır.	1	2	3	4	5
23.	Matematik öğretiminin amacı soru çözerken derste gösterilen yolları kullanarak doğru cevaba ulaşmaktır.	1	2	3	4	5
24.	Matematik öğretiminde öğrenciler tarafından geliştirilen fikirler de dikkate alınmalıdır.	1	2	3	4	5
25.	Matematik öğretimi sürecinde öğrenciler birbirleriyle çalışmaya teşvik edilmelidir.	1	2	3	4	5
26.	Matematik öğretiminde teknolojinin olası kullanımına da önem verilmelidir.	1	2	3	4	5
27.	Matematik öğretiminde işlemlerin yanı sıra, öğrencilerin bilgilerini uygulayabilecekleri problemlere de yer verilmelidir.	1	2	3	4	5
28.	Öğrencilerin matematiği sevmeleri için matematik öğretmenini sevmeleri gerekir.	1	2	3	4	5
29.	Matematik diğer derslerle ilişkili olduğu için önemlidir.	1	2	3	4	5
30.	Matematiksel bilgi öğrencilerin deneyimlerinden kazandıkları bilgileri organize etmeleri sonucunda oluşur.	1	2	3	4	5
31.	Matematik öğretiminin amacı öğrencileri hayata hazırlamaktır.	1	2	3	4	5
32.	Matematik eğitiminde materyaller ve somut gösterimler matematiksel kavramların gelişmesinde etkili değildir.	1	2	3	4	5

BÖLÜM III
Öğretmen Özyeterlik

Lütfen, görüşünüzü en iyi tanımlayan seçeneği, ilgili rakamı işaretleyerek belirtiniz

		Yetersiz		Çok az yeterli		Biraz yeterli		Oldukça yeterli		Çok yeterli
1.	Çalışması zor öğrencilere ulaşmayı ne kadar başarabilirsiniz?	1	2	3	4	5	6	7	8	9

		Yetersiz		Çok az yeterli		Biraz yeterli		Oldukça yeterli		Çok yeterli
2.	Öğrencilerin eleştirel düşünmelerini ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
3.	Sınıfta dersi olumsuz yönde etkileyen davranışları kontrol etmeyi ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
4.	Derslere az ilgi gösteren öğrencileri motive etmeyi ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
5.	Öğrenci davranışlarıyla ilgili beklentilerinizi ne kadar açık ortaya koyabilirsiniz?	1	2	3	4	5	6	7	8	9
6.	Öğrencileri okulda başarılı olabileceklerine inandırmayı ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
7.	Öğrencilerin zor sorularına ne kadar iyi cevap verebilirsiniz?	1	2	3	4	5	6	7	8	9
8.	Sınıfta yapılan etkinliklerin düzenli yürümesini ne kadar iyi sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
9.	Öğrencilerin öğrenmeye değer vermelerini ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
10.	Öğrettiklerinizin öğrenciler tarafından kavranıp kavranmadığını ne kadar iyi değerlendirebilirsiniz?	1	2	3	4	5	6	7	8	9
11.	Öğrencilerinizi iyi bir şekilde değerlendirmesine olanak sağlayacak soruları ne ölçüde hazırlayabilirsiniz?	1	2	3	4	5	6	7	8	9
12.	Öğrencilerin yaratıcılığının gelişmesine ne kadar yardımcı olabilirsiniz?	1	2	3	4	5	6	7	8	9
13.	Öğrencilerin sınıf kurallarına uymalarını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
14.	Başarısız bir öğrencinin dersi daha iyi anlamasını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
15.	Dersi olumsuz yönde etkileyen ya da derste gürültü yapan öğrencileri ne kadar yatıştırabilirsiniz?	1	2	3	4	5	6	7	8	9
16.	Farklı öğrenci gruplarına uygun sınıf yönetim sistemi ne kadar iyi oluşturabilirsiniz?	1	2	3	4	5	6	7	8	9
17.	Derslerin her bir öğrencinin seviyesine uygun olmasını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
18.	Farklı değerlendirme yöntemlerini ne kadar kullanabilirsiniz?	1	2	3	4	5	6	7	8	9
19.	Birkaç problemli öğrencinin derse zarar vermesini ne kadar iyi engelleyebilirsiniz?	1	2	3	4	5	6	7	8	9
20.	Öğrencilerin kafası karıştığında ne kadar alternatif açıklama ya da örnek sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9
21.	Sizi hiçe sayan davranışlar gösteren öğrencilerle ne kadar iyi baş edebilirsiniz?	1	2	3	4	5	6	7	8	9
22.	Çocuklarının okulda başarılı olmalarına yardımcı olmaları için ailelere ne kadar destek olabilirsiniz?	1	2	3	4	5	6	7	8	9
23.	Sınıfta farklı öğretim yöntemlerini ne kadar iyi uygulayabilirsiniz?	1	2	3	4	5	6	7	8	9
24.	Çok yetenekli öğrencilere uygun öğrenme ortamını ne kadar sağlayabilirsiniz?	1	2	3	4	5	6	7	8	9

Kişisel Bilgi Formu

Aşağıda yer alan soruları sizin için uygun olan kutucuğa çarpı (X) işareti koyarak cevaplayınız.

1. Cinsiyetiniz: ☐ Kadın ☐ Erkek

2. Yaşınız: ☐ 22-25 ☐ 26-29 ☐ 30-39 ☐ 40-49 ☐ 50 ve üstü

3. Kaç yıldır öğretmenlik yapıyorsunuz? .... yıl

4. Bulunduğunuz kurumda kaç yıldır çalışıyorsunuz? .... yıl

5. Sınıfınızdaki ortalama öğrenci sayısı kaçtır?

☐ 15 veya daha az
☐ 15- 20
☐ 20- 25
☐ 26- 30
☐ 30- 35
☐ 35 veya daha fazla

6. Öğrencilerinizin matematik başarılarını genel olarak nasıl değerlendirirsiniz?

☐ Düşük ☐ Orta ☐ Yüksek

7. Öğrencilerinizin matematik dersine dair motivasyonlarını genel olarak nasıl değerlendirirsiniz?

☐ Düşük ☐ Orta ☐ Yüksek

8. Sınıfınızdaki disiplin problemlerinin sıklığını nasıl değerlendirirsiniz?

☐ Düşük ☐ Orta ☐ Yüksek

9. 2005 yılından itibaren değişen matematik müfredatı ile ilgili hizmet içi eğitim faaliyetlerine katıldınız mı?

☐ Evet ☐ Hayır

KATILDIĞINIZ İÇİN TEŞEKKÜR EDERİZ.

