AN INVESTIGATION OF ELEMENTARY AND MATHEMATICS TEACHERS' VIEWS ABOUT THE NEW ELEMENTARY SCHOOL MATHEMATICS CURRICULUM

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Approval of the Graduate School of Social Sciences

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ABSTRACT

AN INVESTIGATION OF ELEMENTARY AND MATHEMATICS TEACHERS' VIEWS ABOUT THE NEW ELEMENTARY SCHOOL MATHEMATICS CURRICULUM

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The purpose of this study was to identify and describe elementary and mathematics teachers' views about the new elementary school mathematics curriculum (NC).

A total of 22 elementary teachers (grades 1-5) and mathematics teachers (grades 6-8) Alaca district of Çorum participated. The data were collected through one-to-one interviews with some of the participants and written responses for the interview questions provided by the rest of the participants.

The findings indicated that the participants had positive views about the impact of the NC. Participants reported that the NC helped students reach meaningful learning through the instructional activities, new content, curriculum materials, and new assessment techniques. Participants had positive views about the new roles for the teachers and the students and the increased student motivation that the NC brought. They also expressed challenges in teaching due to the lack of materials, physical facilities, and time. Local differences impacted the implementation of the NC negatively in rural contexts. The intensity of the NC made instructional activities and the assessment processes difficult to implement

in multi-grade and crowded classrooms. Participants did not feel efficient enough to implement the NC since they lacked adequate training and support. While teachers adopted the ideas that the NC brought, they adapted these practices to their existing practices. They reported performing a combination of NC practices and previous practices. Participants claimed that content of Ministry support should be more practice oriented, the curriculum materials should be sufficient in number, and the duration of mathematics lesson should be increased.

Keywords: Teachers' Views, The New Elementary School Mathematics Curriculum, Elementary Teachers, Mathematics Teachers

ÖZ

YENİ İLKÖĞRETİM MATEMATİK DERSİ PROGRAMI HAKKINDA SINIF VE İLKÖĞRETİM MATEMATİK ÖĞRETMENLERİN GÖRÜŞLERİNİN İNCELENMESİ

Keleş, Özkan
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Bu araştırmanın amacı, yeni ilköğretim matematik dersi programı (YP) hakkında öğretmen görüşlerini belirlemek ve betimlemektir.

Çorum'un Alaca ilçesinde görev yapmakta olan toplam 22 sınıf ve ilköğretim matematik öğretmeni çalışmaya katılmışlardır. Bu çalışmanın verileri bazı katılımcılarla birebir görüşme, diğerleri ile görüşme sorularına yazılı cevap alma yoluyla toplanmıştır.

Bulgular katılımcı öğretmenlerin YP hakkında olumlu görüşlere sahip olduklarını göstermiştir. Katılımcılar YP öğretim etkinlikleri, yeni konular, program materyalleri ve yeni değerlendirme yöntemleri ile öğrencilerin anlamlı öğrenmeye erişmelerine yardımcı olduğunu düşünmektedirler. Katılımcılar YP'ın öğretmenlere ve öğrencilere getirdiği yeni roller ve artan öğrenci motivasyonu hakkında olumlu görüş bildirmişlerdir. Katılımcılar materyal eksikliği, fiziksel mekânların yetersizliği ve zaman yetersizliği sebebiyle öğretim sırasında zorlandıklarını ifade etmişlerdir. Yerel farklılıklar YP'ın uygulanışını özellikle taşrada olumsuz yönde etkilemiştir. YP öğretmenlere yeni sorumluluklar getirirken, YP'ın yoğunluğu öğretim etkinliklerinin ve değerlendirme süreçlerinin uygulanmasını özellikle birleştirilmiş ve kalabalık sınıflarda zorlaştırmıştır.

Öğretmenler YP'ın uygulanması ile ilgili uygun eğitim ve desteği almadıkları için kendilerini YP'ı uygulama konusunda yeterli hissetmemişlerdir. Bulgular göstermiştir ki, öğretmenler YP'ın getirdiği fikirleri benimsemişler, bu uygulamaları sahip oldukları uygulamalarına uyarlamışlardır. YP uygulamaları ve önceki uygulamaların bir birleşimi şeklinde öğretim yapmaktadırlar. Katılımcılar Bakanlığın desteğinin daha uygulama ağırlıklı olmasını, program materyallerinin yeterli sayıda olmasını, okullardaki fiziksel şartların iyileştirilmesini ve matematik ders saati sayısının arttırılmasını önermişlerdir.

Anahtar Kelimeler: Öğretmen Görüşleri, Yeni İlköğretim Matematik Programı, Sınıf Öğretmenleri, Matematik Öğretmenleri

To My Parents

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LIST OF ABBREVIATIONS

NC: The New Elementary School Mathematics Curriculum

YP: Yeni İlköğretim Matematik Programı

MNE: Ministry of National Education

SBS: The Level Examination

f: Frequency

N: Sample size

CHAPTER 1

INTRODUCTION

The continuous developments in field of science, technology, and economy have brought the changes in education and eventually in teaching and learning approaches. In the knowledge age, the future of individual and society is based on the skills of reaching, using, and producing knowledge. Gaining these skills and maintaining them lifelong require that education should be based on the production of knowledge. It can be said that one of most important concerns of the developed and developing countries is to adapt to the changes and developments in the world in their education. As a developing country, Turkey should also attune to these improvements in the world. In addition to the global concerns, there has been a desire to increase the quality of education and provide the equality in education in Turkey. While the existed curricula did not meet our societies' needs in the knowledge age, national and international reports showed that the success of Turkish students was low in comparison studies (MNE, 2005).

Considering the global developments and national concerns, the Ministry of National Education (MNE) made changes in elementary school content area curricula including mathematics in 2003. The mathematics curriculum was prepared by considering national and international studies in mathematics education field, teachers' past experiences, mathematics curricula in several countries, and the experiences of mathematics education in Turkey. It also considered the unity of eight year elementary education (Bulut & Koç, 2006).

The new elementary mathematics curriculum was prepared in 2004, piloted at selected schools during 2004-2005 academic year, and started to be implemented in grades 1-5 of all elementary schools during 2005-2006 academics year. For grades 6-8, the implementation of the new curriculum has been started at the 6^{th} grade beginning from 2006-2007 academic year and continued with 7^{th} and 8^{th} grade.

The scope of the new elementary mathematics curriculum was based on the constructivist view and it adopted teaching approaches based on multiple intelligence theory with focus on student-centered learning environments. However, the new curriculum has also brought problems since it is quite different from the previous one in terms of the scope (Bulut, 2007). In this study, I investigated teachers' views about the new elementary mathematics curriculum and aimed to explore how teachers perceived the new curriculum, what kinds of problems they faced during the implementation process, and what suggestions they made to solve them.

1.1 The new elementary school mathematics curriculum

The new elementary mathematics curriculum is based on the principle that "every child can learn mathematics" and follows a conceptual approach in order to enable students to comprehend mathematics and make abstraction by using their intuitions and experiences (MNE, 2005). The curriculum consists of learning areas which include concepts and relations. Conceptual approach requires that more time should be allocated for the construction of conceptual base for mathematical knowledge. With this conceptual approach, the curriculum aims to help students to construct mathematical meanings and to make abstractions from their real-life experiences and intuitions. In addition to the development of mathematical concepts, it was also aimed that some important skills such as problem solving, communication, reasoning, and making connections would be improved (MNE, 2005; MNE, 2006).

The new elementary mathematics curriculum consists of four learning areas as they are numbers, geometry, measurement, and data (probability and statistics) for grades 1-5 (MNE, 2005). There are five learning areas which are numbers, geometry, measurement, algebra, and statistics and probability for grades 6-8 (MNE, 2006). Although there is no algebra area for grades 1-5, some learning outcomes of algebra are included in the convenient learning areas. Learning areas are organized through the connections between the concepts and skills related to the area and the main topic. For instance, numbers learning area aimed to develop the ability of using the numbers and digits meaningfully, to develop the estimation and mental operation skills with understanding the four

arithmetical operations, to ensure that the students associate the fractions, percentages and the decimal fractions and to ensure that the students determine the relations within patterns and students should also apply all these information in the problem situations (MNE, 2005).

In the new elementary mathematics curriculum, some subjects are added as well as some of them are extracted. For instance, in grades 1-5, the new added subjects are patterns, tessellations, transformational geometry, probability, estimation, and object graph (MNE, 2005). Estimation, patterns, tessellations, transformational geometry, fractals, perspective, some subjects related to statistics and probability, and some concrete models are added to the new curriculum for grades 6-8 (MNE, 2006). In addition to changes in content, the new elementary mathematics curriculum emphasized new approaches like new skills, teacher-students roles, instructional methods, and alternative assessment tools.

The new elementary mathematics curriculum aims students to get common skills which are also included in other content areas such as Turkish, Science and Technology, and Social Science. These are critical thinking, creative thinking, communication, making investigations, reasoning, problem solving, using technology, and using Turkish correctly, effectively, and well. Additionally, self-regulation skills, psychomotor skills, and emotional development are taken into consideration in the new curriculum (MNE, 2005; MNE, 2006).

The curriculum is based on the fact that all students should be active in the process of mathematical study. Special emphasis is given to providing environments where students can make researches, make discoveries, solve problems, and discuss and share their solutions and views. Moreover, mathematical concepts should be related to each other and to the other content areas (MNE, 2005; MNE, 2006).

The curriculum suggests instructional strategies so that it would be implemented successfully. It points out that instruction should start with concrete experiences and meaningful learning should be aimed. Students should be active during learning process and make connection to their previous mathematical knowledge. Making connections between the existing concepts should also be given importance. Attention should be paid to emphasizing the outcomes in sub-learning fields and interdisciplinary areas simultaneously while planning and

implementing activities. Moreover, the new curriculum says that student motivation should be taken into consideration. It is expected that students and teachers use concrete materials and technology during the lessons effectively. In addition, the new mathematics curriculum suggests that teachers should follow five steps during planning and implementing mathematics lessons. These steps are: (1) introduction, (2) observation/investigation, (3) explanation, (4) progress and, (5) assessment (MNE, 2005; MNE, 2006).

In the measurement and assessment part of the new elementary mathematic curriculum, not only the products but also learning process is evaluated. The curriculum suggests using different assessment tools in order to reveal individual differences during learning process. With this aim, in the assessment, besides traditional measurement tools (multiple choice, true-false, matching questions, midterms, etc), in order to evaluate process, the new curriculum suggests teachers to evaluate students' performance, use students' portfolio, observe students' emotional development, and utilize from observation forms related to students' emotional development, self esteem and attitude toward mathematics, group studies, and taking responsibility (MNE, 2005; MNE, 2006).

Together with the new elementary mathematics curriculum, students' and teachers' roles have also been changed. In the old curriculum, students didn't take an active role in their learning (Bulut, 2004). This is in contrast to the new curriculum approach in which students' roles are defined as participating actively, mentally, and physically during learning process, being responsible for their own learning, expressing their views, being able to ask questions, having reasoning and problem solving skills, conducting team-work, evaluating their own work, being able to use technology effectively, and having a positive attitude towards mathematics (MNE, 2005; MNE, 2006). On the other hand, teachers' roles were the information provider and the only decision maker in the old curriculum. This contrasted the teacher' roles in the new curriculum approach where teachers are mainly the facilitators (Koç, Işıksal, Bulut, 2007). In addition, teachers' roles are to improve himself/herself, be responsible from students' learning, be able to direct, guide, and motivate, develop activities and implement them, be able to make reasoning and make students to ask questions, participate in students' learning by listening them, cooperate with students and make assessments during

the learning process, and be able to evaluate students with as many measurement tools as possible (MNE, 2005; MNE, 2006). The comparison between the old and the new curriculum are given in Table 1.1

Table 1.1: A comparison of the old and the new curriculum

OLD CURRICULUM	NEW CURRICULUM
Elementary school mathematics curriculum for grades 1 through 5 contains 1249 behavioral objectives. Textbooks written based on these objectives were very uniform and dull. Both the textbook writers and the teachers are restricted to make very limited decisions.	There are 368 learning outcomes that summarize the knowledge and skills for students to develop. These outcomes can be obtained through different learning activities. So, the textbook writers and teachers are relatively freer to produce or choose activities.
The content for 4th and 7^{th} grade is too dense to follow for students considering their development.	The content is distributed evenly from grade 1 through grade 8.
Teaching methods, techniques and strategies are not student centered.	Teaching-learning activities prepared parallel to learning outcomes require student centered methods, techniques, and strategies.
Content is organized based on how to teach.	Content is organized based on how students learn.
There are few sample activities that require the use of manipulative.	Almost all of the sample activities show how to use manipulative for students' construction of knowledge.
There are overlapping content in other subject areas	There are connections to other subject domains.
There are few examples of realistic mathematics.	Daily use of mathematical knowledge is emphasized.
There are limited number of alternative assessment techniques, extra curricular activities, research, and projects.	Alternative assessment techniques, extra curricular activities, research, and projects are included.
All students are expected to exhibit the same performance, with no local flexibility or individual differences. There is little room for students to choose from the alternatives.	Respect for individual differences, different learning and thinking styles is suggested. There is more room for students to choose from the alternatives.
There is little mention about developing positive attitude in students.	There is more emphasis on how to develop positive attitude towards mathematics and on student motivation.

Source: Babadoğan, C., & Olkun, S. (2006). Program development models and reform in Turkish elementary school mathematics curriculum. *International Journal for Mathematics Teaching and Learning.* Retrieved December 15, 2006 from http://www.cimt.plymouth.ac.uk/journal/default.htm.

Teachers are the most important agents in the implementation of the new curriculum (Ersoy, 2006). The innovation of the Ministry of National Education requires that instructional approach changes from the teacher-centered approach to the student-centered one. The mentioned transformation requires that the existing teacher population should also transform their ideas and practices. Considering the 600 000 teachers in elementary and secondary level, this transformation requires both funds and effort. Therefore, pilot implementations and in-service trainings were planned for a five-year period in order to implement the new curriculum completely. However, the success in such a widely participation is especially based on to what extent teachers can adopt innovations and the transformation, and internalize this approach (Ersoy, 2006). Therefore, it is important to explore teachers' views about the new mathematics curriculum and how they perceive the changes in order to investigate the implementation of the program and guide the program revision processes.

Considering the needs for understanding teachers' views about the new mathematics curriculum, this study aimed to identify and describe teachers' views (grades 1-7) about the new elementary school mathematics curriculum. Specifically, this study focused on the following research questions:

1. What are teachers' views about the new elementary mathematics curriculum?
2. What are teachers' views about assessment techniques in the new elementary mathematics curriculum and the level examination?
3. What are the difficulties of teachers about the new elementary mathematics curriculum during the implementation?
4. What are teachers' suggestions about the solutions of their problems during the implementation of the new elementary mathematics curriculum?

The study investigated the specified questions through interviewing with elementary and mathematics teachers about their views considering the new elementary school mathematics curriculum. Teachers' difficulties during the implementation process and their suggestions for the curriculum developers were also explored throughout the study. This study did not compare views of elementary and mathematics teachers, but provided accounts of some differences

in their views about the issues regarding the new elementary mathematics curriculum.

The findings of this study are expected to provide crucial information for curriculum specialists, decision makers, and researchers involved in the curriculum development and improvement process. Moreover, the study is expected to contribute to the literature about curriculum change in Turkey.

1.2 Significance of the study

The most important purpose of the reform studies in mathematics education is to construct a system that helps students learn mathematics meaningfully (Franke & Kazemi, 2001). Teachers play key roles in education reforms as the agents of change who work directly with students (Ryan & Joong, 2005). Therefore, the success of a mathematics reform is directly related to the extent that it can be implemented in classrooms by teachers. In the case of Turkey, teachers have many responsibilities and duties in implementing the new elementary mathematics curriculum (Bıkmaz, 2006; Eğitim Reformu Girişimi, 2005). Kalin and Zuljan (2007) underlined that there is a need for well-qualified teachers in order to implement reform effectively. Also, they stated that curricular changes and innovations can be successful when teachers understand, accept and use them.

Investigating teachers' views might be useful for determining the teachers' needs while they adapt their new roles for the requirements of the new curriculum, because implementation of the curriculum change is the problem of the smallest unit, who is teachers (McLaughlin, 1987). Existing gaps between the new curriculum requirements and how teachers perceive these requirements are also likely to become apparent through such investigation. Exploring teachers' views might be helpful for avoiding the possible problems which might emerge in the future and contribute the development of in-service training programs regarding the new curriculum, which are found to be insufficient (Bal, 2008). In-depth investigation of teachers' views might give information about how much teachers know about the usage of the new curriculum materials and what kinds of problems they face in implementing these materials in the classroom. This might provide insight into the studies conducted to improve and revise the content of

curriculum materials. Teachers' views might be useful for determining whether the new elementary mathematics curriculum would arrive its goal of changing the traditional practice of instruction in Turkey. Overall, investigating teachers' views might contribute to the improvement of the new elementary mathematics curriculum and the content of in-service training. It might also help teachers in finding solutions for the problems they face during the implementation of the new curriculum.

Revisions to Turkish elementary mathematics curriculum are still conducted and will continue to improve the program (Ersoy, 2006). Hence, it is necessary to explore what teachers think about it and provide feedback on how it operates in classrooms based on teachers' self-reports. In this respect, the evaluation of the new elementary mathematics curriculum around teachers' views is necessary for better understanding the adaptation and implementation process.