APPENDİX B: Descriptive Statistics for Items

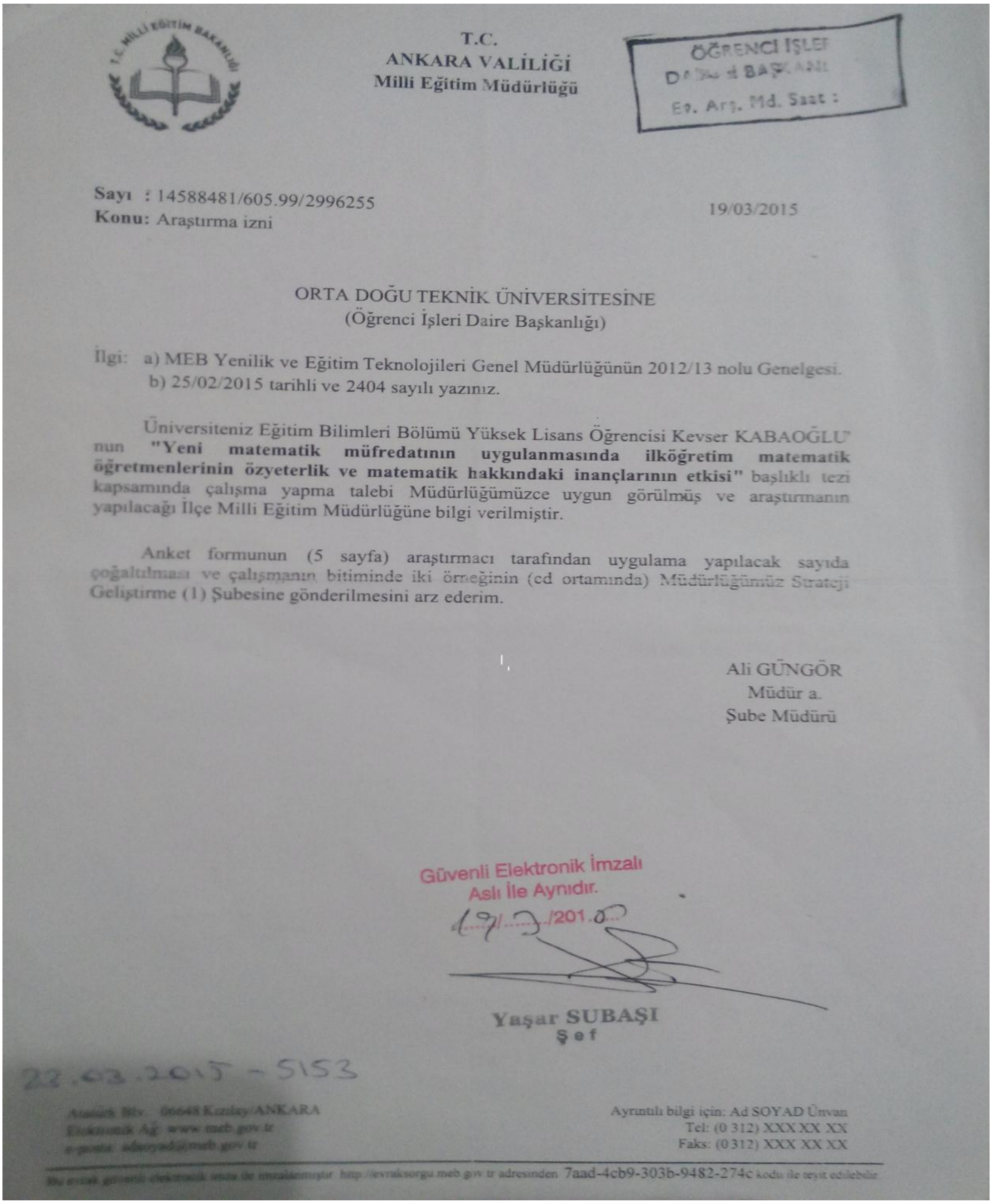
Items	*M*	*SD*
Curriculum Implementation Scale		
1. Bir problemde yer alan verileri tablo veya grafik ile gösterme.	3.43	.81
2. Problemlerin cevaplarını ve işlem basamaklarını açıklama.	4.44	.65
3. Problem çözerken ortaya koyduğu fikirlerinin arkasındaki sebepleri açıklama.	4.35	.71
4. Problemin sonucunu tahmin etme ve tahminin doğruluğunu kontrol etme.	3.73	.88
5. Matematiksel düşüncelerini ifade ederken somut model, şekil, resim, grafik, tablo vb. temsil biçimlerini kullanma.	3.99	.77
6. Matematik hakkındaki düşüncelerini açık bir şekilde sözlü ve yazılı ifade etme.	3.88	.94
7. Günlük dil ile matematiksel ifade ve sembollerin anlamlarını dile getirme.	4.02	.86
8. Matematik hakkında konuşma, yazma, tartışma ve okuma.	3.48	.93
9. Yaptıkları işlemleri ilgili kavramlarla ilişkilendirme.	4.12	.68
10. Öğrendiklerini günlük hayatları ile ilişkilendirme.	4.15	.72
11. Öğrendiklerini diğer derslerle ilişkilendirme.	3.82	.84
12. Öğrendiklerini matematikte diğer konular ile ilişkilendirme.	4.22	.73
13. Mantığa dayalı çıkarımlarda bulunma.	4.24	.68
14. Probleme ilişkin çözüm yollarını ve cevapları savunma.	4.12	.74
15. Matematiksel bir durumu analiz ederken örüntü ve ilişkileri kullanma.	3.85	.82
16. Matematikteki örüntü ve ilişkileri analiz etme.	3.87	.80
17. Tahminde bulunma.	3.61	.89
Mathematics Related Belief Scale		
1. Öğrencilerin matematiksel kavramları anlayabilmeleri için bu kavramların oluşum sürecine katılmaları gerekir.	4.07	.80
2. Öğretmenin, öğrencinin aktif olduğu sınıf tartışmasını oluşturması matematik eğitiminde önemlidir.	4.27	.73
3. Matematik, temelde aritmetik becerilerin günlük hayatta kullanımıdır.	4.16	.88
4. Matematik bilgisi olgular, kurallar ve işlemlerden oluşur.	4.01	.91
5. Matematik öğretiminin amacı öğrencilerin matematiksel kavramları araştırarak akıl yürütmelerini geliştirmektir.	4.34	.76
6. Matematik öğretirken öğrencilerin işlemsel becerilerini artırmak için, kuralların arasındaki ilişkilerin kurgulanması yerine kurallar ezberletilmelidir.	2.30	1.22

7.	Matematik öğretiminde konular arasındaki mantıksal ilişkiden çok ders kitabındaki sıra takip edilmelidir.	2.24	1.13
8.	Matematik öğretmeni işlemleri matematiksel bilgi olarak göstermelidir.	3.05	1.22
9.	Matematiği öğrenmek için öğrenciler çok soru çözmelidir.	3.99	.99
10.	Matematikte, bir bilgi eğer kitap veya öğretmen tarafından anlatılmışsa kesinlikle doğrudur.	2.92	1.17
11.	Matematik dersinde matematiksel düşünmenin önemi vurgulanmalıdır.	4.44	.65
12.	Matematik öğretiminde öğretmenler matematiksel oyunlardan da yararlanmalıdır.	4.37	.63
13.	Matematik eğitiminde öğrencilerin daha önce karşılaşmadıkları şekilde problemleri mümkün olduğunca sık sormak gerekir.	3.80	.86
14.	Matematik dersinde bir kavram problem durumları da yaratılarak öğretilebilir.	4.12	.67
15.	Matematikte hala üretilebilecek yeni bilgiler vardır.	4.27	.70
16.	Öğrenciler matematiksel problemleri kendileri oluşturma ve çözme fırsatına sahip olmalıdır.	4.39	.63
17.	Matematik öğretiminde görsel ve somut gösterimler, materyaller mümkün oldukça sık kullanılmalıdır.	4.54	.63
18.	Öğrenciler aynı sonuca farklı yollardan ulaşabilme fırsatına sahip olmalıdır..	4.62	.58
19.	İspat ve genelleme matematik öğretimi sürecinin önemli bir parçasıdır.	4.40	.65
20.	Matematik öğretiminde materyal ve somut gösterimleri kullanmanın amacı öğrencilerde olumlu tutum geliştirmektir.	4.33	.72
21.	Matematik öğretiminde, konu sonunda problem çözerken öğretmenin öğrettiği basamaklar sırasıyla izlenmelidir.	3.62	1.08
22.	Öğrenciler matematik dersinde kullanılan işlemlerin sebeplerini anlamak için çaba harcamalıdır.	4.33	.68
23.	Matematik öğretiminin amacı soru çözerken derste gösterilen yolları kullanarak doğru cevaba ulaşmaktır.	3.41	1.24
24.	Matematik öğretiminde öğrenciler tarafından geliştirilen fikirler de dikkate alınmalıdır.	4.51	.66
25.	Matematik öğretimi sürecinde öğrenciler birbirleriyle çalışmaya teşvik edilmelidir.	4.48	.61
26.	Matematik öğretiminde teknolojinin olası kullanımına da önem verilmelidir.	4.39	.64
27.	Matematik öğretiminde işlemlerin yanı sıra, öğrencilerin bilgilerini uygulayabilecekleri problemlere de yer verilmelidir.	4.57	.53
28.	Öğrencilerin matematiği sevmeleri için matematik öğretmenini sevmeleri gerekir.	4.20	.83
29.	Matematik diğer derslerle ilişkili olduğu için önemlidir.	4.29	.92
30.	Matematiksel bilgi öğrencilerin deneyimlerinden kazandıkları bilgileri organize etmeleri sonucunda oluşur.	3.89	.92
31.	Matematik öğretiminin amacı öğrencileri hayata hazırlamaktır.	4.17	.80