Most of the studies about the new elementary mathematics curriculum in Turkey are conducted through implementing scales to a large number of teachers. Although these studies provide an insight about teachers' views, they do not give in-depth information about what teachers think about the curriculum, its implementation, and challenges during the implementation. In addition, most of the studies aimed to examine teachers' views about the new elementary mathematics curriculum of grades 1-5 and did not include elementary mathematics curriculum of grades 6-8. Therefore, this study focused on gaining a deeper understanding of teachers' views on the new mathematics curriculum both on the lower and upper elementary grades through conducting in-depth interviews with the teachers.

1.3 My Motivation for the Study

I graduated from Middle East Technical University in 2004 and I have been working as mathematics teacher for four years. During my education, I learned how mathematics can be learned and taught meaningfully based on constructivist approach. I prepared instructional activities and lesson plans based on constructivism for the courses. The new curriculum brought many innovations to elementary mathematics education. It adopts conceptual approach, is based on active participation of students in the learning process, and enables the students to

express their individual differences and abilities via projects and specified assignments. Also it aims to prepare contexts where students can research, discover, discuss their solutions, and develop their psychomotor skills by using materials in activities. Therefore, my undergraduate education was parallel to the ideas and practices emphasized in the new curriculum.

I have been implementing the new elementary mathematics curriculum since 2005, but I have seen that teachers experienced adaptation problems and had difficulties during the implementation of the new curriculum in my teaching context. Therefore, in order to provide a more scientific account of my impressions about the new curriculum, I investigated teachers' views, their difficulties, and suggestions about the new elementary mathematics curriculum in this study. In addition to the useful information this study will provide for curriculum developers and other researchers, I believe that this study will make contribution to my profession as a teacher.

The thesis is composed of five chapters. In Chapter Two, the revision of literature about teachers and reform, positive views about reform movements, the factors affecting mathematics curriculum reform and teachers' difficulties in implementation process, accepting and resisting the new curriculum, the studies about assessment issues in the new curriculum, and the studies in Turkey about teachers' views about the new curriculum are given. The design of study, descriptions of the participants, instruments, procedures, data analysis, the quality of the research, and limitations are given in detail in Chapter Three. Chapter Four gives the results of teachers' views about the new elementary mathematics curriculum. Finally, the summary and discussion of the major findings and the recommendations for future research are presented in Chapter Five.

1.4 The definition of related terms

The new elementary school mathematics curriculum: The elementary school mathematics curriculum which was prepared in 2004 by Ministry of National Education, tested at some pilot schools during 2004-2005 academic year, started to be implemented in 1-5 grades of all schools during 2005-2006 academics year and as for 6-8 grades, started to be implemented with 6^{th} grade beginning from 2006-2007 academic year progressively.

Elementary teachers: Teachers who have been working in 1-5 grades of elementary schools studied. They are graduates of Elementary Education departments of Education Faculties or other departments.

Mathematics teachers: Teachers who have been working in 6-8 grades of elementary schools studied. They are graduates of Elementary Mathematics Education departments of Education Faculties or other departments.

Novice teachers: Teachers participated in this study with 1 to 3 years of experience.

Expert teachers: Teachers participated in this study with at least 4 years of experience.

CHAPTER 2

LITERATURE REVIEW

In this chapter, several studies about reform movements in mathematics education are reviewed. Most of these studies are related to teachers' views and concerns about mathematics curriculum reform. Additionally, studies related to teachers' difficulties during implementation and factors affecting the implementation process, teacher change and development, and teachers' views about assessment of new curriculum are summarized. Most of the reviewed studies are conducted in Turkey. Foreign studies about curriculum were also included.

2.1 Teachers and Reform

Reform in mathematics education has been a major concern in the world in the last 15-20 years. Many countries have initiated several mathematics curriculum reforms in order to change traditional classroom practices and increase students' achievement. Although reform efforts have been quite successful at changing practices in selected classrooms and schools, few have been able to have a broader impact (Ball, 2001). As teachers are most important agents of curriculum reforms, many studies have been conducted to investigate teachers' opinions and perceptions about curriculum reform (McLaughlin, 1987). These studies aimed to help policy agents including curriculum developers, school administrators, and teachers in receiving the policy and improving them.

Learning teachers' views is important for the implementation of the new curriculum, because the success of curriculum reform is mainly based on teachers' way of implementation, to what extent teachers adopt to innovations, teachers' views about reform, and what they believe (Bıkmaz, 2006; Ersoy, 2006). Many studies have been conducted in Turkey in order to investigate the effectiveness of the new curriculum and how teachers implement it. While these studies focused

on the difficulties in implementation most of the time, few studies addressed that some issues in the new curriculum were misunderstood by the teachers. It has appeared that certain concepts such as individual differences, active learning, teachers' role, and employment of measurement techniques were not exactly understood by the teachers as they were stated in the curriculum documents (Bıkmaz, 2006).

2.2 Positive views

Research which has been conducted about the new curricula in Turkey and in the world indicated that the new curricula brought significant improvements for mathematics learning with new approaches in teaching. The effectiveness of the teaching approaches and the changed aspects of the classroom practice were common in teachers' views. For example, Portuguese seventh grade mathematics teachers addressed the changes related to the new mathematics curriculum in Portugal as a higher involvement of students, more group work, and exploratory activities (Ponte, Matos, Guimãraes, Leal, & Canavarro, 1994). In Turkey's case, elementary teachers (grades 1-5) expressed that the new curriculum is based on student-centered approach and active students' participation (Bal, 2008; Bulut, 2007; Kartallıoğlu, 2005) Generally, fifth grade elementary teachers stated that they taught mathematics according to constructivist approach while implementing the new curriculum and most of the teachers associated the new curriculum with this approach (Soycan, 2006). Furthermore, in Erbas and Ulubay's (2008) study, most of sixth grade mathematics teachers expected that the new curriculum would enable students to develop positive attitudes towards mathematics and realize meaningful and permanent learning.

The new Turkish curriculum brought considerable changes in teachers' roles and students' roles (MNE, 2005, MNE, 2006). According to the fifth grade elementary teachers, their role was being a facilitator and guide (Bulut, 2007). Indeed, the new curriculum encouraged teachers to undertake new roles such as guiding students in the classroom as well as providing cooperation, facilitating learning for the students, developing their teaching-learning process, planning the teaching learning environment, and taking individual differences into account (Gömleksiz & Bulut, 2007). Elementary teachers (grades 1-5) also viewed that the

new curriculum helped students use knowledge and make investigation, and aimed to develop students' reasoning, writing and verbal expression skills, and skills related to using of technology (Günay, 2006). Moreover, elementary teachers (grades 1-5) expressed that new curriculum enabled students explore and make reasoning (Kartallıoğlu, 2005).

One of the major parts of the new elementary mathematics curriculum in Turkey is the inclusion of several instructional activities (MNE, 2005a). Fifth grade elementary teachers stated that the new curriculum consisted of visual and student centered activities and helped students learn the importance of subjects and relationship with real life (Bulut, 2007). In Halat's (2007) study, most of the elementary teachers (grades 1-5) expressed that instructional activities had positive effects on students' thinking, attitudes towards mathematics, understanding of mathematical concepts and students' interactions with each other. In his study, teachers stated that activities made positive effect on students and teachers inside and outside of the school. Moreover, they pointed out that activities helped students think, conduct a research, and socialize with an increased interest. It also helped teachers teach the subjects and increased student's interest to the mathematics lesson. In Korkmaz's (2006) study, first grade elementary teachers viewed that students' active participation to activities gave chance students to enjoy mathematics and gain problem solving skills.

When the new elementary mathematics curriculum is evaluated with respect to its content, elementary teachers (grades 1-2-3) positively viewed that learning outcomes were expressed clearly and prepared conveniently for students' developmental level (Bal, 2008; Korkmaz, 2006). Elementary teachers (grades 1-5) also commented on the inclusion and exclusion of some topics in the new curriculum and stated that the intensity of the concepts in the topics was reduced, the new curriculum supported the individual differences and, it considered them as richness (Kartallıoğlu, 2005).

The mathematics textbooks also were changed in the new curriculum. Additionally, course books, students' workbooks, and teachers' guide books were started to be used. Elementary teachers (grades 1-5) claimed that the language used in the course books and workbooks was very clear and appropriate to

students' level, and the teachers' guide book was well-prepared and shaped elementary school teachers' teaching methods in Halat'(2007) study.

The above studies addressed that teachers generally had positive views about the new mathematics curriculum. These views showed that teachers were not against the changes that the new curriculum brought and they considered these changes as positive improvements in terms of mathematics education. The factors that might influence the implementation of the new curriculum and the difficulties teachers might face will be mentioned below.

2.3 The factors affecting mathematics curriculum reform and teachers' difficulties in implementation process

Curriculum change is a difficult process and there are many factors influencing curriculum alignment and change in mathematics education (Handal & Herrington, 2003). Memon (1997, cited in Handal and Herrington, 2003) gave a comprehensive list of factors affecting curriculum change process with respect to curricular, instructional, and organizational factors as given in Table 2.1.

Table 2.1: Factors Affecting Educational Reform in Mathematics Education

Curriculum factors	Instructional factors	Organizational actors
Externally imposed innovation.	Importance attached by teachers to old practice.	Lack of supportive mechanism.
Lack of curriculum users' participation.	Inadequate knowledge of subject matter, method and student assessment.	Lack of coordination.
Non-clarity of curriculum changes.	Examination dominated teaching.	Lack of communication.
Mismatch between official curriculum and actual curriculum.	Mismatch between teachers' belief system and curriculum goals.	Lack of classroom materials.
Change is not responsive to curriculum users' needs.	Lack of detailed planning.	Lack of physical facilities.
Imported innovation.	Lack of motivation, incentives and rewards.	Lack of resources.
Unplanned change.	Lack of professional development.	Lack of INSET.
	Lack of classroom interaction.	Lack of community participation.
	Lack of students' interest.	Influences of political leaders.
		Influence of bureaucracy.

Source: From Memon, M. (1997). Curriculum change in Pakistan: An alternative model of change. *Curriculum and Teaching, 12*, 55-63, cited in Handal, B., Herrington, A., (2003). Mathematics teachers' beliefs and curriculum reform. *Mathematics Education Research Journal, 15*, p.61.

Memon (1997) gave some curriculum related factors such as lack of curriculum users' participation, non-clarity of curriculum changes, mismatch between official curriculum and actual curriculum, and not being responsive to curriculum users' needs. Inadequate subject matter knowledge, lack of method and assessment knowledge, lack of professional development, and examination dominating teaching were some of the factors affecting curriculum change instructionally. As for the organizational factors, he addressed the lack of supportive mechanism, classroom materials, physical facilities, and resources.

Several studies confirm parts of the factors listed in Table 2.1 Manouchehri and Goodman (2001) found that a successful curriculum reform could be successful in the schools where teachers had emotional and intellectual support, and opportunities for improving their content and pedagogical knowledge. They also found other factors affecting teachers' implementation process of new materials and instructional practices, such as teachers' experiences and personal theories, social influences, insufficient time for planning, lack of

conceptual understanding of mathematics concepts and pedagogical content knowledge, and lack of progressive leadership and professional support.

Orrill and Anthony (2003), in similar sense, investigated the barriers on the implementation process of curriculum. They found out that lack of support and materials were the main problems in implementing the curriculum. They also found that the difficulties related to the use of new materials, assessment procedures, classroom management problems caused by the group-works, and lack of experience with using and teaching with curriculum materials influenced the implementation process. Moreover, teachers' existing beliefs about dealing with low-achieving students, the necessity of practice, and the necessity of being comfortable with the textbook had an influence on their views about and experiences with the new curriculum. In addition, professional development programs and teachers' personal definitions of success impacted how they adopted the new curriculum. Orrill and Anthony concluded that the barriers found in their study were the lack of materials and adequate mathematics knowledge, teachers' concerns about students' skills and success, parents' pressure, standardized tests, and time. They suggested that teachers should make revisions in their classroom practices such as their mathematical knowledge, grading, managing groups and using materials in order to implement curriculum successfully.

In the case of Turkey, lack of sufficient time for implementing instructional activities, crowded classroom population, lack of materials, and teachers' lack of adequate knowledge and experience with instructional technologies to implement related activities and new assessment techniques were also seen as barriers to efficient implementation of the new curriculum by sixth grade mathematics teachers (Erbas & Ulubay, 2008).

Teacher training is important in the process of implementation of the new elementary mathematics curriculum since the adaptation process to new roles in the current reform is not easy for teachers and teachers need extensive period of training (Babadoğan and Olkun, 2006). When elementary teachers (grades 1-5) were not provided with training about the new curriculum, they did not have clear ideas about its philosophy (Kartallıoğlu, 2005). Additionally, many teachers might not know the use of concrete materials which the new curriculum required, when

they were not provided with proper training (Babadoğan and Olkun, 2006). Sixth grade mathematics teachers claimed that the implementation of the new curriculum in Turkey was feasible and possible, however, they expressed that they should be informed well and they needed professional development about the new curriculum (Erbas & Ulubay, 2008). Despite the fact that the necessity of the training was documented, most studies indicated that when the new curriculum was implemented, teacher training was generally underemphasized (Bal, 2008; Babadoğan & Olkun, 2006; Bulut, 2007; Halat, 2007; Kartallıoğlu, 2005; Yapıcı & Leblebiciler, 2007).

Lack of materials and lack of school facilities are another important factors affecting implementation process of the new curriculum. In Turkey, elementary teachers claimed that schools' physical facilities were not sufficient for implementing activities. They stated that activities were not applicable in crowded classrooms (Bal, 2008; Bulut, 2007; Gomleksiz & Bulut, 2007; Halat, 2007; Korkmaz 2006). Yenilmez and Çakmak (2007) addressed the difficulty of implementing the new curriculum in crowded and multi-grade classrooms and expressed that teachers' guide books should give directions for implementation of classroom activities in these classrooms.

Elementary teachers (grades 1-5) also addressed that the materials and the schools' physical facilities, especially in terms of technology, were not enough in order to implement the new curriculum (Kartallıoğlu, 2005; Yılmaz, 2008). The major problem with the materials was the lack of information about how these materials should be used and the lack of sufficient number of concrete materials. The elementary teachers (grades 1-5) commented that although there were concrete materials in appendices of the teachers' guide book, sample activities about how concrete materials should be used were not enough. They suggested that the classrooms should be equipped with technological devices and mathematics laboratories should be established (Yenilmez & Çakmak, 2007).

Parent involvement was also considered as an important factor by the teachers who implemented the new curriculum. Elementary teachers (1-5 grades) stated that parents did not accept the new curriculum and were resistant to change (Kartallıoğlu, 2005). First grade elementary teachers also claimed that parents did not have enough information about the new curriculum (Korkmaz, 2006). In

addition, Halat (2007) pointed out that elementary teachers (grades 1-5) did not perceive a considerable change in the parents' involvement in their children's learning after the new curriculum was implemented. Mathematics teachers (grade 6) did not get support from parents who were concerned about their children's success in standardized tests, which seemed to be the major obstacle for parent support (Erbas & Ulubay, 2008).

The studies conducted in Turkey documented that teachers had certain difficulties related to the implementation of the new curriculum based o their views. Those difficulties included lack of teacher training, materials, school physical facilities, and parent support, insufficient time, and teachers' insufficient knowledge about implementation of activities and new assessment techniques. Crowded and multi-grade classrooms were seen as an important concern for the implementation of the new curriculum.

2.4 Accepting and resisting the new curriculum

Teachers have to deal with many difficulties while implementing the new curriculum as documented above. However, they are likely to adapt practices required by the new curriculum to their existing practices.

Curriculum adaptation is one of the many aspects of teachers' practices in the context of reform An investigation of how teachers adapt a new curriculum addressed that teachers adapted it differently and this difference was resulted from three features of teachers' own experiences: (i) teachers' early memories with mathematics, (ii) teachers' perceptions and interpretations of themselves as adult learners of mathematics, and (iii) their mathematical interactions with family members (Drake & Sherin, 2006).

Kyriakides, Charalambous, Philippou, and Campbell (2006) conducted a research aimed to examine teachers' and students' reactions toward a mathematics reform introduced in Cypriot elementary schools, and to investigate the factors influencing the effectiveness of the reform. The results of this study indicated that the mathematics reform was rarely implemented as planned. Teachers in this study frequently made adaptations to the proposed reform practices either to match their mathematics teaching philosophies or to fit their teaching realities and

meet their students' learning needs. Teachers altered the proposed curriculum plans by using extra worksheets or they wrote completely different teaching plans.

The new Cypriot mathematics curriculum was also investigated by Christou, Elipthou-Menon, and Philippou (2004) in terms of the concerns of elementary school teachers in relation to the recent implementation of a new mathematics curriculum and the use of new mathematics textbooks. While teachers in this study were not concerned about their abilities to use new mathematics textbooks and their qualifications in meeting the new curriculum's requirements, they addressed that teaching and planning the lessons for crowded classroom would be a problem. Teachers were concerned about the processes in and tasks of using the mathematics textbooks and about issues related to organizing and managing the classroom activities and time. It appeared that the the duration of teachers' experiences with the new curriculum was not the factor that explained how these concerns developed. Rather, the duration of teachers' experience in the profession was the most important factor. Beginning teachers seemed to be more interested in the implications of the new curriculum, the changes in personal work conditions, and preparation of their daily work. On the other hand, the experienced teachers focused on the effectiveness of the new curriculum on their students and had more ideas about how they would adopt the new curriculum.