32. Matematik eğitiminde materyaller ve somut gösterimler matematiksel kavramların gelişmesinde etkili değildir.	1.97	1.18
Turkish Version of the Teachers' Sense of Efficacy Scale		
1. Çalışması zor öğrencilere ulaşmayı ne kadar başarabilirsiniz?	5.60	1.40
2. Öğrencilerin eleştirel düşünmelerini ne kadar sağlayabilirsiniz?	6.56	1.34
3. Sınıfta dersi olumsuz yönde etkileyen davranışları kontrol etmeyi ne kadar sağlayabilirsiniz?	7.21	1.24
4. Derslere az ilgi gösteren öğrencileri motive etmeyi ne kadar sağlayabilirsiniz?	6.38	1.32
5. Öğrenci davranışlarıyla ilgili beklentilerinizi ne kadar açık ortaya koyabilirsiniz?	7.70	1.16
6. Öğrencileri okulda başarılı olabileceklerine inandırmayı ne kadar sağlayabilirsiniz?	7.23	1.14
7. Öğrencilerin zor sorularına ne kadar iyi cevap verebilirsiniz?	7.89	1.09
8. Sınıfta yapılan etkinliklerin düzenli yürümesini ne kadar iyi sağlayabilirsiniz?	7.42	1.15
9. Öğrencilerin öğrenmeye değer vermelerini ne kadar sağlayabilirsiniz?	7.05	1.14
10. Öğrettiklerinizin öğrenciler tarafından kavranıp kavranmadığını ne kadar iyi değerlendirebilirsiniz?	7.40	1.14
11. Öğrencilerinizi iyi bir şekilde değerlendirmesine olanak sağlayacak soruları ne ölçüde hazırlayabilirsiniz?	7.65	1.09
12. Öğrencilerin yaratıcılığının gelişmesine ne kadar yardımcı olabilirsiniz?	7.03	1.19
13. Öğrencilerin sınıf kurallarına uymalarını ne kadar sağlayabilirsiniz?	7.51	1.06
14. Başarısız bir öğrencinin dersi daha iyi anlamasını ne kadar sağlayabilirsiniz?	6.56	1.34
15. Dersi olumsuz yönde etkileyen ya da derste gürültü yapan öğrencileri ne kadar yatıştırabilirsiniz?	7.25	1.25
16. Farklı öğrenci gruplarına uygun sınıf yönetim sistemi ne kadar iyi oluşturabilirsiniz?	6.45	1.35
17. Derslerin her bir öğrencinin seviyesine uygun olmasını ne kadar sağlayabilirsiniz?	6.64	1.39
18. Farklı değerlendirme yöntemlerini ne kadar kullanabilirsiniz?	7.07	1.33
19. Birkaç problemli öğrencinin derse zarar vermesini ne kadar iyi engelleyebilirsiniz?	7.18	1.24
20. Öğrencilerin kafası karıştığında ne kadar alternatif açıklama ya da örnek sağlayabilirsiniz?	7.66	1.11
21. Sizi hiçe sayan davranışlar gösteren öğrencilerle ne kadar iyi baş edebilirsiniz?	7.28	1.39
22. Çocuklarının okulda başarılı olmalarına yardımcı olmaları için ailelere ne kadar destek olabilirsiniz?	6.72	1.45

23. Sınıfta farklı öğretim yöntemlerini ne kadar iyi uygulayabilirsiniz?	7.19	1.23
24. Çok yetenekli öğrencilere uygun öğrenme ortamını ne kadar sağlayabilirsiniz?	7.11	1.49

APPENDIX C: The Consent Form of Ministry of National Education



T.C.
ANKARA VALİLİĞİ
Milli Eğitim Müdürlüğü

ÖĞRENCİ İŞLERİ DAİRESİ BAŞKANLIĞI
Ev. Arş. Md. Saat :

Sayı : 14588481/605.99/2996255

Konu: Araştırma izni

19/03/2015

ORTA DOĞU TEKNİK ÜNİVERSİTESİNE
(Öğrenci İşleri Daire Başkanlığı)

İlgi: a) MEB Yenilik ve Eğitim Teknolojileri Genel Müdürlüğünün 2012/13 nolu Genelgesi.
b) 25/02/2015 tarihli ve 2404 sayılı yazınız.

Üniversiteniz Eğitim Bilimleri Bölümü Yüksek Lisans Öğrencisi Kevser KABAOĞLU'nun **"Yeni matematik müfredatının uygulanmasında ilköğretim matematik öğretmenlerinin özyeterlik ve matematik hakkındaki inançlarının etkisi"** başlıklı tezi kapsamında çalışma yapma talebi Müdürlüğümüzce uygun görülmüş ve araştırmanın yapılacağı İlçe Milli Eğitim Müdürlüğüne bilgi verilmiştir.

Anket formunun (5 sayfa) araştırmacı tarafından uygulama yapılacak sayıda çoğaltılması ve çalışmanın bitiminde iki örneğinin (cd ortamında) Müdürlüğümüz Strateji Geliştirme (1) Şubesine gönderilmesini arz ederim.

Ali GÜNGÖR
Müdür a.
Şube Müdürü

Güvenli Elektronik İmzalı
Aslı İle Aynıdır.
19/3/2015

Yaşar SUBAŞI
Şef

22.03.2015 - 5153

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e-posta: adsoyad@meb.gov.tr

Ayrıntılı bilgi için: Ad SOYAD Ünvan
Tel: (0 312) XXX XX XX
Faks: (0 312) XXX XX XX

Bu evrak güvenli elektronik imza ile imzalanmıştır. http://evraksorgu.meb.gov.tr adresinden 7aad-4cb9-303b-9482-274c kodu ile teyit edilebilir.

APPENDIX D: Voluntary Participation Form

Orta Doğu Teknik Üniversitesi İnsan Araştırmaları Etik Kurulu
Gönüllü Katılım (Bilgilendirilmiş Onay) Formu

Araştırmacının Adı-Soyadı: Kevser Kabaoğlu

Araştırmacının Kurumu: Orta Doğu Teknik Üniversitesi

Araştırmanın Amacı: Bu çalışmanın birincil amacı ortaokul matematik eğitim programının uygulanma derecesi ile ilköğretim matematik öğretmenlerinin özyeterlik ve matematiğe yönelik inançları arasındaki ilişkinin analiz edilmesidir. Elde edilen verilerle matematik müfredatının gelişim sürecine ve öğretmen yetiştirme programlarına danışmanlık edilmesi amaçlanmıştır.

Çalışma gerek kurum adına gerekse öğretmenler adına herhangi potansiyel bir risk içermemektedir. Katılımcılardan kendilerine basılı olarak dağıtılan "Matematik Hakkındaki İnanışlar Ölçeği", 'Öğretmen Özyeterlik İnançları Ölçeği'' ve "Matematik Eğitim Programı Uygulama Anketi'ni" belirtilen süre içerisinde eksiksiz bir şekilde tamamlamaları beklenmektedir. Ölçekteki ve anketteki soruların cevaplandırılmasının yaklaşık olarak 20 dakika sürmesi ön görülmektedir. Ölçeğin ve anketin 2014-2015 Eğitim-Öğretim yılı ikinci yarıyılı içerisinde uygulanması planlanmaktadır. Katılım tamamen gönüllü olup katılmamaktan ötürü veya katılımdan vazgeçme sonunda olumsuz hiçbir sonuç oluşmayacaktır. Çalışmada elde edilen kişisel bilgiler 3.şahıslarla kesinlikle paylaşılmayacaktır. Katılımcılardan elde edilen veriler sadece analiz için kullanılacak ve tez çalışmasında yer alacaktır. Ayrıca analiz sonuçları tez çalışmasının bir parçası olarak, öğrencilerin kişisel bilgileri paylaşılmadan bilimsel kongre ve konferanslarda sunulabilir.

Araştırmaya ilişkin sorular için aşağıdaki iletişim adreslerinden iletişime geçilebilir.

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Araştırmanın amacı konusunda bilgilendirildim ve gönüllü olarak katılmayı kabul ediyorum.

Katılımcının Adı-Soyadı:
İmzası:

APPENDIX E: Turkish Summary

GİRİŞ

Değişen dünyada sosyokültürel, ekonomik, bilimsel ve teknolojik değişmeler tüm toplumlar için kaçınılmaz hale gelmiştir (Ersoy, 1997). Bu bağlamda, bireylerin zamanın değişen koşullarına ve ihtiyaçlarına adaptasyonunu sağlamanın nihai yolu olan eğitim sistemleri için de değişim ve gelişme kaçınılmazdır (Ersoy, 1997). Bu nedenle, eğitimin temel yapı taşı olan eğitim programlarının en belirgin özellikleri değişen şartlara göre revize edilmelerine olanak sağlayan esnek yapılarıdır (Güven ve İşcan, 2006; Memnun, 2013). Dünyada eğitim alanındaki gelişmeleri yakından takip etmek ve gerekli reformları ülkedeki şartların ve ihtiyaçların değerlendirilerek dizayn edilmesi toplumsal gelişmenin sağlanması adına hayati önem taşımaktadır (Memnun, 2013).

Eğitim alanındaki güncel yaklaşımlar, çağın ihtiyaçlarına cevap verebilecek bireylerin temel özelliklerini yenilikçi, demokratik, yaratıcı, çözüm üretebilen ve işbirlikçi olarak tanımlamışlardır (Hargreaves, 1994). Dolayısıyla, bireylerin eleştirel düşünme, muhakeme etme, karar verme, çıkarım yapma, problem çözme ve bağımsız düşünme becerilerinin gelişmesinde çok önemli bir rol üstlenen matematik eğitimi değişen eğitim yaklaşımları açısından özel bir yere sahiptir (Clarke, 2008; Forgasz ve Leder, 2008; Ulubay, 2007). Ayrıca Ersoy (1997), kaliteli ve etkili matematik eğitimini bilgi çağının en temel gereksinimi olarak nitelendirmiştir.

Bu bağlamda, 1960lı yılların başlarında matematik eğitiminde yeni eğilimler ortaya çıkmış ve bu kapsamda öğretimin yerini öğrenme, geleneksel yaklaşımların yerini de öğrenciyi merkeze alan yapılandırmacı eğilimler almıştır (Goldin, Rösken ve Torner, 2009). Eğitimde yaşanan bu yeni yönelimler, öğrencilerin matematiksel öğrenmelerini geliştirmek amacıyla içerik ve öğretim alanlarında da bir dizi değişimleri beraberinde getirmiştir (NCTM, 2000). Matematiği anlama, anladığını uygulayabilme ve matematik öğrenmeye karşı kendine güven ya da güvensizlik gibi olgular öğrencilerin okul hayatında karşılaştıkları öğrenme durumlarıyla yakından ilgilidir (NCTM, 2000). Dolayısıyla, eğitim programlarında yapılan reformları hayata geçirebilecek ve uygun öğrenme ortamlarını hazırlayabilecek yegane unsur olan öğretmenlerin matematik eğitiminin gelişmesindeki yeri ve misyonu tartışılamaz.

Eğitimde yapılandırmacı yaklaşımlar dünyada 1960lı yılların başlarında seslerini yükseltmeye başlamış olsalar da, yankılarının ülkemize ulaşması ancak 2000li yıllarda mümkün olmuştur. Nihai olarak 2005 yılında, eğitim sistemimiz ile ilgili eleştirilere cevap niteliğinde ortaöğretim müfredatımızda köklü reformlar gerçekleştirilmiştir. Neredeyse, tepeden tırnağa olarak nitelendirilebilecek olan bu değişim hareketi, hedefler, içerik ve öğretim yöntemleri açısından köklü yenilikleri barındırmaktadır (MEB, 2006). En temelde yeni eğitim programının merkezinde içeriğin yerini ‘‘öğrenen’’ almıştır. Matematik eğitimi geliştirme çabaları 2013 yılında eğitim programında gerçekleştirilen düzenlemelerle süreklilik arz etmiştir (TTKB, 2013)

Eğitim alanında yaşanan reformların, öğrenmeyi öğretimin bir adım önüne taşımasıyla öğretmenin daha pasif bir görev üsleneceği sanılsa da gerçek bunun tam tersidir. Matematik eğitimindeki güncel yaklaşımlar, öğretmeni bir orkestra şefi olarak tasvir etmekte ve etkili öğrenme ortamlarının oluşturulmasının birinci dereceden sorumlusu olarak tayin etmektedir (Manouchehri ve Goodman, 1998). Bu bağlamda, öğretmenin görevi sadece programı uygulamak olarak nitelendirilemez. Onlar aynı zamanda programı yorumlayan, gerektiğinde tekrar tanımlayan ve bu sayede gelişim sürecine katkı sağlayan eğitimin gerçek aktörleridirler (Hargreaves, 1994). Dolayısıyla öğretmenlerin eğitimsel mevzulara bakış açıları, onların sınıf içi uygulamalarını etkileyen temel faktörlerden olması açısından önemlidirler (Tan ve Saw Lan, 2011). Öğretmenlerin eğitim-öğretim sürecine yönelik inançları, onların programı nasıl değerlendirdiği ve uyguladığı hakkında en önemli belirleyicilerdendir. Bir filtre görevi üslenen öğretmen inançları, öğretim yöntem ve tekniklerinin ve benimsenecek eğitim pedagojilerinin belirleyicisi olarak eğitim programlarının başarıya ulaşmasında hayati bir öneme sahiptir (Tan ve Saw Lan, 2011).