Several studies have found how the new mathematics curriculum is adopted by the teachers in Turkey through investigating their views. First grade elementary teachers' previous experiences seemed to have an influence on how they viewed the changes in the curriculum (Korkmaz, 2006). It appeared that fifth grade elementary teachers generally could not adopt the practices and philosophies in the new curriculum completely. The reason seemed to be teachers' tendencies to consider their previous experiences (Yılmaz, 2006). For example, first grade elementary teachers claimed that mathematics textbooks did not consist of sufficient number of exercises. Teachers had the view that the new curriculum was not sufficient since it had less topics compared to the previous curriculum. However, they seemed to miss the issue that the topics were presented in more depth (Korkmaz, 2006).

A case study of a first grade elementary teacher documented that teachers were likely to have difficulties in making students active in the classroom, using concrete materials, and adopting the teaching methods during the implementation of new mathematics curriculum (Toptaş, 2007). During the lesson, the teacher in this study used generally lecturing method and the lesson was based on question and answer. The teacher did not ask probing questions, and generally asked questions to remind. The only technology used was overhead projector. The teacher did not use concrete materials much. Researcher claimed that although the new curriculum advised that students should be more active in the activities, he observed that the teacher did not allow students to perform the activities on their own. These indicated that the teacher implemented the new curriculum usually through the old curriculum practices without taking into consideration the main aspects of the new curriculum.

One of the factors that impacted how the new curriculum in Turkey was adapted by the teachers seemed to be the type and the location of the school teachers worked. Günay (2006) found a significant difference between the teachers working in public schools and private institutions in terms of their adaptation process to the new curriculum practices. Elementary teachers (grades 1-5) in public schools claimed more problems with the new curriculum because of lack of copying facilities, lack of resources for making investigation, load of stationary for students. Günay (2006) attributed this difference to the inadequacy of the physical conditions in the public schools the effects of the traditional practices in public schools, and the familiarity of the private schools with the new curriculum. Similarly, when rural and city schools were compared, lack of sufficient physical facilities such as laboratories, lack of technological tools such as computers, and insufficient in-service training provided for teachers in the villages appeared as the biggest barriers for the successful implementation of the new curricula in rural schools (Yapıcı & Leblebiciler, 2007).

The reviewed studies showed that certain factors seemed to influence how teachers adapt new curriculum practices. The new curriculum generally was not implementing as planned in Turkey. This seemed to be the result of lack of facilities, materials, and adequate training. Time management became an important problem especially in the case of crowded classrooms.

Pligge, Kent and Spence (2000) sought teacher change within the context of mathematics curriculum reform. Teachers changed their perceptions about the nature of mathematics and how mathematics should be thought. Teachers in this study stated that they had different understanding of mathematics and claimed that the curriculum helped them and their students to realize more about the discipline of mathematics. The researchers also found that the design and implementation of the new mathematics curriculum provided teachers with opportunities to learn new mathematics by assessing their students' ideas to solve problems.

2.5 Assessment issues in the new curriculum

In the new curriculum, alternative assessment approaches based on constructivist learning theory were also taken into consideration in measuring and assessing the students' learning (MNE, 2005a). The most difficult adaptation process during the curriculum reform process could be in the measurement and assessment area (Bıkmaz, 2006). The techniques in measurement and assessment part of the new curricula such as portfolio, concept maps, observation, interview, performance assessment, peer-assessment, self-assessment, project assessment, and attitude scales are quite new for the teachers who used to implement only essay or multiple choice examinations. However, turning from traditional assessment procedures toward alternative assessments is an important theoretical change, and change takes time (Anderson, 1998).

Watt (2005) investigated teachers' attitudes towards alternative assessment methods in secondary school mathematics used by 60 mathematics teachers from 11 secondary schools in Sydney, together with reasons why they would or would not implement these. The finding of the study indicated that teachers were satisfied with traditional tests, particularly for senior school years. Although the least experienced teachers reported more positive attitudes, they generally did not consider implementing alternative assessment methods. These teachers most commonly used observation as an alternative assessment method, followed by oral and practical tasks. On the other hand, more experienced teachers most commonly used oral tasks as an alternative method, followed by observation and practical tasks. While oral tasks, practical tasks, and observation were mostly used by teachers, student journals, self-assessment and parental assessment were rarely

used. Teachers' major concern in using the alternative assessment methods was the subjectivity. Moreover, they claimed that some methods, especially, student journals, were not suited mathematics classroom. More experienced teachers addressed the lack of time as the main problem for using oral and practical tasks and student journals.

Culbertson and Wenfan (2003) also examined primary grade literacy teachers' attitudes towards and practices in alternative assessment by investigating the relationship between them and by identifying factors which influenced each. They found that most of the teachers supported alternative assessment. Standardized tests were not considered as useful in the primary classroom by 40.2 % of the teachers. Most of the surveyed teachers indicated that they used some forms of alternative assessment such as portfolios, checklists, and projects weekly. Almost all of the participating teachers used the teacher observation as a form of assessment. Portfolios, journal writing, open ended questions, checklists, anecdotal records, projects, demonstrations, and self-assessment were used by over half of the teachers. The findings of the study also revealed that teachers with 18 or fewer years experience had more support for alternative assessment techniques, but they did not implement them frequently. Teachers' practices of alternative assessment techniques were more affected by training, administrative support, availability of the resources, and by reading scholarly journals. Teachers addressed that the alternative assessment methods decreased students' text anxiety, allowed for differing ways of learning and for students to actively participate in assessment, and encouraged student understanding of difficulties. Moreover, teachers claimed that alternative assessment increased teacher knowledge of students, helped teachers in planning future instruction, and it helped understanding the extend of growth over time. On the other hand, lack of time, management difficulties, subjectivity in reporting, lack of teacher knowledge, large class size, and unwillingness to change were seen as disadvantages of alternative assessment techniques.

Cheng (2006) explored the views of junior secondary science teachers about the implementation of alternative assessment tasks in science classes in Hong Kong. Teachers reported that alternative assessment tasks positively affected students' scientific thinking abilities, interest in learning science, and

ability to relate the science topics to their daily life experiences. However, teachers also mentioned their difficulties and anxieties about implementation of alternative assessment tasks. Lack of knowledge and experience of alternative assessment procedures was reported as the main problem and it resulted in lower confidence and higher uncertainty about the use of alternative assessment procedures. Lack of time for implementing alternative assessment tasks especially in the large class sizes was another problem. The curriculum load also discouraged teachers to spend a lot of time in order to prepare new assessment practices.

Teachers in Turkey expressed that the new curriculum would bring several assessment procedures based on process-oriented methods as well as product-oriented ones. They seemed to have a positive view about the emphasis on the mutual relationship between the instruction and evaluation in the new curriculum, and the fact that students' performance would be evaluated in each step of the instruction (Bulut, 2007). Therefore, teachers expressed that students would be more successful in the new curriculum by implementing new assessment procedures. On the other hand, the studies showed that teachers had problems in implementing the assessment part of the new mathematics curriculum (Bal, 2008; Bulut, 2007; Erbas & Ulubay, 2008; Erdal, 2007; Gunay, 2006 ; Kartallıoğlu, 2005; Orbeyi & Guven 2008; Yılmaz, 2006).

Most of the assessment techniques in the new curriculum could be considered as beyond teachers' knowledge and practice since the previous curriculum did not focus on alternative procedures. Teachers might not have enough experience or the motivation to use new assessment techniques. It was suggested that mathematics teachers needed training about the new assessment techniques in the new curriculum (Erbas & Ulubay, 2008). Moreover elementary teachers (1-5 grades) could not understand the philosophy of the alternative assessment techniques and did not know how to use them. Even when teachers were aware of alternative assessments, they did not implement the techniques sufficiently (Kartallıoğlu 2005). According to elementary teachers (grades 1-2-3), this problem resulted from many and complicated evaluation criterions, and crowded classrooms for using these alternative assessment tools (Bal, 2008). Lack of time appeared as one of the important obstacles in implementing the

assessment and evaluation approaches (Bal, 2008; Bulut, 2007; Soycan, 2006; Uçar, 2007) due to the time needed to fill out observation forms and to prepare the materials (Uçar, 2007). Moreover, elementary teachers (grades 1-2-3 and 5) had problems in implementing the evaluation forms (Günay, 2006; Yılmaz, 2006) and 5th grade teachers had difficulties in using the rubrics to evaluate students' performance (Bulut, 2007). Therefore 5th grade teachers tended to implement old assessment techniques (Yılmaz, 2006).

Erdal (2007) investigated 200 elementary teachers' preferences in using the assessment techniques, such as portfolio, concept maps, projects, rubric, peer-assessment, and self-assessment, and their knowledge about these assessment tools in the new elementary school mathematics curriculum in Afyonkarahisar during 2006-2007 academic year. She found that teachers mostly used multiple choice tests, written examinations, performance tasks, projects, and portfolio in the mathematics lesson. They used mathematics journals and concept maps the least. Her study revealed that most of the elementary teachers did not have adequate knowledge about the new assessment techniques. As a result of this, teachers stated that they did not feel sufficient in using of all assessment techniques in the new curriculum. They claimed that they did not take adequate training about the use of new assessment techniques in the new curriculum and lack of resources limited their preferences in the selection of the assessment techniques. Erdal (2007) also stated that teachers could not eliminate the influence of the old assessment techniques, such as multiple choice tests and midterms, completely and they did not adapt the alternative assessment techniques in the new curriculum effectively. Despite the ineffective usage of the new assessment techniques, teachers had positive views that the using of new measurement and assessment tools would enable students have opportunities to present their capabilities, and teachers would have the opportunity to evaluate students completely and direct students towards investigation.

Similar to Erdal's (2006) study, Orbeyi and Guven (2008) investigated 459 elementary teachers' perceptions about the measurement and assessment tools in new elementary curriculum in Çanakkale, Edirne, and Eskişehir. They found that although elementary teachers often used student portfolio and multiple choice tests, they rarely used group evaluation forms and course attitude scales.

Moreover, Uçar (2007) found that the usage of the project study, written exams, and portfolio study seemed to be related to the grade level taught. First, second, and third grade teachers generally preferred to use these assessment techniques.

Turkish studies showed that teachers had problems in implementing the assessment part of the new mathematics curriculum. Insufficient time, inadequate of use of rubrics, and many and complicated evaluation criteria were expressed as difficulties for using new assessment techniques. Teachers could not understand the philosophy of the new assessment techniques and tended to implement the old assessment techniques. Furthermore, teachers claimed that they did not have sufficient knowledge in using of all assessment techniques and did not receive sufficient training about the use of new assessment techniques. Despite the insufficient in use of the assessment techniques, teachers had positive views about them and claimed that they would provide students opportunities to present their capabilities. Teachers also would have the opportunity to evaluate students completely and direct students towards investigation and increase students' success.

2.6 Studies in Turkey about teachers' views about the new elementary mathematics curriculum

The studies in Turkey about teachers' views about the new mathematics curriculum are mostly conducted with elementary teachers (1-5 grades). There are only few studies conducted with mathematics teachers (6-8 grades) in order to evaluate the new elementary mathematics curriculum. Most of the researchers focused on teachers' views, perceptions, and concerns about the new curriculum and teachers' difficulties during the implementation. There are also few studies which specifically investigated teachers' views about and difficulties in the measurement and assessment in the new curriculum. Furthermore, most of the studies were conducted in teachers who work in schools located in cities. The researchers generally used questionnaires and few of them used semi-structured interview in order to collect data.

The current study was conducted with both elementary teachers and mathematics teachers and aimed to learn these teachers' views about new curriculum including the assessment component and the level examination. Semi-

structured interviews were conducted in order to obtain participating teachers' views in detail. Moreover, this study was conducted in a district of a city, where most teachers worked in rural settings and some of the teachers even taught in multi-grade classrooms. In this respect, the current study aims to provide a detailed documentation for the research areas where few studies have been conducted.

CHAPTER 3

METHOD

This study explored the views of 10 elementary teachers (grades 1-5) and 12 mathematics teachers (grades 6-8) about the new elementary mathematics curriculum in 2007-2008 academic year. The major data source was one-on-one interviews with a group of participants and written responses to the interview questions provided by another group of participants.

The method of inquiry will be explained in detail in this section. Design and participants of the study, methods and procedures used to gather and analyze data, issues of the quality, and the limitations of the study will be described.

3.1 Design of the study

The elementary intention of the study was to make a detailed description of teachers' views about the new elementary mathematics curriculum. The study could be considered as an evaluation of the new elementary mathematics curriculum from the teachers' point of view. Qualitative methods fit the nature of program evaluation studies since they help in documenting the ideas and experiences of the curriculum implementation process in depth and detail (Patton, 2002). Therefore, a qualitative approach was employed for the data collection. In a qualitative study, depth and detail are captured by interviews, observations, and documents with small number of people and cases. However, the possibility of generalization is limited (Patton, 2002). The data of this study were collected through interviews and participants' written responses to the interview questions since interviews would provide direct record of people's experiences, views, feelings, and knowledge (Patton, 2002).

3.2 The participants

A total of 22 elementary teachers (grades 1-5) and mathematics teachers (grades 6-8) from 17 public elementary schools in the district of Alaca, Çorum participated in the study. Participating teachers were chosen on the bases of the ease of communication, access, and being voluntary.

Ten of the 22 participants were mathematics teachers and 12 of them were elementary teachers. When this study was conducted, participating mathematics teachers were implementing the new elementary mathematics curriculum in 6^{th} and 7^{th} grade. Moreover, ten of the participating teachers were working in the inner districts and the others were working in villages during the study. Two of the elementary teachers were teaching mathematics in multi-grade classrooms and one taught before. Multi-grade classrooms are the classrooms in which teachers work with more than one curriculum grade at the same time (Kaya, 2005).

Table 3.1 describes the characteristics of the participating teachers in terms of gender, age, teaching experience, and education.

Table 3.1: Characteristics of participating teachers

Teachers' Characteristics(N = 22)	f
Gender	
Male	18
Female	4
Education	
Elementary Education	11
Physics Education	1
Elementary Mathematics Education	10
Teaching Experience	
1-3 years	11
4-14 years	11
Grades and Contexts Taught	
1-5 Inner district	5
1-5 Village	7
6-7-8 Inner district	5
6-7-8 Village	5

Table 3.2 shows the identifiers of participants used in this thesis, teaching experience and data collection ways. The letter "E" was used to refer to the elementary teachers (1-5 grades). The letter "M" identified the mathematics teachers (6-8 grades). The range of teaching experience of elementary teachers

changed between 2 and 14 years. There are six elementary teachers with less than 4 years of experience and six teachers with 5 to 14 years of experience. The range of teaching experience of mathematics teachers varied from 1 to 8 years. There are five mathematics teachers with less than 4 years of experience and five teachers with 5 to 8 years of experience. Moreover, the range of teaching experience of elementary teachers with the new curriculum changed between 2 and 2.5 years. The range of teaching experience of mathematics teachers with the new curriculum varied from 1 to 1.5 years. In this study, three elementary teachers and five mathematics teachers stated that they did not attend to the seminars about the new elementary mathematics curriculum.

In general, 11 participants were considered as novice teachers and 11 participants were considered as expert teachers. Data was collected by interviews from seven elementary teachers and six mathematics teachers. Five elementary teachers and four mathematics teachers provided written their responses to interview questions.

Table 3.2: The identifiers of the participants

Identifier	Data collection	Experience	Experience with the new curriculum		Seminar
			Year	Grade	
E1	Interview	5 years	2.5 years	1-2-5	Yes
E2	Interview	8 years	2.5 years	1-2-5	Yes
E3	Written	7 years	2.5 years	3-4-5	Yes
E4	Interview	8 years	2.5 years	1-4-5	Yes
E5	Interview	11 years	2.5 years	2-3-4	No
E6	Written	14 years	2.5 years	1-4-5	Yes
E7	Interview	2 years	2 years	1-2-3 *	No
E8	Written	3 years	2.5 years	3-4-5 *	Yes
E9	Interview	3 years	2.5 years	1-2-5	Yes
E10	Written	2 years	2 years	4-5	Yes
E11	Interview	2,5 years	2.5 years	1-5	Yes
E12	Written	2 years	2 years	4, 4-5 *	No
M1	Written	7 years	1.5 years	6-7	Yes
M2	Interview	3 years	1.5 years	6-7	No
M3	Interview	4 years	1.5 years	6-7	Yes
M4	Interview	2,5 years	1.5 years	6-7	No
M5	Interview	3 years	1.5 years	6-7	Yes
M6	Written	1 year	1 year	6-7	No
M7	Written	3 years	1.5 years	6-7	Yes
M8	Written	5 years	1.5 years	6-7	No
M9	Interview	7 years	1.5 years	6-7	No
M10	Interview	8 years	1.5 years	6-7	Yes

* These grade levels were taught together (multi-grade classrooms).

3.3 Research context

The population of Alaca district is 22590, which could be considered as a small town. The economy of the district mostly is based on agriculture. On the account to the level of income, generally, middle income people consists the majority of the population. Ninety percent of the population depends on farming. In Alaca, there are 5 high schools, 12 inner district elementary schools, and 8 village elementary schools and 15 village elementary schools with multi-grade classrooms.

3.4 Instrument and Data Collection

The data for this study were gathered through one-on-one interviews with thirteen teachers and through written responses to the interview questions by nine

participants. The instrument and the ways interviews were conducted are explained here in detail.

3.4.1 Interview Protocol

A semi-structured interview protocol developed by the researcher and a researcher in mathematics education field was used as the data collection tool.