Bu kapsamda öğretmen inançları ve sınıf içi uygulamalar arasındaki çok yönlü ilişkinin analiz edilmesi, eğitim alanında gerçekleşen yeniliklerin kalıcı ve etkili olması açısından kilit faktörlerden bir tanesidir. Ayrıca ülkemizdeki matematik eğitiminin gelişimi ve geleceği açısından da hayati öneme sahiptir. Dolayısıyla öğretmenlerin matematik hakkındaki inançları ve öğretmen özyeterlik inançlarının eğitim programının uygulamaları üzerindeki etkisi bu çalışmanın asıl amacıdır.

Çalışmanın Amacı

Bu çalışmanın asıl amacı 2013 Ortaokul Matematik Programı'nın uygulanma seviyesinin öğretmenlerin matematik hakkındaki inançları ve özyeterlik inançları ışığında incelenmesidir. Bu amaçla öğretmenlerin matematik hakkındaki inançları ve özyeterlik algıları belirlenmiştir. Ayrıca cinsiyet, tecrübe, son çalışılan kurumdaki çalışma yılı ve hizmet içi seminerlere katılım gibi faktörlerin öğretmenlerin sınıf içi uygulamalarına etkileri de analiz edilmiştir. En temelde bu çalışma,

- Ortaokul düzeyinde, matematik programının uygulanma seviyesini öğretmenlerin matematik hakkındaki inançları ve öğretmen özyeterlik inançları ne derece yordamaktadır?

sorusuna cevap aramak amacıyla yürütülmüştür.

Çalışmanın Önemi

Ülkemizde program değerlendirme ve öğretmen inançları alanlarında yürütülmüş birçok çalışma mevcuttur. Ancak matematik eğitim alanında bu iki alanı birleştiren geniş kapsamlı bir çalışma örneği bulunmamaktadır. Öğretmen inanışlarının öğretmen üzerindeki etkisi göz önüne alındığında, bu durumun ülkemiz açısından matematik eğitimi alan yazınında önemli bir açık oluşturduğu ileri sürülebilir. Bu kapsamda bu araştırma, alan yazınında var olan bir eksikliği giderme ve matematik eğitiminin daha ileri noktalara taşınması yönünde gelecek çalışmalara yeni yönelimler sunma açılarından önemlidir.

Ayrıca araştırmanın öğretmenlerin eğitim alanında yaşanan yeniliklere karşı bakış açılarını analiz etmek gibi bir misyonu da vardır. Bu bağlamda çalışmanın verileri ve sonuçları öğretmen yetiştirme programlarındaki bazı derslerin içeriklerinin geliştirilmesine danışmanlık edebilir. Özellikle öğretmenlerin inanışları ve sınıf içi uygulamaları arasındaki çok yönlü ilişkiler baz alınarak, onların eğitimsel reformlara karşı kişisel hazır bulunuşluklarını geliştirici uygulamalar tasarlanabilir.

Son olarak, araştırmanın sonuçları eğitim programlarının gelişim sürecine ve öğretmen yetiştirme programlarına katkı sağlarken dolaylı yoldan öğrencilerin matematiksel öğrenmelerine de katkı sağlamaktadır. Daha iyi matematik öğrenen nesiller demek, daha çok sorgulayan, araştıran ve ayrıntıları fark eden kişiler demektir. Bu bağlamda bu tarz çalışmalar aslında matematik eğitimine katkı sağlarken bir yandan da ülkenin gelişimine katkı sunmaktadır.

ALAN TARAMASI

Eğitim programı uygulaması, program tasarlayıcılarıyla programın uygulamasını gerçekleştirmekten sorumlu kişiler arasındaki etkileşim sürecini işaret eder (Ornstein ve Hunkins, 2004). Çok yönlü yapısı gereği eğitim programının uygulama süreci planlanan reformun özelliklerinden toplumun sosyokültürel yapısına, okul ortamından öğretmen niteliklerine kadar birçok faktör tarafından etkilenmektedir (Fullan ve Pomfret, 1997; Gredler, 1996; Ornstein ve Hunkins, 2004). Öğretmenler ise reform çalışmalarının başarıya ulaşmasında programın uygulayıcıları olarak önemli bir role sahip oldukları için tüm bu etmenler içinde özel bir yere sahiptirler (Fullan, 2007). Bu gerçeğe dayanarak 1970lerin başında öğretmen nitelikleri eğitim araştırmacıları arasında artan bir ilgiyle takip edilen bir konu haline gelmiştir (Op't Eynde ve diğerleri, 2002).

Özellikle öğretmen inançları öğretmenlerin öğretimle ilgili kararlarını, yeni fikirlere karşı tutumlarını ve öğretimle ilgili davranışlarını büyük oranda etkilediği için araştırmacıların yoğun ilgisini çekmiştir (Guskey, 1987). Ayrıca, literatürde de sıklıkla vurgulandığı gibi, matematik eğitiminde öğrencilerin matematiksel bilgileri mantıksal olarak kavramaları ve başarılarının artması ancak öğretmen ve öğrencilerin bazı inançlarının değişimiyle mümkündür (Goldin ve diğerleri, 2009). Bu kapsamda, öğretmen inançlarının detaylı bir şekilde analiz edilmesi, bu inançların oluşum süreçlerinin anlaşılması adına önem taşımaktadır. Bu inançların nasıl şekillendiğini bilmek nasıl değişeceklerinin anlaşılmasına katkı sağlayacağı için matematik eğitiminin gelişimi açısından değerlidir (Chapman, 2002; Wilson ve Cooney, 2002). Matematik eğitiminde öğretmen inançlarına dair yapılan çalışmalar, öğretmenlerin matematikle ilgili inançları ve öğretmenlerin özyeterlik inançları alanlarında yoğunlaşmıştır. Öğretmenlerin matematikle ilgili inançları alan yazında, matematiğin doğası, matematik öğrenimi ve matematik öğretimi açılarından analiz edilmiştir (Aguirre, 2009). Birçok araştırmacı tarafından vurgulandığı gibi, bu inançlar öğretim programının başarılı bir şekilde uygulanmasında belirgin bir role sahiptirler (Aguirre, 2009; Tan ve Saw Lan, 2011; Thompson, 1992; Törner, 2002). Öğretmen davranışlarının bir diğer güçlü belirleyicisi olan özyeterlik, öğretmenlerin öğretim için ortaya koydukları çaba, belirledikleri hedefler, zorluklar karşısında gösterdikleri direnç ve mesleki motivasyonları hususlarında güçlü bir belirleyiciliğe sahiptir (Gibson ve Dembo, 1984). Sonuç olarak, eğitim alanındaki reformların başarısı, öğretmenlerin matematik hakkındaki inançları ve öğrencilerin performanslarını arttırmada kendilerini ne kadar yeterli gördüklerine ait yargılarıyla çok yakından ilgilidir.

Türkiye'de matematik eğitiminde öğretmen inançları, 1990ların sonunda popüler bir araştırma konusu haline gelmiştir ve 2005 de gerçekleştirilen eğitim programı geliştirme çalışmalarıyla birlikte gittikçe artan bir üne sahip olmuştur (Eraslan, 2009). Yapılan araştırmalarda elde edilen bulgular, Türk matematik öğretmenlerinin eğitim sürecinde daha çok yapılandırmacı bir yaklaşım benimsediğini ve sınıf içi uygulamalarda öğrenci-merkezli bir anlayışla geliştirilen matematik eğitim programın temel prensiplerine bağlı kaldıklarını göstermiştir (Budak,2011; Bulut, 2006; Kayan, 2011; Türk, 2011; Uçar ve Demirsoy, 2010; Ulubay,2007; Zakiroğlu,2012).