The interview protocol consisted of 12 main questions and related sub-questions. The interview questions aimed at exploring teachers' views about the new elementary mathematics curriculum. Interviews started with questions about the aim of mathematics teaching and teachers' mathematics lessons, and then continued with questions related to teachers' views about the new curriculum, teachers' guidebooks, textbooks, and instructional activities. Additionally, teachers' views about project and performance tasks, the level examination, and changes in student motivation, sufficiency of mathematics knowledge, teachers' efficiency, challenges, and support mechanisms during the implementation process were addressed. Finally, teachers were asked to express their beliefs about whether the new elementary mathematics curriculum would be successful in reaching its objectives and were encouraged to declare their messages to curriculum developers. The demographic data about participating teachers were also gathered through the interviews. The interview protocol is given in Appendix B.

3.4.2 Data collection procedure

The data collection procedure started after necessary permission from the Ministry of National Education and Ethical Commission in Middle East Technical University were obtained. Participating elementary teachers and mathematics teachers were chosen on voluntary basis. The data were collected through interview or written responses to interview questions by considering participants' preferences.

Thirteen of the 22 teachers were interviewed in one-on-one settings. The interviews were conducted either in a room in participants' school or in the interviewer's house depending on participants' preferences. The researcher made sure that there was nobody else in the room and there was no interruption during

the interviews. One-on-one interviews started after a few minutes of general conversation, and then interview questions were asked in the same order to the 13 teachers. Teachers were encouraged to express their views about the new curriculum in detail. In order to do this, they were given time to respond, reflect, and consider their responses. As teachers seemed to struggle with responses, sub-questions were used to explore details or encourage elaboration. When the interviews progressed and came to an end, teachers were encouraged to complete their thoughts with any additional comments they felt necessary. Each interview lasted approximately 30 minutes and was audio-recorded.

Nine of the 22 teachers provided their views as written responses to the interview questions. Five of them were elementary teachers, others were mathematics teachers. Written data was collected due to participants' preferences. Six teachers wanted to give their views about the new elementary mathematics curriculum in written form since they believed that they would provide richer information in this way. Therefore, the researcher prepared the interview questions and delivered them to the participants either via e-mail or in person. The responses were collected over the same channel when participants completed their responses.

Audio-recorded interview data were transcribed verbatim and transcriptions and written responses were reviewed by me in order to ensure clarity and completeness for data analysis. When I detected incomplete responses or unanswered questions, I went back to the teachers and conducted shorter interviews with them or asked for their written views about the missing issues depending on the participants' preferences. The process of reviewing the data and going back to the participants for unclear issues continued until I had clear understanding of participants' responses and the responses fully addressed the interview questions.

3.5 Data Analysis

The transcriptions of the one-on-one interviews and written responses to interview questions comprised the elementary data source for this study.

The data were first read by the researcher and main issues that appeared in the responses for each interview question and each participant were summarized.

Recurring statements and issues were noted and a table was constructed including the frequency of the issues and the participants who mentioned the issues. The most recurring issues were considered as the codes for data analysis. This process was performed for elementary and mathematics teachers separately. After the codes were finalized, the whole data were coded once more. After the coding, initial themes such as teaching and learning with the new curriculum, students' motivation, difficulties in the implementation of the new curriculum, support mechanisms during the implementation, performance tasks and projects implementations, and suggestions to the curriculum developers were identified for both elementary and mathematics teachers. Considering the similar nature of the initial themes, the analysis process for elementary and mathematics teachers were multi-grade and these initial themes were clustered to upper and more comprehensive themes. The different codes that appeared from elementary and mathematics teachers' data were maintained in order to emphasize the differences in the findings. The clustering process for common themes was repeated several times until the themes converged to the most comprehensive yet consistent upper themes and sub-themes.

The clustering process resulted in four main themes with sub-themes. The first theme was teachers' views about teaching and learning in the new curriculum and it included meaningful learning, instructional approaches in the NC and its impact, teachers' and students' roles, student motivation and curriculum materials. The second theme was teachers' views about assessment procedures and the level examination in the NC which included projects and performance tasks, and the level examination. The third theme was teachers' challenges in implementing in the NC requirements including time management, teachers' efficiency, and support system in the NC. Final theme was teachers' suggestions for the effective implementing of the NC and it consisted of the success of the NC, improvement of the NC. The whole clustering process was monitored by a researcher in the mathematics education field and performed by another researcher in the same field simultaneously.

In a qualitative study, Patton (2002) suggests ideas on convergence and divergence in coding and classifying data. He states that data must first be looked at from a convergent point of view. After the regularities are found and categories

are established, he says that categories must then be judged by two criteria. These criteria are internal homogeneity and external heterogeneity. These criteria deal with how the data belong in a certain category. In this study, internal homogeneity was used to determine data-category association. For instance, the teachers' views of that the new curriculum provided learning by doing was placed in teaching and learning category in order to provide internal homogeneity. Some challenges such as time management during the implementation of teaching learning activities were also placed under this category in order to provide more meaningful account of teachers' views. External heterogeneity was applied to make sure there was not a large amount of overlapping data or data that could not be assigned to a category. As for external heterogeneity, more general time management related views were placed under challenges category instead of the teaching and learning category.

Another part of data analysis is to use divergence in coding and classifying data. Patton (2002) defines divergence as "the fleshing out of patterns or categories" (p. 466). Patton implies the "thickening" of data and says that fleshing out data involves looking closely at the information obtained from interviews to make categories "thick" or "fleshy" with data. In order to provide divergence in data, information from interviews was reviewed and more data were placed in the categories as they fit into patterns in this study.

As a result of data analysis, teachers' views about the new elementary mathematics curriculum were separated into four major categories. These categories included: (1) Teachers' views about teaching and learning in the NC, (2) Teachers' views about assessment procedures and the level examination in the NC, (3) Teachers' challenges in implementing in the NC requirements, and (4) Teachers' suggestions for the effective implementing of the NC.

3.6 The quality of the research

The practical standards that help researchers in judging the quality of the conclusions from the findings of the research can be referred as the quality of the research (Miles & Huberman, 1994). The efforts and skills of the researcher determine the quality of a qualitative research (Golafshani, 2003). Therefore, the

researcher's role through the data collection and analysis procedures will be described here in detail.

The interview protocol was prepared through the suggestions of a researcher in mathematics education field, who held a doctoral degree and was experienced in qualitative research traditions. He monitored the study through the data collection and data analysis process. He also participated in deciding the initial codes and upper themes.

The researcher had met the participating teachers before the study and had a friendship relation with some of them. This situation might have impacted participants' responses both positively and negatively. While some of the participants might have provided sincere responses, others might have altered their responses in order to impress the researcher or not to show their possible lack of knowledge about the new curriculum. In order to reduce the researcher impact, the researcher asked sub-questions. For example, when the researcher asked whether the participants felt efficacious in implementing the new curriculum, he also posed sub-questions related to the subjects unknown or learned during the implementation, usage of concrete materials, and possible attended training related to the new mathematics curriculum. The sub-questions helped the researcher to capture participants' possible difficulties and teachers' efficiency in implementing the new mathematics curriculum, with decreased impact of his relationship with the participants.

During the interviews, when the questions were not clear for the participants, the researcher tried to express these questions clearly by asking sub-questions. The researcher generally summarized participants' responses with one or two sentences before moving to the next question and asked for participants' approval. Moreover, when the participants' responses were not clear or related to the question, the researcher asked the same question again until the researcher felt that the participants' responses clearly addressed the interview questions. After all the data were collected, the researcher reviewed the data and turned to participants when there were incomplete or unrelated responses in the participants' data and completed them by conducting additional interviews or asking for additional written responses.

Multiple coders coded the data during the data analysis and an expert monitored the whole data analysis process. The first coder was the researcher and the second coder was a doctoral candidate in the Elementary Science and Mathematics Education Program in the Faculty of Education at Middle East Technical University and she was experienced in qualitative data analysis. Both coders initially read the transcripts of the interviews and the written responses in order to reach a common understanding of the data for further coding decisions. Then, the coders determined the codes that would be used in the analysis and coded the data together. This helped the codes to reach a common understanding for further analysis and also provided insight into upper themes. The process of merging upper themes continued until no data was left uncategorized under a theme. The coding and reaching initial themes were monitored by the previously mentioned expert in mathematics education and final themes were monitored by another expert in the mathematics education field.

3.7 Limitations of the study

The number of participated teachers was limited with a total 22 elementary teachers and mathematics teachers in this study. The limited number of participating teachers did not allow the researcher to generalize the findings to a larger group of teachers. The findings of this study were limited with interviewed 22 teachers who worked in Alaca district, Çorum. Additionally, the findings of the study were limited to the responses of the participating teachers. This study did not consider reporting the elementary and mathematics teachers' views separately. Rather, the study documented elementary and mathematics teachers' views together, which might be considered as a limitation of this study. Since the written responses to interviews questions were taken from nine participants, follow up questions were not asked. Although the researcher reviewed the data and turned to these participants when there were incomplete or unrelated responses in the participants' data and completed them by asking for additional written responses, certain data could be missing, limiting the interpretations of the findings. Furthermore, 14 participants reported that they attended the seminars offered by the Ministry about the new mathematics curriculum. These participants might have developed views about the NC based on these seminars and expressed these

views which they might not have fully internalized. Since the participants' views were not supported by observation of their teaching practices, the findings are limited to their views.

CHAPTER 4

RESULTS

This chapter presents the main findings of the study. Teachers' views about new elementary mathematics curriculum (NC) were given under four major categories. These categories are (i) teachers' views about teaching and learning in the NC (ii) teachers' views about assessment procedures and the level examination in the NC, (iii) teachers' challenges in implementing in the NC requirements, and (iv), teachers' suggestions for the effective implementing of the NC.

In the first category, teachers' views were classified with respect to how they refer to meaningful learning; instructional approaches in the NC and its impact, teachers' and students' roles, student motivation and curriculum materials. In the second category, teachers' views about projects, performance tasks, and the level examination were mentioned. Teachers' views about time management, teachers' efficiency, and support system in the NC were presented in the third category. Finally, in the fourth category, teachers' views about success of the NC and their suggestions for how it would be improved were documented.

This study explored the views of 10 elementary teachers (grades 1-5) and 12 mathematics teachers (grades 6-8) about the new elementary mathematics curriculum in 2007-2008 academic year. The half of the participants was novice teachers with 1 to 3 years of experience, whereas other half was expert teachers with at least four years of experience. If the frequencies of participants' responses were equal or close considering teachers' branches (elementary teacher or mathematics teacher) and teaching experience, their views were reported together. If there were significant differences between their views, they were given separately with respect to grade level and experience variables.

The letters "E" and "e" was used to refer to the quotes of elementary teachers (1-5 grades). The letters "M" and "m" identified the quotes of

mathematics teachers (6-8 grades). Additionally, the letter "ex" was used for expert teachers and the letter "n" was used for novice teachers in this chapter.

4.1 Organization of the Result Chapter

This chapter gives the findings of this study by using the teachers' paraphrased claims or direct quotes. During the translation of transcripts, some additional phrases were added to increase readability. This was performed due to loss of meaning while translating the excerpts in Turkish to English. Table 4.1 shows the examples of additions to participants' quotes and their usage.

Table 4.1: Examples of Specific Additions to Participants' Quotes

Addition	Usage
[New curriculum] was prepared according to the constructivist approach *"[N]ew curriculum diversified my teaching methods.*	Completing the meaning of the quote Increasing readability Sentence adjustment
[…]	Claims between two statements which are not included in the quote

4.2 Teachers' views about teaching and learning in the NC

4.2.1 Meaningful learning

All of the participants expressed positive views about instructional activities in the new curriculum (NC). They stated that instructional activities helped students understand mathematics easily and learn meaningfully. One teacher stated that "instructional activities are beneficial with respect to making abstract concepts concrete and making students active" (M6). Another teacher claimed that "[…] instructional activities are not only [directly] taught but they also addressed each student's interest area by doing, seeing, listening, and touching" (E3).

The following comments reflected how meaningful learning took place in detail:

> "When instructional activities are conducted properly, they increase students' capacity for understanding. In the past, students really had difficulty in understanding mathematics. However, with these activities being carried out, students learn as if they learn by experience. And students don't forget their learning even after some time. When [this

> learning] is related with their daily lives, very good results are gathered. Permanent learning occurs" (E5).
>
> […] "For example, it says that "there are five ducks and tree of them flies and goes out. How many ducks are left behind?" Two were left. Let's paint these. Let's paint the remaining ones with a color; flying ones with another color. Children realize what is happening here. [Students] are painting and also they are differentiating the answer of the question and the flying ducks. They learn by painting and doing. In my opinion, these activity books contribute the approach which we call as "learn by doing" (E1).

While all of the participating teachers expressed positive views about meaningful learning, some of the participants (6 out of 22, ex: 4, n: 2, e: 1, m: 5), especially mathematics teachers, expressed challenges they faced during the implementation of the new curriculum. These teachers stated that instructional activities were not always enough or sufficient for student learning.

> "Up to now, one of the most important questions has been why we are learning mathematics. The question was being asked at the university as well. I find [the NC] good in answering these questions. For instance, it exemplifies the parallel lines as railroad. It is associated [with a real life object]. […] Actually, child can have a clue from here by himself. It is said that two parallel lines are like railroad. On the other hand, when you ask whether it is enough or not, of course it is not enough. The activity in total is not enough to teach the subject. […] It [addresses the content in a] very simple [way]" (M9).

Although all of the participants valued the meaningful learning the NC brought, half of the participants (11 out of 22, ex: 5, n: 6, e: 3, m: 8) and majority of mathematics teachers expressed that teaching with instructional activities created time management problems, especially when compared to their previous teaching practices. The following scripts exemplified these views:

> **M3:** Since the student discovers knowledge by performing the activities on his own, [the knowledge] becomes more permanent. However, it may take more time. For instance, how many lines can pass through a point on a plane? There was a question like this one. I was teaching this question with the old method [by saying that] infinite numbers of lines pass. I used to solve a question immediately [about this subject].
>
> **Researcher:** [While you were teaching with] direct instruction?
>
> **M3:** Yes. By direct instruction. But now, I am doing it like this. [I] take a paper [and put] a point in middle of the paper. Well. I fold several times from different places around the point. Student sees the lines passing through it. Student can arrive at the result by himself before I say it. For instance, he says that infinitely many lines pass through [this point].

> Knowledge becomes more permanent, but I say again, it takes more time… It has such disadvantage.
>
> "I don't implement all of the activities. I don't do it, because, you know time is not enough."(M10)
>
> "Carrying out some activities wants more time. However, the result or the theorem at the end of the activity becomes very simple. […] . Therefore, I show flexible and I don't carry out each activity. I carry out the activities which are easier, need a few equipments and the most importantly, do not require more time, and could be completed in a short time."(M7)
>
> "There are activities whose explanation of how to be conducted takes more than one class hour."(E2)

Briefly, all of the participating teachers stated that instructional activities helped students learn mathematics meaningfully and understand easily. However, some of the participants addressed that doing the instructional activities was insufficient in learning mathematics; and the half of the participating teachers, especially mathematics teachers, had the view that conducting the activities in the NC required more time than allowed.

4.2.2 Instructional approaches in the NC and its impact

Most of the participants (19 out of 22, ex: 9, n: 10, e: 11, m: 8) expressed positive views about instructional approaches in the new elementary mathematics curriculum (NC) and their impact. They pointed out that the NC was student-centered, consisted of learning through doing and experiencing, and helped students be active and learn by discovering through the activities. These participants also stated that the NC was prepared according to the constructivist approach and multiple intelligence principles which helped master learning. They generally compared the NC to the previous curriculum and stated that "[New curriculum] was prepared according to the constructivist approach" (E7). Another teacher said that "the new curriculum [compared to the previous one] include[d] student-centered instruction with many methods and techniques suitable for multiple intelligence principles" (E3).

The reason for the change in the instructional approach was the need for "learning [mathematics] by doing" (M8). They considered the previous curriculum as behind the developments in the field of education and expressed

that "educational system should be student-centered rather than teacher-centered" (M6). As the participants expressed the need for a change in the instructional approaches, they elaborated more on the changes they viewed:

> "When I analyzed [the NC], I realized that it is good. I realized that the activities and outcomes were organized in order to allow students get rid of rote learning and to enable them learn at a higher level. I realized that the activities and performance tasks are settled at the center of the [new] curriculum and that students are more active. It seems that they have worked to form a student model that use and produce knowledge instead of receive it as presented and solve multiple choice tests continuously." (M13)

Most of the participants (19 out of 22, ex: 9, n: 10, e: 10, m: 9) also expressed that learning became permanent in the NC. At this point, they stated that new curriculum made mathematics concrete and daily life examples were more common in the NC:

> "New curriculum is student-centered and teacher is a guide. In the new curriculum, there are more concrete things. In this way, the knowledge becomes permanent, learning becomes permanent. In this curriculum, mathematics is concrete. In this curriculum, children find how and from where the formulas are obtained by themselves. For instance, in my classroom, children found the formula about percentage problems by themselves. The old curriculum was more abstract, based on memorization, and didn't include daily life examples." (E12)

In addition, they viewed that the NC consisted of more use of materials and visual aspects were foreground.