YÖNTEM

Çalışmada ilköğretim matematik öğretmenlerinin sınıf içi uygulamalarının, öğretmen özyeterlik ve matematik hakkındaki inançları tarafından ne derece yordandığının belirlenmesi hedeflenmiştir. Bu amaç doğrultusunda, yordayıcı korelasyonel (ilişkisel) araştırma deseni kullanılmıştır. Nicel araştırma yöntemlerinden olan korelasyonel desenin en temel özelliği, iki yada daha çok değişken arasındaki ilişkinin değişkenlere müdahale edilmeden incelenmesidir (Fraenkel, Wallen ve Hyun, 2012).

Araştırmanın bağımlı değişkeni yeni matematik eğitim programının uygulanma seviyesi, bağımsız değişkenleri ise öğretmenlerin matematik hakkındaki inançları, öğretmen özyeterlikleri ve öğretmen demografikleridir (cinsiyet, tecrübe, son çalışılan kurumdaki çalışma yılı ve hizmet içi seminerlere katılım).

Çalışma Grubu

Ankara'da çalışan ilköğretim matematik öğretmenleri bu çalışmanın hedef kitlesini oluşturmaktadır. Araştırmaya Ankara'nın Etimesgut, Çankaya ve Yenimahalle ilçelerinde bulunan okullarda çalışan 322 gönüllü ilköğretim matematik öğretmeni katılmıştır. Katılımcıların belirlenmesinde uygun örnekleme yöntemi benimsenmiştir.

Veri Toplama Aracı

Bu çalışmada veriler dört bölümden oluşan bir anket aracılığıyla toplanmıştır:

1. Matematik Eğitim Programı Uygulama Ölçeği
2. Matematik Hakkındaki İnançlar Ölçeği
3. Öğretmen Özyeterlik Ölçeği
4. Kişisel Bilgi Formu

Birinci bölümde kullanılan ölçek, Ulubay (2007) tarafından geliştirilmiştir. Eğitim programlarında gerçekleştirilen reformların, sınıf düzeyinde ne derece karşılık bulduğunu sorgulamaya yönelik hazırlanan ölçek, 17 maddeden oluşmaktadır ve maddeler beşli skala üzerinden değerlendirilmektedir (1-hiç, 5-her zaman). Ölçeğin geçerliğine kanıt sağlamak amacıyla açıklayıcı faktör analizi uygulanmıştır ve ölçeğin tek boyutlu faktör yapısı doğrulanmıştır. Ayrıca ölçeğin iç tutarlılık güvenirliği için Cronbach Alfa katsayısı 0.88 olarak hesaplanmıştır.

İkinci bölümde, Kayan (2011) tarafından geliştirilen "Matematik Hakkındaki İnançlar Ölçeği"ne yer verilmiştir. Ölçek beşli Likert tipi (1-kesinlikle katılmıyorum, 5-kesinlikle katılıyorum) 32 maddeden oluşmaktadır. Ankette öğretmenlerin matematiğe yönelik inançları geleneksel ve oluşturmacı olarak sınıflandırılmıştır. Uygulanan açıklayıcı faktör analizi bulguları doğrultusunda ölçekten 8 madde çıkartılmıştır. Ölçeğin son halinin faktör yapısı orijinal haliyle paralellik göstermektedir. Cronbach Alfa katsayısı "geleneksel" boyut için 0.77, "oluşturmacı" boyut için ise 0.88 olarak hesaplanmıştır.

Üçüncü bölümde, Tschannen-Moran ve Woolfolk Hoy (2001) tarafından geliştirilen ve Türkçe'ye adaptasyonu Çapa, Çakıroğlu ve Sarıkaya (2005) tarafından yapılan "Öğretmen Özyeterlik Ölçeği" kullanılmıştır. Ölçek, 24 maddeden oluşmakta ve her madde dokuzlu skala üzerinde değerlendirilmektedir (1-yetersiz, 9-çok yeterli). Ölçeğin üç boyutlu bir yapısı vardır: öğrenci katılımına yönelik özyeterlik, öğretim stratejilerine yönelik özyeterlik ve sınıf yönetimine yönelik özyeterlik. Yapılan doğrulayıcı faktör analizi sonuçları da ölçeğin üç boyutlu yapısını onaylar niteliktedir. Ölçeğin iç güvenirliğine yönelik Alfa katsayıları "öğrenci katılımına yönelik özyeterlik" boyutu için 0.83, "öğretim stratejilerine yönelik özyeterlik" boyutu için 0.84 ve "sınıf yönetimine yönelik özyeterlik" boyutu için 0.86 olarak hesaplanmıştır.

Son bölüm öğretmen demografikleri (yaş, cinsiyet, tecrübe, son çalışılan kurumdaki çalışma süresi ve hizmet içi seminerlere katılım) ve çalışma koşullarına (sınıftaki öğrenci sayısı, karşılaşılan disiplin problemleri seviyesi, öğrencilerin motivasyon ve başarı düzeyleri) yönelik sorular içermektedir.

Veri Toplama Süreci ve Verilerin Analizi

Çalışmanın başında ODTÜ Etik Kurulu ve Milli Eğitim Bakanlığı'ndan gerekli izinler alınmıştır. Veri toplama süreci tamamıyla araştırmacı tarafından yönetilmiştir. Öğretmenlerin çalıştığı okullar tek tek ziyaret edilerek, gerekli açıklamalar yapılmıştır. Ayrıca bütün detaylar katılımcılarla paylaşılarak, tamamen gönüllü katılım esas tutulmuştur. Tabachnick ve Fidell (2013) tarafından önerilen 50+8m (m: yordayıcı değişken sayısı) formülüne göre anlamlı çıkarımlar yapabilmek için gerekli olan katılımcı sayısı alt limiti 122 (50+8×9)'dir. Dolayısıyla bu çalışmanın örneklemi gerekli analizleri yapabilmek için yeterli büyüklüktedir.

Elde edilen veriler, hiyerarşik çoklu regresyon kullanılarak analiz edilmiştir.

BULGULAR

İlköğretim Matematik Öğretmenlerinin Sınıf İçi Uygulamaları, Matematik Hakkındaki İnançları ve Özyeterlikleri

Çalışmaya katılan ilköğretim matematik öğretmenleri yeni matematik eğitim programı uygulamaları seviyesini "yüksek" olarak raporlamışlardır (*M*=3.96, *SD*=0.46). Ayrıca elde edilen ortalama değerlerine göre, öğretmenlerin matematiğin doğası, öğrenilmesi ve öğretilmesi hususlarında geleneksel yaklaşımlardan (*M*=3.19, *SD*=0.70) ziyade, nispeten daha yapılandırmacı inançlara (*M*=4.38, *SD*=0.37) sahip oldukları görülmektedir. Katılımcıların öğretmen özyeterliklerinin ise hem öğretim yöntemlerini uygulama alanında (*M*=7.33, *SD*=0.86), hem öğrenci katılımı açısından (*M*=6.64, *SD*=0.87), hem de sınıf yönetimi alanında (*M*=7.25, *SD*=0.88) yüksek seviyede olduğu görülmektedir. Ancak, öğretmenler kendilerini öğretim yöntemlerinin uygulanması alanında diğer iki alana göre göreceli olarak daha yeterli hissettikleri anlaşılmaktadır.