> "[…] Now, since [mathematics] has turned out to be more visual, it attracts students eventually. Students look at the geo-board more carefully and they listen better, you know. Or he wants to play with a symmetry mirror, to look at symmetry of the letter he has done on the mirror. He listens to the lesson better. For this, I think [the NC] is useful. It is beneficial for learning. In the lesson, student becomes more active. […] Also, the learning becomes permanent since it is visual, you know." (M9)

> "In the old curriculum, teacher taught the subjects on blackboard. For instance, students didn't' feel anything. Teacher was explaining, if something is "a", then it is "a". There was no questioning. We were copying [knowledge] like a copy machine immediately. But now, teacher helps students feel the subject by performing activities or asking questions. Since students feel the subject, they are able to think on the subject. Then, when they think [about the subject], the knowledge can be transferred more permanently to students by activities and teacher guidance." (E7)

The changes in the instructional approaches in the NC changed and diversified most participants' teaching methods (15 out of 22, ex: 8, n: 7, e: 6, m: 9). One teacher claimed that: "[N]ew curriculum diversified my teaching methods. The old curriculum was based on teacher-centered and direct-instruction and probing" (P3). Another teacher expressed that "in the old curriculum, I used direct-instruction method, now, I help student participate actively" (M6). The change was also a new learning experience for the participants: "[…] when I look instructional activities, sometimes, I say that mathematics can be taught in this way. I have learned new ways I haven't known through the activities" (M5). Participating teachers specifically addressed their learning experiences in several topics:

> "I saw that the commutative property in multiplication can be taught with shapes or objects. New curriculum brought new methods and teaching techniques." (E2)

> "[…] I teach through the activities and I use discovery method and make students think on subject.[…] I study the usage of counters in the unit of integers and transparent fraction cards in multiplication in order to not have a difficulty in class. I saw them on textbooks. I haven't seen them before." (M3)

> "[The NC] has enabled us to use more materials and visualization in [mathematics]. I was teaching everything for the exams. I have learned the multiplication of fractions by using shapes." (M8)

Some of the participants (8 out of 22, ex: 4, n: 4, e: 4, m: 4) expressed that the NC eliminated learning through memorization:

> "[…] In the past, the formulas were learned by memorization and operations were done with these formulas. But, we didn't know where this formula came from. But, [now] through the activities, student can understand how the formula is constructed, why it is formed in that way, and how it can be changed and used in a different situation."(E5)

Some of the participants (6 out of 22, e: 3, n: 3, p: 3, m: 3) expressed that the NC helped students develop more than one skill. They viewed that the NC increased students' inquiry and interpretation skills:

> "[…] In the past, there was only knowledge and applying knowledge, now there is a goal to develop students' interpretation skills and to enable students to find whether something is true or false by themselves."(M4)

> "I believe that new curriculum contributes to the development of students' cognitive, sensorial, and psycho-motor skills more."(E8)

To summarize, the participating teachers had positive views about instructional approaches in the NC and their impact on students' learning, their teaching methods, and students' skills. On the other hand, some of the mathematics teachers (4 out of 22, ex: 1, n: 3, e: 0, m: 4) stated that they had adaptation problems to new curriculum as the following excerpts illustrated:

> "[…] However, it cannot be said that I am adapted to the new curriculum totally. Although I really want to implement the new curriculum, I haven't adapted new curriculum completely yet because of the concern of the exam (Level Examination), the problem about time management to cover all the curriculum subjects, and the insufficiency of students' background in the village school where I am working. I am in a place between the old system and new system. I often use direct-instruction method and classical question types of the old system in my lessons in order to cover the entire new curriculum subjects."(M7)

The above views showed that most of the participating teachers viewed that new curriculum was student-centered, enabled students to learn by doing, and discovering mathematics through the activities, and it placed the students in an active role. They also addressed that since the NC was prepared according to constructivist approach and multiple intelligence principles, it helped students' learning more effectively compared to the old curriculum. Most of the participants expressed that learning became permanent in the NC since memorization was highly discouraged since mathematics was provided by use of materials, daily life examples, and visual tools. Also, most of the participating teachers viewed that the NC changed and diversified their teaching methods and the NC helped students develop more than one skill. However, some of the mathematics teachers mentioned adaptation problems about the new curriculum due to their concerns about the curriculum load and the students' level of prerequisite knowledge and the level examination.

4.2.3 Teachers' and students' roles

Most of the participants (19 out of 22, ex: 9, n: 10, e: 10, m: 9) expressed that teacher's and student's roles have been improved positively in the mathematics classroom through the NC. Participants viewed teachers' role as the guide for students' mathematics learning. Students were associated with an active role in their own learning. Participants seemed to have very clear views about the

roles of the teacher and the students in the mathematics classroom as expressed below:

> "Students are the ones who discover the knowledge, as for teachers, they are the ones who direct and guide students. It is an approach that enables students to be active, not passive, placing the student at the center. Teacher is the guide who enables students to reach knowledge and to fill their gaps." (E10)

> "In my lessons, students participate in the lesson actively. For instance, when an activity is implemented or a game is played; students' decisions are valid. Students are at the center of instruction and teacher is a guide." (E8)

> "Teacher is the guider according to the new curriculum. Teacher doesn't say anything directly, he tries to make students discern. Student reaches the knowledge by himself by generalizing from activities and examples through the guidance of the teacher." (M6)

> **"**Student is the one who discovers the knowledge, generates creative ideas, interprets the events, produces concepts and facts by doing observation, and uses these generalizations in his daily life. Teacher, on the other hand, is only a guide for students to reach knowledge. Teacher is the one who makes students wonder and investigate by asking questions, and corrects students' mistakes when necessary." (M7)

The new role that the participating teachers viewed as essential in the new curriculum, however, brought additional responsibilities for the teachers. Some of the participants (4 out of 22, ex: 2, n: 2, e: 3, m: 1) pointed out that teachers' work-load was increased in the NC, as illustrated below:

> "Students' active participation makes instruction more efficient, but this makes teacher's work a little difficult. Even if the teacher is rather passive, since we do the guidance in learning, I am having some difficulty." (M3)

> "In this curriculum, teachers' work load is increased. You should make students active all the time. Otherwise, we have a difficulty to get success." (E12)

Some of the participating teachers (3 out of 22, ex:1, n: 2, e:1, m:2) also expressed that students' background was not enough in order to carry out teachers' and students' roles addressed in the NC.

> "[…] however, unfortunately, I can't say that my students and I carry out these roles completely. Unfortunately, I use teacher-centered approach because students' background is not enough. I can implement student-centered approach only after I make my students to be curious to investigate, very interested to generate knowledge, and be creative individuals." (M7)

> "Since students' previous knowledge is not enough, especially in arithmetic, we don't implement activities completely, and I have to use direct-instruction method." (E12)

In summary, most of the participating teachers viewed that teacher's and student's roles have been improved positively by the NC requirements. However, this improvement brought extra work-load for the teachers and some of the participants claimed that students' background was not enough in order to carry out the new roles that teachers and students were supposed to perform in the NC.

4.2.4 Student motivation

The new curriculum emphasized the students' role as active in their own learning. This new role was also supposed to increase students' motivation in learning mathematics. Therefore, the participants were asked about their views regarding the student motivation. Most of the participants (15 out of 22, ex: 5, n: 10, e: 6, m: 9), especially novice teachers, expressed that there was an increase in students' participation and interest in the mathematics lesson. They thought that the NC provided participation of all students in the lesson at different levels. One teacher claimed that "most of the students wait for mathematics lesson excitedly. The participation of students increased a lot" (P3). The reason for such a change was viewed as the existence of the activities in which students learned by actually doing and experiencing the mathematics:

> "[The reason for students' participation is that] there are many activities. Students learn by doing and living and also more permanently." (E11)

> "Since students do something and mathematics is concrete, students' interest increases more." (M4)

> "Students' interest in some subjects is increased. For instance, most of the students drew the graph of selling of bagel in the school cafe willingly." (M8)

Participating teachers (16 out of 22, ex: 7, n: 9, e: 12, m: 4), especially elementary teachers, also viewed that new curriculum decreased students' fear of mathematics. The NC resulted in a change in students' views about mathematics since mathematics became interesting and fun: "New curriculum eliminated the view of mathematics as a boring, cold, and abstract [lesson]" (E1). This new view

increased students' motivation in learning mathematics and participating in the mathematics lessons as illustrated by the following excerpts:

> "This year, children like mathematics more than other lessons." (E1)
>
> "I think that [the new curriculum] decreases students' fear on mathematics. Students' participation is increased as a result of different and enjoyable activities. [Students] like mathematics more." (E12)
>
> "[…] When I say mathematics lesson, students say "oleyy" and so this pleases you too. However, in the old curriculum, mathematics was a lesson feared. […Now mathematics is] made easier, more concrete, and more enjoyable. […] Here, if the teacher can teach mathematics by playing, making story, and [making] students participate, mathematics becomes more enjoyable. However, in the old curriculum, this was not the case. Teacher was teaching and teaching, then, when students didn't understand, he was forcing them. An unsuccessful student had difficulty to express [his ideas] and to solve problems. Now, I think that mathematics is more enjoyable since students gain self-confidence and the ability to do mathematics as mathematics became like a game." (E4)
>
> "Instructional activities made the mathematics lesson more enjoyable. They increased students' interest in the lesson."(M2).

In brief, most of the participating teachers, especially novices viewed that the NC increased in students' participation and interest in the mathematics lesson and also influenced student motivation positively. Moreover, most of the participants, especially elementary teachers, expressed that concrete representations of mathematical concepts through the activities had the most impact on decreasing students' mathematics fear and increasing interest in learning mathematics.

4.2.5 Curriculum materials

The new curriculum brought new textbooks for mathematics. Teachers' guide books, course books and workbooks were sent to all schools and teachers were required to follow these books in teaching mathematics. Therefore, the textbooks became the main tool for teaching in the NC. Almost half of the participating teachers (12 out of 22, ex: 5, n: 7, e: 7, m: 5) stated that the course book and workbook were effective in teaching and learning mathematics. They claimed that "[…] Textbooks [have] interesting and curiosity raising information, questions, activities, games, puzzles, and pictures" (M7). Participants viewed that

the textbooks presented real life examples for the students, which increased students' interest:

> "In the old textbooks, mathematics was taught with the old examples that had been in the textbook for ten or fifteen years. Today, the textbooks consist of actual examples related to sports activities and our players of halter, basketball, and football. […] The students are more interested since they see the people on TV in their textbooks. It is good that the examples in the books are [from real life]." (E1)

Participants also viewed that the development of the course book and the workbook was good and expressed positive views about the separation of the course book and the workbook:

> "Separation of the workbook from the course book is good. [Students] are curious about [the book] because of this reason, [books become] attractive. When [the workbook] was [embedded] in the course book, [students] did not pay attention, it was not attractive. Since the work book is a different book like a vacation book, it gains student's attention." (M5)

While these teachers expressed the positive views about textbooks, some of them (7 out of 22, ex: 3, n: 4, e: 2, m: 5) also expressed negative views.

> "In textbooks, the activities are good and simple however, at the end of the subject, for instance, at the sixth grade, a simple activity about percentage was carried out, but then a difficult problem was asked. Here, solving this problem is impossible for children. And, I think that the numbers in the problems tires children extremely. […] If the aim is to teach the subject, simple tasks can be given and students can be more comfortable."(M9)

> "There can be problems from the region to the region when the meaning of words is considered. While teaching Cartesian coordinate system with the example of cinema, the word of "gala" is used, but this word is not explained. It should be thought that students may not know these words. A seventh grade student may not know the meaning of "gala". […] In addition, discussion questions don't still exist in the textbooks. There is "Did we learn?" part. In this part, I see mostly exercises, but, there is not a discussion or thought provoking questions such as, why zero power to zero is indefinite, or why a fraction is undefined when the denominator is zero. There should be more thought provoking questions [in the textbooks]."(M2)

Furthermore, some of the participants (7 out of 22, ex: 6, n: 1, e: 4, m: 3) viewed that course book and workbook were not sufficient in many aspects. These participants expressed that they needed additional resources for their teaching:

"I think that [the content] in the course book and workbook are not sufficient. If they were enough, most teachers didn't need additional sources. Today, if you go to any

school [you can see] all teachers use additional sources. I use them, too. This shows one thing that the textbooks are not sufficient." (E4).

For one participant, "the textbooks sent by the Ministry have poor quality of print and pictures. The objects are not understood. The examples should be explained completely and they are not sufficient" (E6). Specifically, the number and the quality of the questions in the textbook were mentioned by the participants as insufficient:

> "In the course book, the information about subjects is very little. There are less questions and examples. Mainly, activities cover [most of the textbook]. In the workbook, there are questions that are not mentioned in course book. The types of questions are similar and easy. Good quality questions are very little." (M7)

Moreover, the organization of the content in the textbook was not viewed as suitable for the younger students:

> "Textbooks… Students can understand where a subject is started and finished if they observe them carefully. The subjects were very mixed. Of course, mathematics is connected but children have a certain capacity, they are just second graders. […] Main titles are mixed with sub-titles. That is, students can confuse which main title includes the sub-titles they are learning since the distinction was not done. The content is organized like a [mixture of] subjects. That is, this is not suitable for second grade."(E2)

The problems with the teachers' guide book were expressed by half of the participating teachers (11 out of 22, ex: 6, n: 5, e: 4, m: 7). They expressed that teachers' guide books "can [not] be followed easily [… and] are complicated" (M3) and didn't give teachers autonomy: "Teachers' guide books express [how to do things] and they don't give teachers autonomy" (M1).

> "Let me state it clearly. I do not follow teachers' guide book. Why? I think that the things mentioned in [teacher's guide book] are less than the things required. […] But when I look at the final part of the book, more loaded things are required. Therefore, I teach the subject by adding my old experiences on the tasks to students. I already give what is in the book. Additionally, I give extra knowledge to open up some gates for the children. So, I think that teacher' guide book is narrow. I mean that teacher' guide book does not take the subject in wide frame." (M9)

> "Teacher's guide book is insufficient. It is not useful except for checking the goals. Most of time, teachers use their own pre-knowledge and teach the subject with the activities and exercises that they prepared from other sources."(E3)

The NC also required that the teachers should implement certain learning activities most of which included various hands-on materials. Most of the participants (14 out of 22, ex: 7, n: 7, e: 8, m: 6) addressed the lack of materials such as manipulative and software CDs and that it was difficult to teach through the NC when they lacked the materials and the necessary technology: "Mathematics textbooks require that a CD should be played, but there are only a few village schools which have computer labs and projection device" (E8). Similarly, another village school teacher claimed that "there is difference between the teaching methods in teachers' guide book and what we can do in the village. Specifically, we have difficulty in finding the materials" (E1). The problem with the insufficient number of materials was illustrated as follows:

> "The [schools] with sufficient number of materials do not have problems. […] But, when I enter to a classroom of 40 students and when I have 5 geo-boards, I give one geo-board to eight students. [All students want to hold the geo-board.] You cannot do what is required." (M9)

Participating teachers expressed these views based on their experiences in the classroom and sometimes presented illustrations for their views about the difficulties in using the materials in the NC as the following:

> "We don't completely implement transformational geometry. In this subject, for instance, if we had a projection device in the classroom in order to show shapes on the digital environment, this subject might be taught very well. But instead, if we use other materials, this subject will take more time. The blackboard cannot be used. If we think that existing materials are enough, this will be not right. For instance, there are some materials with magnets. We need them in teaching transformational geometry. Because, drawing of transformation is difficult, but it is easy to carry the figures [when we use magnet materials]."(M5)

The new curriculum brought changes in the content of the mathematics lesson. While some topics such as sets were taken out of the curriculum until the sixth grade, some new topics such as patterns, tessellations, symmetry, data management, three dimensional buildings, and spatial visualization were added to the new curriculum. Also, the topics like division and multiplication were taken out of the first grade content and were put into the second grade curriculum.

All of the participants expressed positive views about the new added topics in the NC. They stated that new added topics develop students' visualization skills and mathematical intelligence. These topics were enjoyable, beneficial, and interesting for the participating teachers:

> "Patterns and transformational geometry are very useful. It enables students to think in three dimensions. Number patterns are interesting for the students. They feel like they are solving puzzle and it is enjoyable [for the students]. [These topics] develop students' spatial intelligence." (M7)

> "[Patterns in geometry and in algebra] are like solving a puzzle. [...] Because [students] discover and think about the pattern. It is good, it makes them think. They enjoy it since they form their own figures. Number patterns are like puzzle as well. They are enjoyable [for the students]. They make [students] discover. They make students think." (M5)

> "Patterns enable students to develop logical and visual-spatial [intelligence]. Symmetry is a subject which is necessary and first grade students can understand this topic."(E11)

> "Since [the new added topics] enable students to develop reasoning and hypothesizing skills, I think that they are suitable for the NC."(E10)

> "Patterns, transformational geometry, estimation, and similar subjects enable students to be eager. They contribute to the development of students' psychomotor skills. They prevent mathematics lesson from being taught in a monotonous way and [they] enable students to be active."(E8)

> "These topics develop students and teachers. Students learn these subjects by wanting, being entertained, and enjoying. Students develop both mathematical and visual intelligence while learning these subjects."(E5)

Participants also emphasized the connection of the new added topics with real life as expressed below:

> "New added topics are connected to the daily life. People often use estimation in their life … transformational geometry and patterns, too. They are always in our contexts but we didn't know them. Learning them is good for students. I am happy that these new topics are added."(E9)

> "I like patterns the most [among the new added topics]. I consider patterns as reasons and consequences. For instance, you give a pattern example. Square-square-triangle… Here, you help students gain induction skills. That is, in real life, children can estimate the consequences when certain conditions appear. With this way, children can improve their skills of foreseeing even if they are not aware. Estimation is also good. I think it develops students' imagination and scope. It is also enjoyable." (E4)

Most of the elementary teachers (8 out of 12, ex: 6, n: 2), especially expert teachers participated in the study expressed positive views of the changes that the NC brought. They stated that the NC was convenient for students' level, as illustrated below:

> "New curriculum is alleviated and prepared to be convenient for students' level when compared to the old curriculum. Therefore, students' learning is made easier. Instead of presenting the topics in a condensed way, they are presented in a more practical way in the new curriculum, making the students active. […] Actually I am teaching only the natural numbers in a single semester now. But in the previous [curriculum] the natural numbers, place value, addition, and subtraction were condensed [in a single semester]." (E9)

> **"**It is good that division and multiplication were taken out of the first grade. Because first grade curriculum includes reading, writing, and using of handwriting. Placing the teaching of division and multiplication in second grade is better. Generally, students' capacity for multiplication is convenient for the second grade." (E2)

Some of the participants (6 out of 22, ex: 3, n: 3, e: 1, m: 5), especially mathematics teachers, stated that the new curriculum was considered as very intensive, despite their views about the benefits of the new topics:

> "It was said that the content of new curriculum would be alleviated. However, the subjects are still very intensive. There are many units. In my opinion, instead of adding new topics, some topics should have been eliminated." (M7)

> "The content of the new curriculum is too loaded just to make sure that each topic is mentioned. This does not let the teacher and the students breathe. […] For instance, [the content] of the seventh grade was not much. We don't know how the content of eighth grade will be but sixth grade is very intensive. [Topics] are too integrated, they are given as simple but there is a density and that tires us a lot." (M9)

Seven participants (out of 22, ex: 3, n: 4, e: 1, m: 6) also commented on the partition of the units. These participants, mainly mathematics teachers, claimed that partition of units created some problems. They said that there was a problem in the transition between topics and thought that it was uncertain where topics were finished: "At what point the topics should be completed is not definite" (M8). The following excerpt illustrated the problem in detail.

> **"**[…]The subjects have more partitions or were separated unlike the previous [curriculum], there is no entirety. For instance, in the seventh grade, the concept of factorial is explained shortly before the probability topic. In my opinion, since we don't meet this subject in future, I get confused, because [the units] are broken into parts. […]We have difficulty in transition between topics even though the units have names. For instance, you have difficulty in transition from one subject to another subject. Students cannot comprehend why they are learning the subjects and cannot follow them. They seem to have understood, but they cannot establish a relationship when there is a transition from one subject to another subject." (M2)

The reason for the difficulty the teachers addressed seemed to be a result of not adopting the organization of topics in the NC but continuing with the trends of the previous curriculum:

> "This is resulted from being of accustomed to the old system. In the past, we started with fractions. For instance, we taught the definition of fractions, demonstration of them on number line, and then continued with four operations. This situation doesn't go on in this way anymore." (M2)

> "[…] Is passing from one topic to another efficient for children? In my opinion, it is not efficient. It may be resulted from that we don't teach the topics completely. We might like the old system more. We teach the topics completely and pass another topic. […] We don't know completely what students know. We have this problem." (M10)

To sum up, more than half of the participants had positive views about the course book and workbook, but many also claimed that the books were not sufficient. Also, the half of the participants expressed some problems in teachers' guide books. In addition, most of the participants mentioned some challenges during the implementation of new curriculum due to the lack of materials. While the textbook and the activities were planned by the materials, the materials were mostly not sufficient in number, and differences in the school facilities, especially in the village schools, made it difficult to implement the NC. Furthermore, all of the participants expressed positive views about new added subjects in the NC. Most of the elementary teachers addressed positive views about the alleviation in the NC. However, some of the participants, especially mathematics teachers claimed that the new curriculum was very intensive. Six mathematics teachers and one elementary teacher also expressed that partition of units created teaching and learning problems. The reasons for these difficulties were speculated as not adopting the changes in the NC fully, in participants' words.

4.3 Teachers' views about assessment procedures and the level examination in the NC

4.3.1 Projects and performance tasks

Participants' views about the new assessment tasks that the NC brought were asked in order to gain their perspective in these new initiatives of the NC. Most of the participants (16 out of 22, ex: 7, n: 9, e: 9, m: 7) expressed positive

views about assessment techniques. They stated that performance tasks and project homework were useful:

> **"**Projects and performance tasks enable students to increase their knowledge level to other upper levels. They enable students to reach application and comprehension levels. They enable students to make analysis and synthesis by using the knowledge. […] They enable students to construct authentic products at their knowledge level. This contributes to learning and education."(E8)

> "In the past, we have yearly homework given to students at the end of the semester. By changing the name of this homework and extending the period, students can do projects and performance tasks as an individual or as a group. They enable students to conduct research."(E9)

Although the participants' views were mostly positive about project and performance tasks, most participants (12 out of 22, ex: 5, n: 7, e: 6, m: 6) expressed that they did not always benefit the implementation of these assessment techniques efficiently: "Only a few students prepare the homework seriously. Teachers follow the students who don't prepare homework most of the time in order to gain the homework" (M1). It also appeared that local conditions had an impact on the nature of the assessment:

> "I cannot get the sufficient product from the students in performance tasks. Students do not have the opportunity to conduct a research in the village. I consider the students' in-class performance in grading the [performance tasks]" (E8).

Additionally, the performance tasks and the projects were eventually transformed to an extra load which teachers and students did not benefit and turned to be another product to be graded:

> "I think that it does not have any contribution. […] Last year we emphasized a little to make it more understandable but this year it is just going towards grading. It is not only me; it is something that all teachers do. The performance tasks we assign do not contribute much to the content we teach in the class. Projects are also an extra load for everyone." (E1)

In this study, two elementary teachers were teaching mathematics in the multi-grade classrooms. Although this was a special case, their views about the assessment tasks worth to be reported in order to understand the case of implementing the NC in multi-grade classrooms:

> "Although projects and performance tasks would actually make a very big contribution to students, I cannot gather efficient [products]. Only a few students submit them completely. Since I am [teaching in a] multi-

> grade classroom, I don't have any opportunity to implement performance tasks in classroom. Giving performance tasks from each lesson causes weariness both for the teacher and the student. […] I don't gather efficient [products] because of the insufficient opportunities in the village like the internet and library." (E12)

Some of the participants (5 out of 22, ex: 3, n: 2, e: 2, m: 3) stated that they didn't implement performance task in classroom because of the lack of time as illustrated in the following excerpts:

> "We were told that performance tasks should be done in classroom. If I really intend to implement this in a classroom of 30 students, it will take several weeks. [I will be behind] the curriculum."(M3)

> "When students do performance task in classroom, they definitely need help from a person. You [have to] help [each] student in one hour. Our time is limited. […] Therefore, we don't implement it."(M9)

> "I cannot implement performance tasks because of insufficient of time." (E6)

Most of the mathematics teachers (8 out of 10, ex: 4, n: 4) addressed the workload that the performance tasks brought to students.

> "Performance tasks bring too much burden for students. They take most of students' time of outside the school."(M1)

> **"**Performance tasks and projects bring a lot of load to students. I think that since students are assigned performance tasks from each lesson, this situation causes weariness on students."(M4)

To summarize, most of the participating teachers had positive views about the performance tasks and project, and they addressed them as useful. However, they did not benefit efficiently from these tasks or did not fully implement them in the classrooms due to time management concerns. Most of the mathematics teachers also had a view that addressed performance tasks as a burden for the students since these tasks were assigned in each content area, not only in mathematics. Moreover, two elementary teachers teaching in multi-grade classrooms mentioned time management problems and lack of resources in village settings concerning why they did not take enough efficient projects and performance tasks.

4.3.2 The level examination

The new curriculum brought a measurement and assessment system based on evaluation of the complete educational process. After the curriculum was changed, a new measurement and assessment methodology based on the new curriculum became necessary and level examinations were established. These examinations are planned to be implemented at the end of sixth, seventh and eighth grades. The questions in the level examination are prepared according to the main paradigms of the NC. According to the Ministry of National Examination, level examination is not such an exam condemned students to private teaching institutions; on the contrary, it connects students to their schools. In this respect, the participating teachers were asked their views about the relation between the level examination and the NC. The level examination will be referred as SBS, which is the Turkish abbreviation for this exam. During the data collection, the level examination was not done yet when this study was conducted.

Most of the participants (15 out of 22, ex: 8, n: 7, e: 6, m: 9) expressed that the SBS was more selective and useful in assessing students' learning. One teacher expressed that "I think that having the exam in three stages instead of one is a good [implementation]. In this way, the lack of success may be recompensed" (M6). The participating teachers expressed their views as follows:

> **"**I think that [the SBS] is very useful and very equitable, because, in the old system, students' success was evaluated with only one exam. Now, this exam is [divided into three parts]. I think that since this contains longer time, it is very useful and fair. I think also that the questions of the SBS will be suitable to new curriculum. In this exam, school and teacher are also determining [factors], because there is student's success point in school report and school's point. Together with them, I think it is more fair. I believe that it will useful."(E4)

> **"**It is good [that SBS is initiated]. If the exam [would stay as] OKS, it would have been absurd. Because, we evaluate with students by the process. Condensing this into three hours would be out of aim. […] School became important too. The points that are assigned to the students at school and students' performance points in lessons became effective." (E12)

> **"**Students enter the SBS exams at the end of each lesson and they are responsible for their own grades. The load at eighth grade is removed. In the evaluation of secondary education gate examination, the percentages in the SBS points were increased proportionally from sixth grade to eighth grade. In this way, more fair evaluation is made. […] The educational differences between big cities and small rural places were

> removed since the questions in the exam are asked from the subjects in textbooks and activities." (M2)
>
> **M9:** Actually, it is good from point of view of the seriousness of school. That is, […] students have to take that year seriously. […] Since each year is evaluated separately […] an unsuccessful student for one year can recompense it by studying next year. That is, he can turn it ot success. Instead of one chance, more than one chance is good. Because, we think of gaining students every time instead of losing them.
> **Researcher:** Did you look at question types?
>
> **M9:** [The sample the SBS questions are] good. […] The questions can be answered easily by students who listen to the lesson, participate in the lesson. Of course, students have to make a little more effort in order to gather a good result.

Some of the participants (8 out of 22, ex: 3, n: 5, e: 4, m: 4) also addressed the negative effects of the SBS that there will be inequality between rural and city schools and students' workload would be increased. They also pointed out that students began to go to private teaching institutions in early grades; they started to compete in early grades, and became more stressful. Some of the participants illustrate these views explicitly as follows:

> "[Being evaluated by the SBS exam] means that students should show more performance every year. Students and their parents get stressed since they perceive this more as a competition and race. While this competition is not at a high level in rural districts, the race has increased a lot in cities. For this, parents in cities started to provide their children with private lessons and training in private educational institutions."(M2)
>
> "Although the new system has been established with the aim of eliminating the private institutions, more students have started to attend these institutions. Now [some students] start to attend at the fourth grade."(E12)
>
> "I am not in favor of the measurement of success of students and teachers by the SBS exams. […] From a point of view, we can say 3 exams are better from only one exam in determining students' future. However, while the students were running like a horse only at the end of the eighth grade, now they are doing this at the end of each grade and the race starts in younger ages." (M7)

Few participants talked about the fairness issues that the SBS might have brought. One had the view that the new examination system would be fair when students in city and rural settings are considered; whereas two novice elementary teachers addressed that there was actually an unfair situation for students in rural schools:

> "Here, actually I think there is an inequality. Because a student in a rural school and a student in city school has to answer the same questions [in the SBS exam]. Students in the city schools have more advantages. They have a chance to go the private institutions. They can see various examples in their contexts. Since they have a different life context and more opportunities, they become well-prepared. However, students in the villages don't have an opportunity to go private institutions. I think it would have been better if students in city and rural schools were asked different questions." (E7)

Moreover, some teachers also addressed that the SBS was quite contradictory to the approaches that the NC tries to adapt from different aspects:

> "I think that this is good because it shows us that to what extent students can apply given information in written format, but I don't think it is a suitable approach for the new curricula. Because, while the new system mentions about evaluating students from many different respects, the SBS evaluates students only in a written way. And this is a contradictory approach to the multiple intelligences theory."(E3)

> "New curriculum is not suitable for an examination style. Even if the questions are asked as easy in the first few years, they will become difficult gradually. This is examination in the end. [Therefore] all students will study for it. May be, conducting the examination each year might make measurement realistic. However, a student who studies only course book cannot be successful."(M1)

To sum up, most of the participants expressed that the SBS was more useful in assessing student learning. On the other hand, some of the participants also addressed negative effects of the SBS such as unfair results for rural and urban school students, increasing students' workload and stress, and the raising attendance in private teaching institutions.

4.4 Teachers' challenges in implementing the NC requirements

During the interviews, the participants expressed the challenges they faced during the implementation of the new curriculum. So far, some of the challenges were mentioned about instructional activities, teachers' and students' roles, textbooks, lack of materials, the content of new curriculum, and the project and performance tasks by the participants. In this section, the other challenges the participants faced during the implementation of the NC were documented.

4.4.1 Time management

Almost all of the participants (20 out of 22, ex: 11, n: 9, e: 10, m: 10) stated that time were not enough in order to implement the requirements of the new curriculum: "Time is not enough. It is not enough. It is enough to implement activities but not to enough to solve questions. It is not enough to understand what students know and do not know" (M10). The following excerpts illustrate how the NC requirements influenced teachers' time management:

> "I think that time is enough for the implementation of activities at 1st, 2nd, and 3rd grades, but when we think of 4th and 5th grades… I was teaching 5th grade students last year and I had difficulty in keeping the math curriculum pace [in the 5th grade]. Other teachers also could not keep the pace." (E4)

> "Time is not enough for students to actually do the activity. We either implement [the activities] as a group or the whole class. I mean, when we assign it to the students, we cannot handle it. Guidance is still the teacher's job. The teacher guides. When the teacher guides, the activities are completed on time. But when they are assigned to the students, they are not completed on time." (M2)

> "In the new curriculum, I cannot implement anything completely. I don't implement all the activities, assessment techniques such as peer evaluation, group evaluation, and self-evaluation due to lack of time [and] I don't benefit from projects and performance tasks efficiently."(M7)

Some of the participating mathematics teachers (4 out of 22, ex: 3, n: 1, e: 0, m: 3) tried to manage the time by not implementing the activities, which did not solve the time management problem completely: "I don't spare time for the activities […] Besides, I cannot solve enough questions about the subjects in classroom either from the course book or workbook" (M9).

Briefly, the participants expressed that time were insufficient in order to implement the requirements of the NC. They tried to manage the time by implementing the activities mostly in a teacher-centered setting or not implementing them at all.

The time management problem also interfered with other problems and made the situation more difficult to handle for the participating teachers. Some of the mathematics teachers participants (4 out of 22, ex: 3, n: 1, m: 4) addressed that when schools' physical facilities were not suitable, it was not easy to implement the NC. They pointed out that crowded classrooms were not suitable to implement

instructional activities, especially when difficulties in classroom and time management were considered:

> "Active participation of students is very positive and very important for students' learning. But in crowded classrooms… Making each student talk… becomes problematic for some of the students. Sparing some time for students to think about the questions affects students' learning positively. But I have difficulty in finishing curriculum subjects completely." (M3)

Implementation of the NC in multi-grade classrooms was difficult for two of the participating elementary teachers who were teaching in multi-grade classrooms and who taught before when time management is considered.

> "Since I am teaching in the multi-grade classroom, time is not enough."(E12)

> "[…] Now, I am teaching at third grade and I implement all activities on time and regularly. But unfortunately, we do not have the opportunity to implement them on time and regularly in the multi-grade classrooms.[…] I worked in a multi-grade classroom in a village. I taught 4^{th}-5^{th} grades. [During the implementation of the NC], there is a need to be flexible, because time is not enough." (E8)

To sum up, almost all of the participants expressed that time were not enough in order to implement the requirements of the new curriculum. Also, some of the participating teachers addressed that when schools' physical facilities were not suitable, it was not easy to implement the NC. They pointed out that and multi-grade and crowded classrooms were not suitable to implement instructional activities, especially when difficulties in classroom and time management were considered

4.4.2 Teachers' efficiency in implementing the NC

The requirements of the NC from the teachers were mostly away from the requirements of the previous curriculum. Therefore, it can be said that the teachers had to deal with a new approach in teaching, for which they might not have adequate training. Almost half of the participating teachers (12 out of 22, ex: 6, n: 6, e: 5, m: 7) felt qualified enough to implement the NC, while the other half did not feel so. These teachers mentioned difficulty in implementation of some subjects including representation, and implementation of some activities, usage of materials, and lack of sufficient knowledge of instructional methods:

> "I don't feel [I have] sufficient [knowledge]. Because I don't have the sufficient knowledge to teach the subjects. We didn't receive any guidance. We just try to adapt our existing knowledge to the [the NC activities] and teach subjects." (M9)

> "I don't feel [I have] sufficient [knowledge]. We did something like tangram. However, we do not know how to implement them, we do not have an example of them so we do not know what exactly they are, and we do not know how they are taught." (M10)

> "No, I don't feel enough. I think I have deficiencies and in this regard, I try to improve myself in order to be more successful. The reason of this is that I use traditional teaching methods in some subjects." (E10)

One of the most important aspects of the NC is the extensive use of materials. However, most of the participants (15 out of 22, ex: 9, n: 6, e: 9, m: 7) addressed the lack of experience with using concrete materials and related teaching methods: "We have difficulties in techniques and methods for teaching" (M9). Nine participants (out of 22, ex: 6, n: 3, e: 5, m: 4) also claimed that training was necessary for the usage of concrete materials: "The teachers should be given training especially about using materials" (E12). The following excerpts illustrate the participating teachers' views in detail:

> **"**There aren't any problems at 1st, 2nd, and 3rd grades. But we sometimes had difficulties while using some of the materials in the 4th and 5th grade. For example, we had difficulty in using the symmetry mirror. We asked our colleagues whether they used them or not. They said no. We asked if they had a guess about it, nobody knew. [So] everybody used different methods. I had this problem and I also observed my friends' problems. The teachers should be given training for this. They have to know how to use the documents and the materials. It's very difficult to teach things that we don't know." (E4)

> **"**We have limited knowledge of the usage. […] If we take the materials and work on it, we can create something. But we don't have the guides."(M9)

> "[…] We don't know how to implement some activities. We can't understand exactly. […] Especially representation… We can understand, that's ok, but how can we teach it to the students? Isn't that more important? We don't have concrete knowledge about these. We try to teach but we do it with our [existing] knowledge. Each teacher tries to teach it differently. There should be training [for these]." (M10)

To sum up, almost half of the participating teachers did not feel qualified enough to implement the NC. The reason for their perceived inefficacy seemed mostly resulted from the lack of experience and training about the usage of the methods and materials that the NC brought. These participants mentioned

difficulty in implementation of the activities and they expressed that they lacked sufficient knowledge of instructional methods. Moreover, most of the participants addressed the lack of experience with using concrete materials and related teaching methods. In addition they claimed that training was necessary for the usage of teaching methods and using of concrete materials.