Yordayıcı Değişkenler ve Bağımlı Değişken Arasındaki İlişki

Yapılan korelasyon analizi, öğretmenlerin matematik eğitim programı uygulama seviyeleri ile öğretmen özyeterlikleri (öğrenci katılımı, öğretim yöntemlerinin uygulanması ve sınıf yönetimi alanlarında), matematik hakkındaki inançları (geleneksel ve yapılandırmacı yaklaşımlar açısından) ve öğretim tecrübesi arasında istatistiksel olarak anlamlı ve pozitif korelasyonların var olduğu görülmüştür.

Yordayıcı değişkenler arasında ise, istatistiksel olarak en güçlü ve pozitif ilişkinin öğretmen özyeterlik alt boyutları arasında olduğu görülmüştür. Ayrıca, öğretmelerin yapılandırmacı matematiksel inançları ve özyeterlik üç alt boyutunun her birisi arasında anlamlı ve pozitif bir ilişki saptanmıştır. Son olarak, öğretmenlerin matematik hakkındaki inançlarının yapılandırmacı ve geleneksel boyutları arasında anlamlı negatif bir ilişkinin varlığı saptanmıştır.

Yeni Matematik Eğitim Programı Yordayıcıları

Öğretmen demografiklerinin (cinsiyet, tecrübe, son çalışılan kurumdaki çalışma süresi ve hizmet içi seminerlere katılım) yeni matematik eğitim programının uygulanma seviyesi üzerindeki etkisi incelenmiştir. Analiz sonuçlarına göre, öğretmen demografiklerinin hiçbirisi öğretmenlerin sınıf içi uygulamalarına anlamlı bir şekilde etki etmemektedir, $F(4, 317) = 1.586$, $p>.05$.

İkinci adımda, öğretmen demografikleri kontrol edilerek öğretmelerin matematik hakkındaki inançlarının eğitim programının uygulanma seviyesi üzerindeki etkisi incelenmiştir. Elde edilen sonuçlara göre öğretmenlerin matematik hakkındaki inançlarının eğitim programının uygulanma seviyesini anlamlı derecede yordadığı saptanmıştır $F(6, 315) = 19.681$, $p<.05$. Bu model toplam varyansın %25 ini açıklamaktadır. Hem yapılandırmacı alt boyutun(%15 bireysel katkı)ve hem de geleneksel alt boyutun (%2 bireysel katkı) öğretmenlerin eğitim programı uygulama derecesini anlamlı seviyede yordadığı görülmüştür.

Son adımda, öğretmen demografikleri ve öğretmenlerin matematik hakkındaki inançları kontrol edildikten sonra, öğretmen özyeterliklerinin eğitim programının uygulanma derecesi üzerinde anlamlı bir etkisi olduğu belirlenmiştir $F(9, 312) = 17.440$, $p<.05$. Öğretmen özyeterlikleri varyansın %6 sını açıklamaktadır. Alt boyutlardan arasında yalnızca öğrenci katılımına yönelik özyeterliğin (%4 bireysel katkı) öğretmenlerin yeni eğitim programı uygulama derecesini anlamlı seviyede yordadığı bulunmuştur.

TARTIŞMA

Bu çalışmada 2005 yılında uygulamaya konulan ve 2013 yılında tekrar revize edilen ilköğretim matematik eğitim programının öğretmenler tarafından ne derece uygulandığı, öğretmen demografikleri, matematik hakkındaki inançları ve öğretmen özyeterlikleri açısından değerlendirilmiştir. Elde edilen veriler doğrultusunda matematik eğitim programının ilköğretim düzeyinde uygulanma seviyesinin "yüksek" olduğu belirlenmiştir. Bu sonuç alan taramasında Bulut (2006), Ulubay (2007) ve Türk (2011)' ün bulgularını destekler niteliktedir. Bağımsız değişkenler açısından sonuçlar gözden geçirildiğinde ise, öğretmenlerin matematik hakkındaki inançlarının ve öğretmen özyeterliklerinin eğitim programının uygulanma derecesini anlamlı ölçüde yordadığı ancak öğretmen demografiklerinin bu kapsamda istatistiksel olarak anlamlı bir etki gösteremediği belirlenmiştir. Elde edilen veriler yine alan taramasındaki birçok çalışma ile paralellik göstermektedir (Aguirre, 2009; Goldin, Rösken ve Törner, 2009; Guskey, 1987; Pajares, 1997; Sapkova, 2014; Thompson, 1992).

Öğretmenlerin matematik hakkındaki inançları, araştırma sonuçlarına göre matematik eğitim programının uygulanma seviyesinin en güçlü yordayıcısı olarak belirlenmiştir. Bir eğitim programının başarıyla uygulanmasında şüphesiz en önemli rol öğretmenlerindir. Öğretmenlerin matematiğin doğası, öğretimi ve öğrenimi hakkındaki inanışlarının, seçecekleri eğitim yöntemlerinden kullanacakları materyallere ve öğrencilere karşı olan tutumlarına kadar birçok etmeni önemli derecede etkilediği birçok araştırmacı tarafından sıklıkla vurgulanmıştır (Aguirre, 2009; Goldin ve diğerleri, 2009; Kayan ve Haser, 2013; Sapkova, 2014; Thompson, 1992). Bu bağlamda, öğretmenlerin matematik hakkındaki inançları matematik eğitimi alanında gerçekleştirilmek istenen reformların başarıya ulaşmasında önemli bir belirleyicidir (Aguirre, 2009).Ayrıca çalışma sonuçlarına göre matematik ve matematik eğitimi hakkında daha yapılandırmacı bir yaklaşım sergileyen öğretmenlerin, güncel matematik eğitim programını nispeten daha iyi derecede uyguladıkları görülmüştür. Yapılandırmacı yaklaşımda, öğrencilerin ihtiyaçları eğitimsel süreçlerin planlanmasında esas alınmış ve öğrenci merkezli eğitimsel süreçlerin önemi vurgulanmıştır (Sapkova, 2014). Eğitime yönelik daha yapılandırmacı bir yaklaşım benimseyen öğretmenler öğrencilerin fikirlerine değer verir, onların derse aktif katılımını destekler, araştıran ve sorgulayan bireyler yetiştirmeyi hedefler ve öğrencilerin bilgi ve becerilerini kullanmalarına olanak sağlayan problem ortamları oluştururlar (OECD, 2009). Dolayısıyla öğrenci merkezli eğitim yaklaşımlarının vurgulandığı güncel matematik programının uygulanmasındaki yapılandırmacı matematiksel inançlarının belirgin etkileri beklenen bir sonuçtur.