4.4.3 Support system in the NC

The previous section documented that the participating teachers needed training about the usage of the materials and the implementation of the activities that the NC required. The training offered by the Ministry, on the other hand, was not considered as effective by the participants who received it. Most of the participants (14 out of 22, ex: 8, n: 6, e: 9, m: 5) expressed inadequacy of in-service training. More specifically, they explained this issue with reference to the seminar content as follows:

> **"**[The training] absolutely [is] not [effective]. Because more than 90% of the in-service training is nothing but the slides show."(E3)

> "I think the lecturers should be the teachers who used this curriculum in the pilot schools. I cannot say we have got enough support [about the implementation]. In fact we learned it by trial and error method."(E1)

> "The teachers should be taught how they can teach mathematics lessons, how these lessons should be taught according to the new curriculum or how the material should be used in the lessons."(E5)

> "I don't think [the seminars] were enough. A very big curriculum has changed. This is not something that will be dealt within 3 or 4 days."(M5)

Some of the participants (8 out of 22, ex: 3, n: 5, e: 3, m: 5) did not attend the seminars offered by the Ministry. The reason for not attending was expressed as follows:

> "They didn't present teaching but they introduced the mathematics curriculum. We don't need that. Indeed, [we need practice about] the implementation. It can be more beneficial if materials are introduced and the usage of materials is taught. They just describe mathematics curriculum. [They talk about] how program is planned, what are changed, what are added. These can be understood by the people who look at the book."(E5)

More than half of the participants (13 out of 22, ex: 6, n: 7, e: 8, m: 5) addressed the lack of support from the other teachers and school administrators in

implementing the NC. For the participants, the main reason for this lack of support seemed to be administrators' and peer's lack of knowledge and the lack of contexts in which teachers would gather and share their experiences:

> **"**I can't get enough support from the teachers and the school administrators. I think the teachers and the administrators don't exactly understand the curriculum. Everybody has questions in mind and because of this there are varieties in practice."(M6)
> "Generally the teachers who teach the same level classes are in a dialogue. We also have dialogues with the teachers who teach the same class with us. […] [But this is limited] just to our school. There should be monthly meetings where the teachers talk about how they carried out the activities and can share their experiences so that [teachers] learn a lot of new things from each other." (E4)

In addition to the lack of quality support participants received from the Ministry, other teachers and school administrators, most of the participants (17 out of 22, ex: 9, n: 8, e: 10, m: 7) expressed that there wasn't enough support from parents either. The parents in village settings were especially claimed to be indifferent to the change in the curriculum:

> "The parents stay away from the school so they are also away from the curriculum." (M7)

> "The parents aren't sensitive enough because the school is in the village" (E8).

The parents in the city settings were, not so much knowledgeable about the curriculum either. Participants complained about parents' lack of knowledge and support. This was illustrated clearly in the following excerpts:

> "The parents are not fully conscious about the program. I mean, they are not aware of it. So we don't get positive feedback from them at this moment. The parents who are teachers are aware of the situation and they follow it carefully. We don't have problems with them. But the other parents don't even know when their children will be administered the exam. […] Most of the parents think that their children will be administered the exam only at the end of the 8th grade. They don't know that children's performance in the lessons and their behaviors against their teachers and friends will be evaluated as a whole. […] They do not spare time and come to the meetings but we can only talk about [the NC] in the parent meetings. The notes we write [for the parents] are thrown away even without being read." (M9)

> **"**The parents don't have a great interest. I wish the parents met somewhere which could be arranged by school administrators or town's department of education. The parents should be given the essential knowledge. When parents come to school, they say that their students don't know this, don't know that. […] Parents say that they learned

> everything when they were at school. […] The students don't have to learn everything in the new curriculum, but the parents don't know this. The parents should be informed about this." (E5)

Ultimately, most of the participants expressed inadequacy of in-service training. They stated that they did not receive any quality support from the seminars organized by the Ministry and they learned how to teach through the NC by trial and error method. Also, participants did not receive much support from the other teachers and school administrators in implementing the NC, and expressed the need for contexts for sharing experiences. The participants also viewed that there wasn't enough support from parents either.

4.5 Teachers' suggestions for the effective implementation of the NC

It was anticipated in the beginning of the study that teachers would like to provide comments and suggestions for the NC based on their experiences in order to be improved. Therefore, participants were asked if they wanted to express suggestions to the Ministry about the NC.

4.5.1 Success of the NC

Most of the participants (17 out of 22, ex: 7, n: 10, e: 10, m: 7) predicted that new elementary mathematics curriculum would be successful, however, they emphasized that the NC should be improved continuously:

> "[...] I believe that [the NC] will be successful. But, if [the NC] is not renewed, it will not respond anything as happened in the past. Because science is continuously improving. [There is a need] to renew [the NC] continuously. […] I believe that [the NC] will be beneficial, but I do not believe that it will be sufficient. [The NC] should be improved continuously" (P1).

The participants were also aware that the consequences would not be immediate:

> **"**Yes I believe [that it will be successful]. But this success needs time. Now the students, teachers and the parents are in the process of getting used to it. The curriculum will be successful after necessary knowledge and experience [are gained]. However I also think that it will be successful unless there is another new curriculum, [which is a case in our country]." (M7)

While the participants complained about some of the missing or contradictory components during the implementation of the new curriculum, such

as the lack of materials and the SBS examination system, they also expressed views that these issues would be improved by time:

> **"**I believe that it will be successful. At least it will be more successful than the previous one. I also believe that the lack of activities and material will be overcome in the future. (M3)

> "I believe that it will be successful in teaching concepts in mathematics and science lessons. […] However it will not be successful if there will be questions in the SBS with the same understanding [of the past exams]. If the students will be evaluated according to the activities, it will be beneficial."(M2)

> "I wonder that did [the curriculum developers] enter a mathematics lesson in [rural settings] or teach subject? They may implement in pilot schools. […] The chance of the implementation of new curriculum decreases. On the other hand, in future, when the materials are increased, the number of students in a classroom is decreased, that is, conditions are suitable, and the new curriculum will be implemented better." (M9)

To sum up, most of the participating teachers expressed that new elementary mathematics curriculum would be successful, but they stressed that new curriculum should be improved continuously and no other major curriculum change should be done. Participants' suggestions in order to improve the NC are summarized in the next section.

4.5.2 Improvement of the new curriculum

In order to implement the NC effectively, most of the participants (17 out of 22, ex: 9, n: 8, e: 8, m: 9) made suggestions. The participants mostly made suggestions about time problem during the implementation of the NC.

> "[…] the duration of math lessons should be increased." (E2)

> "There should be a consistency between curriculum and time." (M3)

> **"**I would like to have the subjects simpler and the teachers would not have the concern to cover the curriculum topics. I also want that the mathematics lesson hours should be increased to 6 hours in order to fully implement the activities and complete the assessment procedure."(M7)

The participants also stated that the conditions of schools in villages should be considered: **"**The curriculum should be made more flexible. The schools in villages and the schools with limited opportunities should be considered more" (E8).

Most of the participating teachers (14 out of 22, ex: 8, n: 6, e: 6, m: 8) added their suggestions about curriculum materials. They suggested that manipulative and software should be increased: **"**Visual materials should be supplemented. […].Calculators should be used more. Also mathematic programs can be added this and mathematics laboratories can be established."(M2). Participants also made suggestions about improvement of textbooks. "The textbooks should be prepared clearer in order to be followed. The instructional activities should be more beneficial."(M3). The following advices illustrate the improvement in textbooks in more detail:

> […] Both students' books and workbooks can be more functional. For example there aren't enough spaces for each exercise. The students cannot write their answers since there are not enough spaces left. The textbooks should be written according to the students' age level."(E2)

> "There should be more exercises. I believe that the narrowing the topics and preparing short questions will be more beneficial. I want activities to be short and applicable. Activities should be prepared taking into consideration the class sizes."(M8)

Since the participants did not benefit much from the educational seminars, some of the participants (8 out of 22, ex: 4, n: 4, e: 5, m: 3) also suggested that support from the Ministry should be increased:

> "They should get more beneficial seminars for the new curriculum and continuous feedback from teachers about the new curriculum should be gathered" (M3).

> "We do not know how materials should be used. Seminars should be given related to the usage of materials." (E6)

Briefly, in order to implement the NC effectively, the participants recommended that the duration of mathematics lessons should be increased, mathematics lessons should include more use of manipulative, mathematics laboratories should be established, the textbooks should be prepared clearer in order to be followed, the instructional activities should be more beneficial, village schools' conditions should be considered more, and effective seminars about the requirements of the NC should be provided by the Ministry.

4.6 Summary

In this study, all of the participants expressed positive views about instructional activities. All of them stated that instructional activities enabled

students to learn mathematics meaningfully and understand easily. However, some of the participants, especially mathematics teachers addressed that doing the instructional activities was not enough in learning mathematics and also the half of the participants, mainly mathematics teachers claimed that conducting the activities in the NC required more time than allowed.

When their views are considered about instructional approaches in the NC and its impact, most of the participating teachers viewed that new curriculum was student-centered, enabled students to learn by doing, living, and discovering mathematics through the activities, and it placed the students in an active role. They also addressed that since the NC was prepared according to constructivist approach and multiple intelligence principles, this made students' learning more effective compared to the old curriculum. Since the NC made mathematics concrete, consisted of more daily life examples, and more use of hand-on and visual materials, most of the participants claimed that permanent learning occurred in mathematics. Also, most of the participating teachers expressed that the NC changed and diversified their teaching methods in addition to the changes in the instructional approaches. In addition, some of the participants viewed that the NC helped students develop more than one skill. On the other hand, some of the mathematics teachers mentioned adaptation problems about the new curriculum due to their concerns about the curriculum load, the students' level of prerequisite knowledge, and the level examination (SBS).

Participating teachers mostly viewed that teacher's and student's roles have been improved positively by the NC requirements. However, this improvement brought an increase in the work-load of the teachers and participants claimed that students' background was not enough in order to carry out the new roles that teachers and students were supposed to perform in the NC.

The participants were also asked about their views about student motivation. Most of the participants, especially novice teachers, expressed that students' participation and interest in mathematics lesson were increased. They thought that the NC provided participation of all students to the lesson at different levels. The reason for such a change was viewed as the existence of the activities in which students learn by actually doing mathematics. Moreover, most of participating teachers, especially elementary teachers, also viewed that the new

curriculum decreased students' fear of mathematics. They also addressed that the NC resulted in a change in students' views about mathematics since mathematics became interesting and fun. This new view increased students' motivation in learning mathematics and participation in the mathematics lessons.

During the interviews, the participants expressed their views about textbooks. Almost half of the participants stated that the course book and workbook were effective in teaching and learning mathematics. Participants viewed that the textbooks presented real life examples for the students, which increased students' interest. Participants also viewed that the development of course book and workbook was good and expressed positive views about the separation of course book and workbook. On the other hand, some of the participants viewed that course book and workbook were not sufficient in many aspects. Participants mentioned a gap between the activities and questions, the inconsistency of the textbooks in small districts' local culture, and insufficiency of thought provoking questions. They also expressed that they needed additional resources for their teaching. Particularly, the questions in the textbook were mentioned by the participants as insufficient. Also, the organization of the content in the textbook was not viewed as suitable for the lower grade students. Moreover, half of the participating teachers expressed that teachers' guide book was difficult to be followed, was complicated, and limited teachers' autonomy in conducting the activities.

The NC also required that the teachers should implement certain learning activities most of which included various hands-on materials. Most of the participants addressed the lack of materials such as manipulative and software CDs, and that it was difficult to implement the NC when they lacked the materials and the necessary technology.

All of the participants expressed positive views about new added topics in the NC. They stated that the new added topics developed students' visualization skills and mathematical intelligence. These topics were enjoyable, beneficial, and interesting for the participating teachers. Most of the elementary teachers, especially expert teachers, also stated that the NC was prepared as convenient for students' level. Some of the participants, especially mathematics teachers, stated that new curriculum was generally considered as very intensive and that partition

of units created some problems. They stated that there was a problem in the transition between the topics and thought that it was uncertain where topics were finished.

Positive views about assessment techniques were expressed by most of the participants. They stated that performance tasks and project homework were useful. On the other hand, they also expressed that they didn't always benefit the implementation of these assessment techniques efficiently. It also appeared that local conditions had an impact on the nature of the assessment since the resources in rural contexts were limited. Some of the participating teachers expressed that they did not implement performance tasks in classroom due to time management concerns. Also, two elementary teachers teaching in multi-grade classrooms mentioned time management problems and lack of resources in village settings concerning why they did not take enough efficiency from projects and performance tasks. Moreover, most of the mathematics teachers addressed the workload that the performance tasks brought to students since these tasks were assigned in each content area.

The level examination (SBS) was considered as more selective and useful in assessing students' learning by most of the participants. Some of the participants also addressed negative effects of the SBS that there will be inequality between rural and city schools and students' workload would be increased. They also pointed out that students began to go to private teaching institutions and compete in the early ages which made them more stressful.

Almost all participants stated that time were not enough in order to implement the requirements of the new curriculum. Some of the participants also addressed that when schools' physical facilities were not suitable, it was difficult to implement the NC. Also, they pointed out that crowded classrooms were not suitable to implement instructional activities, especially when difficulties in classroom and time management were considered. They also mentioned difficulty in implementation of the NC in multi-grade classroom.

Almost half of the participating teachers felt qualified enough to implement the NC, while the other half did not feel so. These teachers mentioned difficulty in implementation of topics including representation, activities, and materials, and they addressed that their knowledge of instructional methods was

insufficient. In this respect, most of the participants addressed the lack of experience with using concrete materials and related instructional methods. They also claimed that training was necessary for the usage of instructional methods and using of concrete materials.

Inadequacy of in-service training received from the Ministry was expressed by most of the participants. Participants also expressed that there wasn't enough support from parents and complained about parents' lack of knowledge about the NC. Additionally, the lack of support from the other teachers and school administrators in implementing the NC was addressed.

Finally, most of the participating teachers anticipated that the new elementary mathematics curriculum would be successful, but they stressed that new curriculum should be improved continuously. Participants' suggestions about the NC included increasing the duration of mathematics lessons, more usage of manipulative and software, revising of the textbooks in order to be followed and the instructional activities in order to be more beneficial, establishing mathematics laboratories, more consideration of village schools' conditions, and more opportunities of effective seminars about the requirements of the NC.

CHAPTER 5

DISCUSSION AND RECOMMANDATIONS

The main purpose of this study was to identify and describe teachers' views about the new elementary school mathematics curriculum. Specifically, this study focused on teachers' views about new mathematics curriculum, the difficulties they faced, and their suggestions for the solutions of their problems during the implementation of the new curriculum. In this chapter, the major findings of the study is summarized and discussed, followed by the recommendations for future research.

5.1. Existence of positive and negative views about the new curriculum

The findings showed that participating teachers had both positive and negative views about the new curriculum. While all participants expressed positive views about the general impact of the new curriculum practices on students' learning, negative views appeared when more specific issues were asked.

The participants stated that instructional activities enabled students to learn mathematics meaningfully and understand easily. They claimed that instructional activities were beneficial in making abstract concepts concrete. For the participants, the NC consisted of more daily life examples and more use of materials and visualization. When instructional activities, which made mathematics concrete, were conducted properly, they increased students' capacity of understanding and permanent learning occurred. Participant' views were parallel with the goals of the new elementary mathematics curriculum because the NC pointed out that instruction should start with concrete experiences and meaningful learning should be aimed (MNE, 2005, MNE, 2006). This shows that the participating teachers had grasped the goals of the new curriculum and were able to observe the proposed changes in their classrooms. Therefore, they

developed positive views about the impact of the NC on the meaningful learning. This finding has been supported by many Turkish studies about the NC. In Bulut's (2007) study, fifth grade elementary teachers stated that new curriculum helped students learn the importance of subjects and relationship with real life by means of visual and student-centered activities. Additionally, in Halat's (2007) study, most of the elementary teachers (grades 1-5) claimed that instructional activities had positive effects on students' thinking, attitudes towards mathematics, and understanding of mathematical concepts. Therefore, the current study helped in understanding teachers' views about the positive impact of the NC on students' learning.

The participating teachers in this study also had positive views about the use of instructional approaches in the NC. They claimed that the new curriculum was student-centered, enabled students to learn by doing and discovering mathematics through the activities and it placed the students in an active role. They also addressed that since the NC was prepared according to the constructivist approach and multiple intelligence principles, it helped students' learning more effectively compared to the old curriculum. The NC underlined that students should be active during learning process and make connection to their previous mathematical knowledge while making connections between the existing concepts should be given importance (MNE, 2006). These findings addressed that the teachers participating in this study had certain ideas about the instructional approaches in the NC, their intentions, and the theoretical background of these approaches. These findings confirmed the previous studies in which elementary teachers (grades 1-5) expressed that the new curriculum was based on student-centered approach and students' active participation (Bal, 2008; Bulut, 2007: Kartallıoğlu, 2005). Also, in Soycan's study (2006), most of the fifth grade elementary teachers associated the new curriculum with constructivism. It can be speculated, based on the findings of the current study and the previous studies that, the teachers have mostly understood the ideas emphasized in the NC and they were able to connect these ideas to the reasons for the classroom practices required in the NC and to their impact.

Participants' views about the instructional approaches in the NC seemed to have some impact on their teaching practices. The participating teachers claimed

that the NC changed and diversified their teaching methods and techniques. They stated that they started to use discovery method by carrying out the required activities. The participants also claimed that they had learned new teaching strategies for the mathematics content. These views might be interpreted that while the participants had knowledge about the teaching approaches, they had the opportunity to implement these approaches with the initiation of the NC. Additionally, teachers seemed to have learned new mathematics content by the help of the NC. Yet, since participants' teaching practice was not observed before and after the implementation of the NC, these views should be interpreted with caution. Within the limits of the participants' views, it could be stated that teachers did not have the complete mathematics content and pedagogical content knowledge needed in implementing the curriculum before the implementation. They might have improved such knowledge through implementing the NC requirements. However, the nature of the implementation and the amount of the learning could not be observed in this study.

The participants also mentioned positive effects of the NC on student motivation. Especially novice teachers expressed that students' participation and interest in mathematics lesson were increased. This finding has been supported by Manouchehri and Goodman's (2001) study. In their study, most of the seventh grade mathematics teachers agreed with the view that when they used standards-based materials in USA, students' interest in learning mathematics and participation in class activities increased. The participants thought that the NC provided participation of all students to the lesson at different levels. The reason for such a change was viewed as the existence of the instructional activities in which students learn by actually doing mathematics.

5.2 New roles and new responsibilities

One of the most important finding was participants' positive views about teachers' roles and students' roles. The participating teachers viewed that teacher's and student's roles have been improved positively by the NC requirements. This finding has been supported by many Turkish studies about the NC. In Bulut's (2007) study, teachers' roles were seen as facilitator and guide in the new curriculum by fifth grade elementary teachers. Teachers in the current study stated

that students' roles were being an active learner by doing, skillful, logical thinker, and interpreter. On the other hand, the participants claimed that students' background was not enough in order to carry out the new roles that teachers and students were supposed to perform in the NC. In this condition, the participants claimed that they did not implement activities completely and used teacher-centered approach and direct instruction method.

This improvement in teachers and students' roles brought additional responsibilities. The participants claimed that there was an increase in teachers' work load in the NC. This finding confirmed Bıkmaz's (2006) claim that planning a learning process based on the new curriculum approach and to implement this would further increase teachers' work load. She underlined that teachers must be more organized in order to be able to carry out different educational tasks emphasized by new measurement and evaluation approaches, design a more activity-oriented teaching-learning process, consider students' pre-knowledge and individual differences, and make close cooperation with their peers during the implementation of the NC.

As an increase in teachers' work load were taken into consideration, teachers' efficiency became one of the important aspects during the implementation of the NC. Almost half of the participating teachers felt qualified enough to implement the NC, while the other half did not feel so. The participants mentioned their difficulties in representation of concrete concepts, carrying out activities and using of concrete materials. In this respect, the participants addressed the lack of experience with using concrete materials and related instructional methods. These findings showed the importance of support mechanism for teachers in order to realize the requirements of the NC. Babadoğan and Olkun (2006) underlined that the changes in the elementary mathematics curriculum required two important changes that should be considered by the reformers: (i) teacher training and (ii) teaching and learning materials, especially the mathematics manipulative. They stated that there was a strong need for teacher training and manipulative materials in the classroom however very little action had been taken to overcome these difficulties. The study confirmed the claim of Babadoğan and Olkun (2006), because the participants claimed that training was necessary for the usage of instructional

methods and using of concrete materials but they did not receive adequate in-service receiving from the Ministry. This finding also confirmed the findings of other Turkish studies (e.g., Bal, 2008; Babadoğan & Olkun, 2006; Bulut, 2007; Halat, 2007; Kartallıoğlu, 2005; Korkmaz ,2006; Yapıcı & Leblebiciler, 2007).

The participants addressed the lack of support from the other teachers and school administrators for the implementation of the NC. In the local settings, teachers are generally alone in their schools and they do not have any peers who would help them for the NC. Therefore, the results of the study suggested that teachers' meetings should be done carefully and seriously about the changes in the new curriculum. Depending on the participants' claims, it appeared that teachers needed workshops rather than presentations for the implementation of the activities, usage of concrete materials, and time management. Also the school administrators should be informed more about how they would support to teachers for the implementation of the new curriculum.

Another important aspect was lack of parents' support during the implementation of the NC. Parents have an important role in the reform of mathematics education and they influence the direction of reform (Peresini, 1998). According to MNE (2005a), parents have an important role in supporting children's learning and the new curriculum aim to make parents a part of the instruction with outside school activities. However, the participants expressed that there wasn't enough support from parents and complained about parents' lack of knowledge of the NC in this study. From a different perspective, parents in Ersoy's (2007) study claimed that they were not well-informed about the NC, so their contribution to the implementation process was inadequate. Therefore, the findings of this study showed that parents should be informed about the new curriculum and the school-parent cooperation should be provided in both village and city settings.

5.3 Content

The participants expressed positive views about new added subjects such as patterns, transformational geometry, estimation, symmetry, tessellations and statistics in the NC. They stated that new added subjects develop students' visualization skills and mathematical intelligence, and they were enjoyable,

beneficial, and interesting for the participating teachers. One important emphasis was given to the connection between the new added subjects and real life examples. These findings confirmed Bulut's (2007) findings in which fifth grade elementary teachers stated that the new added topics enhanced the curriculum. Implementing a new mathematics curriculum requires teachers to adopt new strategies not only for teaching mathematics, but also for their own learning mathematics (Drake, 2006). Teachers in this study claimed that the new curriculum also taught them a new mathematics and they had a chance to learn more about the content by implementing the activities. Therefore, teachers' views in this study showed that the new mathematics curriculum helped teachers enhance their knowledge.

The success of the new curriculum is also depended mostly on the effective use of the textbooks, which guides them for the content. The preparation of the course books and teachers' guide books convenient to the new curriculum's philosophy and structure is important (Eğitim Reformu Girişimi, 2005). The participants in this study claimed that the course books and workbooks were effective in teaching and learning mathematics. The participants also viewed that the textbooks presented real life examples for the students, which increased students' interest. In addition, they also claimed that the development of course book and workbook was good and they expressed positive views about the separation of course book and workbook. While these findings were consistent with the previous findings (Halat, 2007), the participating teachers also expressed that teachers' guide book was difficult to follow, were complicated and limited teachers' autonomy in teaching, which was contradictory to some findings of Çakır'(2006) study. In her study, teachers claimed that teacher's guide book guided in planning and encouraging students to be prepared for the lesson. It seemed that teachers needed guidance in using the teacher book for the implementation of the new curriculum. In addition, the participants viewed that course book and workbook were not sufficient in many aspects: the content, examples, exercises were insufficient, there was a gap between activities and exercises, and textbooks did not consider the local conditions in rural settings, consistent with Çakır's (2006) study on 4^{th} grade mathematics textbooks. These

findings addressed that the textbooks for the implementation of the new curriculum should be revised carefully, as indicated previously (Korkmaz, 2006).

One reason for teachers' views about the insufficiency of the new curriculum textbooks could be the way that the NC handled the topics. Korkmaz (2006) claimed that although the old curriculum consisted of more concepts in less detail, the new curriculum adopted less concepts in depth. He claimed that this situation caused some teachers to have the views that the curriculum was insufficient. Ersoy (2006) highlighted that textbook was the most important resource for a teacher when library, internet connection, and peers did not exist in the teaching context. Therefore, this study showed that more emphasis should be given in reviewing the textbooks by considering the teachers' views with special attention on rural context.

5.4 Assessment techniques and the level examination (SBS)

The participants expressed positive views about the assessment techniques in the NC. They stated that performance tasks and project homework were useful for student learning. This finding showed that teachers adopted the idea that these assessment techniques were effective. In this regard, in Bulut's (2007) study, fifth grade elementary teachers believed in that students would be more successful with the new curriculum since they were evaluated through various assessment procedures that focused on both process-oriented methods as well as product-oriented methods.

The participants expressed negative views about projects and performance tasks when their views were asked in detail. They stated that they did not always benefit the implementation of these assessment techniques efficiently. It can be speculated based on the findings of the current study that the reason for not benefiting the assessment techniques might be not knowing how to prepare, use, guide, and evaluate projects and performance tasks. This finding also was supported by Turkish studies. Erdal (2007) found that elementary teachers (grades 1-5) felt that they did not have adequate knowledge for using new alternative assessment techniques in the new curriculum. Erbas and Ulubay (2008) found that teachers' lack of sufficient knowledge about various assessment techniques suggested in the curriculum were seen as difficulty in the implementation process

by sixth grade mathematics teachers. According to results of questionnaire, they also found that sixth grade mathematics teachers implemented the new assessment techniques at an average level and commented that most of the assessment techniques in the new curriculum were almost unknown for the teachers except their definitions. Bal (2008) found that although elementary teachers (grades 1-2-3) were aware of the new alternative assessment techniques, they did not implement them sufficiently. The reasons for insufficient implementation for teachers in this study were that evaluation criterion were complex and numerous and the implementation of the assessment tools took more time, especially in crowded classrooms, consistent with the previous findings of the studies conducted on elementary teachers (Erdal, 2007; Korkmaz 2006; Toptaş, 2007; Yılmaz, 2006).

In a circular letter of MNE (2007) about performance tasks, it was expressed that the preliminaries such as data collection and investigation of the task could be done outside of school and the parts of formation of product and concluding task should be implemented inside the classroom when necessary. In this way, it is said that students' performance during the task can be evaluated by teachers more truly through observation. However, in this study, the participating teachers expressed the dilemma of implementing performance tasks and managing the time. As a result, the teachers preferred not to implement the performance tasks. Therefore, the findings of the study showed that performance tasks did not help teachers who already had difficulties with time management. The nature of performance tasks and their practicability should be reviewed by the curriculum developers.

Briefly, in the process of implementation of the new curriculum, it can be said that teachers experienced difficulty mostly in implementing the assessment techniques. Although these techniques are introduced shortly in the curriculum, in the implementation, how they should be used and evaluated in different classroom settings, how often they should be applied, how they should be graded and what will be contribution in determination of students' success grades have been not clear in the curriculum. Therefore, teachers' views should be considered in reviewing these issues.

Another most important finding in this study is related to the level examination (SBS). The participants claimed that the SBS was more selective and useful in assessing students' learning. They viewed that students' success was evaluated with only one exam in the old system and now, this exam was divided into three parts. In this way, an unsuccessful student for one year can recompense by studying more the next year. Students' academic grades and behavior grades were important and determinant in the evaluation of students' success in the SBS. The participants underlined the increase in the role of school learning for SBS. The participants' views showed parallelism with MNE's statements. For the Ministry of Education, if students miss an opportunity, students will have a chance to compensate for it with the SBS of second and third year (MNE, 2009).

The participants also addressed negative effects of the SBS that there would be inequality between rural and urban schools and students' workload was increased. They also pointed out that students began to go to private teaching institutions in early ages, started to compete in early ages, and they became more stressful. The participants also claimed that the SBS was quite contradictory to the approaches in the NC tries to adapt by different aspects. These findings are not consistent with MNE's (2009) statements because they did not agree with the view that the new system directed students to go private teaching institutions. Rather, the Ministry claimed that since this new model was based on process and measuring students' success as different respects, it will not lead students towards private institutions. In addition, the Ministry asserted that students' and parents' stress will be maintained at optimal level due to spreading the SBS examinations to time. While the Ministry proposed these changes for the level examination system, the participating teachers had quite contradictory experiences and foresights. These views should be seriously considered in evaluating the impact of SBS on students' learning and success.

5.5 Differences between elementary' and mathematics teachers' views

The study resulted in some differences between elementary and mathematics teachers' views about the NC. In particular, mathematics teachers addressed that although the NC helped in meaningful mathematics learning, instructional activities were not always sufficient for student learning. The reason

for such views might be the ways that the participants implemented the curriculum activities. The main aim of instructional activities is to help for learning of themes or concepts well. However, when teachers do not create discussion environment on the concept, the activity is likely to loose its meaning (Bıkmaz, 2006). Therefore, it might be speculated that if the participating mathematics teachers did not implement the NC activities as intended, they might have experienced insufficient outcomes for students' learning. This claim, however, was not fully supported by the current study since the participants' teaching practices were not observed.

Participating mathematics teachers viewed that the new curriculum decreased students' fear on mathematics. They addressed that the NC resulted in a change in students' views about mathematics since mathematics became interesting and fun. This new mathematics increased students' motivation in learning and participating. These findings confirmed the previous studies in which elementary teachers (grades 1-5) expressed that that the new curriculum increased student motivation positively and made them more socially active (Halat, 2007). Sixth grade mathematics teachers viewed that the new curriculum helped students develop positive attitudes towards mathematics (Erbas & Ulubay, 2008).

The addition of new topics made the new curriculum very intensive for the participants, especially for the mathematics teachers in this study. This situation might have caused teachers to have time management problems in the NC for grades 6-7-8. This finding and comment has been supported by the findings of Erbas and Ulubay (2008) in which many sixth grade mathematics teachers complained from intensiveness of the content. Teachers in their study also claimed that implementing the activities in the new curriculum took too much time. They believed that if the content of the curriculum was reduced, this problem would disappear.

The participating elementary teachers, especially the expert teachers, stated that the NC was prepared to be convenient for students' level. This result showed consistency with the studies of Bal (2008) and Bulut (2007). In her study, Bal (2008) found that elementary teachers (grades 1-3) had the views that the outcomes in the new elementary mathematics curriculum were expressed clearly and the content of the new curriculum was alleviated and prepared for students'

developmental levels. Also, fifth grade elementary teachers expressed that some topics that were abstract to the students were taken out in Bulut's (2007) study.

The organization of the content in the NC was criticized by the participants in this study. Especially mathematics teachers claimed that partition of units created problems. They stated that there was a problem in the transition between topics and thought that it was uncertain where subjects were finished. The new curriculum was prepared to emphasize the relationship of mathematical concepts with daily life, the connection of them both inner and interdisciplinary areas (MNE, 2005, MNE, 2006). Therefore these findings indicated that participating mathematics teachers did not understand the connection between the topics and the new curriculum intentions completely. The reason of this difficulty seemed as a result of not adopting the organization of the topics in the NC but continuing with the trends of the previous curriculum. This finding showed that teachers should be guided about the organization of the content and the main philosophy of the new elementary mathematics curriculum.

The participants, mainly the mathematics teachers viewed that conducting the activities in the NC required more time than allowed. This finding had also been addressed previously (Erbas & Ulubay, 2008). Curriculum load, students' level of prerequisite knowledge, and the level examination (SBS) seemed to be important concerns for the participating mathematics teachers and these factors impacted the ways participants implemented the NC. Furthermore, two elementary teachers who were teaching in multi-grade classrooms and who taught before expressed that implementation of the NC in multi-grade classrooms was difficult when time management is considered.

According to MNE (2005a), instead of the traditional assessment techniques, performance evaluation, portfolio, project, poster, self-evaluation, group and peer evaluation and etc. should be emphasized more in multi-grade classrooms. However, the participants claimed that they did not have the opportunity to implement performance tasks in classroom. In this regard, it seemed that multi-grade classrooms should be considered as a special case and certain alignments in the new assessment techniques should be made. Moreover, elementary teachers should be informed how performance tasks are implemented in the multi-grade classrooms.

Most of the mathematics teachers addressed the workload that performance tasks brought to students. They claimed that performance tasks were a burden for the students, since these tasks were assigned in each content area, not only in mathematics.

5.6 Needs

In this study, the participants mentioned negative views and challenges about the NC. There are many reasons for these views. The participants pointed out difficulties in carrying out activities, time management, assessment procedures, and using concrete materials. They addressed the lack of experience with using concrete materials and related instructional methods. In this respect, they claimed that training was necessary for the usage of instructional methods and using of concrete materials.

The participants also stated that time were not enough in order to implement the necessities of the new curriculum, confirming previous findings (Erbas & Ulubay, 2008). When they implemented the instructional activities, they could not solve many questions. Not implementing the instructional activities in order to solve more questions became a common practice. Yılmaz (2006) commented that fifth