Elde edilen bulguların ilginç olan kısmı ise geleneksel yaklaşımların ilköğretim matematik öğretmenleri tarafından anlamlı derecede kabul görmesidir. Bu durum iki şekilde açıklanabilir. Öncelikli olarak inançların doğası çelişen inançların birlikte var olmalarına olanak sağlar niteliktedir (Green, 1971). İnançlar yapısal olarak kümeler içinde var olurlar ve inanç kümeleri arasındaki etkileşim minimum düzeydedir (Green, 1971). Bu sayede birbirleriyle çelişen inançların aynı kişi tarafından değerli bulunması olasıdır. Green (1971) tarafından yürütülen çalışmanın verileri de matematik öğretmenlerinin geleneksel ve yapılandırmacı yaklaşımları birlikte değerlendirdikleri sonucunu desteklemektedir. Ayrıca inançların değişimi belirli aşamalardan geçerek bir süreç içerisinde gerçekleşir (Op't Eynde ve diğerleri, 2002). Bireylerin yaşantılarını ve gözlemlerini kendi kişisel filtrelerinden (değer yargıları, var olan düşünce ve inançları, ihtiyaçları, hedefleri, gibi) geçirdikten sonra ulaştıkları yargılar var olan inançlarla karşılaştırılır (Op't Eynde ve diğerleri, 2002). Yeni ve var olan inançlar arasındaki çelişkiler değişimin başlangıcıdır. Türkiye'de değişen eğitim yaklaşımları öğretmenlerin var olan inançlarını sorgulamalarına ve matematiksel inançlarda değişim sürecinin başlamasına olanak sağlamıştır. Var olan bütün inançların birden değişmesi mümkün değildir ve alan yazında sıklıkla vurgulandığı üzere beklenenden daha zor bir süreçtir (Goldin ve diğerleri, 2009; Thompson, 1992; Törner, 2002). Dolayısıyla, devam eden değişim süreci geleneksel ve yapılandırmacı inançların birlikte var olmalarının önemli bir gerekçesidir.

Şüphesiz ki geleneksel inançların süregelen varlığından daha çok onların öğrenci merkezli bir yaklaşımla tasarlanan güncel matematik programının uygulanmasına olan anlamlı katkıları çalışma bulgularının en ilgi çekici kısmını oluşturmaktadır. Aslında var olan her teori bir öncekinin eksiklerine ve hatalarına dikkat çekmek ve bu eksiklikleri tamamlamak için geliştirilmiştir (Combs, Popham ve Hosford, 1977; Dembo, 1981). Dolayısıyla eğitimsel teoriler arsında kesin bir ayrım söz konusu değildir. Değişen koşullar ve ihtiyaçlar eğitimde farklı yaklaşım, yöntem ve tekniklerden faydalanılmasını gerekli kılmıştır. Bu nedenle her teori değerlidir ve önemli olan zamana ve duruma uygun olan teoriden en etkin şekilde faydalanabilmektir (Combs ve diğerleri, 1977). Bu bağlamda, *Matematik Hakkındaki İnançlar Ölçeği'* ndeki geleneksel yaklaşıma ait bazı maddeler yapılandırmacı yaklaşımda da kabul görmektedir (madde 9 gibi). Aynı durum yapılandırmacı yaklaşıma ait bazı maddeler için de geçerlidir (madde 22 gibi). Sonuç olarak geleneksel matematik hakkındaki inançların güncel matematik programının uygulanma seviyesi üzerindeki etkisi kabul edilebilir düzeydedir.

Öğretmenlerin özyeterliklerinin, uygulamadaki ilköğretim matematik eğitim programının uygulanma derecesinin bir diğer güçlü yordayıcısı olması çalışma bulgularının bir diğer önemli boyutunu oluşturmaktadır. İlgili alan yazında birçok araştırmacı tarafından bu sonuç teyit edilmiştir (Gibson ve Dembo, 1984; Henson, 2001; Pajares, 1997; Tschannen-Moran ve diğerleri, 1998). Öğretmenlerin tercihlerinin ve davranışlarının en önemli belirleyicisi olan özyeterlikleri, öğretmenlerin koydukları hedefleri, öğrencilerin başarıları adına ortaya koydukları çabayı, engeller ve zorluklar karşısındaki mücadele azimlerini ve mesleki heyecanlarını belirgin ölçüde etkilemektedir (Henson, 2001; Tschannen-Moran ve diğerleri, 1998). Öğretmen özyeterliği yüksek olan öğretmenlerin, reformlara açık olmaları, yeni eğitimsel metot ve teknikleri uygulama konusunda istekli olmaları ve eğitimsel hedefleri gerçekleştirme hususunda gayretli ve planlı olmaları beklenmektedir. Özyeterliği düşük olan öğretmenlerin aksine, başarısızlıklar karşısında motivasyonlarını kaybetmez ve kendilerine olan inançlarını yitirmezler (Tschannen-Moran ve diğerleri, 1998). Bu kapsamda, öğrencilerin eğitim sürecine aktif katılımı, ailelerle işbirliği, farklı yöntem ve tekniklere olanak sağlayan esnek öğretim anlayışı ve süreç değerlendirmesi gibi öğrenci merkezli yaklaşımların temel prensipleri ancak özyeterlikleri yüksek öğretmenler tarafından gerçekleştirilebilir. Sonuç olarak elde edilen bulgular alan taraması ile paralellik göstermektedir.

Ancak öğretmen özyeterliklerinin üç alt boyutundan yalnızca öğrenci katılımına yönelik özyeterlik boyutu, eğitim programının uygulanmasına bireysel olarak anlamlı derecede katkı sağlamıştır. Sınıf yönetimi için gerekli olan beceriler ile öğrenci merkezli bir eğitim programını başarıyla uygulamak için gerekli olan beceriler birbirinden çok farklıdır (Ornstein ve Hunkins, 2004). Dolayısıyla sınıf yönetimine hakim olmak demek programı başarılı bir şekilde uygulamak demek değildir. Bu bağlamda, sınıf yönetimine karşı öğretmen özyeterliklerin programın uygulanma derecesini anlamlı bir şekilde etkilememesi anlaşılabilir bir sonuçtur. Bunun yanında, kullanılan ölçekteki maddeler daha çok programın öğrenci merkezli yapısına vurgu yaparak, öğrencilerin aktif katılımının ne ölçüde sağlandığını sorgulamaya yönelik hazırlanmıştır. Güncel öğretim yöntem ve tekniklerinin kullanılmasına gerektiğince yer verilmemiştir. Bu kapsamda, öğretim yöntemlerinin kullanılmasına yönelik öğretmen özyeterliklerinin programın uygulanmasına anlamlı derecede katkı sağlayamamaları, öğretmenlerin bu alandaki düşüncelerinin tam olarak yansıtılamamasından kaynaklanmış olabilir.

Son olarak, çalışma bulguları öğretmenlerin cinsiyeti, tecrübesi, bulunduğu kurumdaki çalışma yılı ve yeni eğitim programı ile ilgili hizmet içi eğitim seminerlerine katılma durumu gibi öğretmen demografiklerinin, öğretmenlerin güncel matematik eğitim programını uygulama dereceleri üzerinde anlamlı bir etkilerinin olmadığını göstermiştir. Bu sonuç, Budak (2011), Meşin (2008) ve Türk (2011)'ün çalışma bulguları tarafından desteklenmektedir.

APPENDIX F: Consent Form for Copying the Thesis

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü	
Sosyal Bilimler Enstitüsü	X
Uygulamalı Matematik Enstitüsü	
Enformatik Enstitüsü	
Deniz Bilimleri Enstitüsü	

YAZARIN

Soyadı : Kabaoğlu
Adı : Kevser
Bölümü : Curriculum and Instruction

TEZİN ADI (İngilizce) : PREDICTORS OF CURRICULUM IMPLEMENTATION LEVEL IN ELEMENTARY MATHEMATICS EDUCATION: MATHEMATICS-RELATED BELIEFS AND TEACHER SELF-EFFICACY BELIEFS.

TEZİN TÜRÜ : Yüksek Lisans [X] Doktora [ ]

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. [X]
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. [ ]
3. Tezimden bir (1) yıl süreyle fotokopi alınamaz. [ ]

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: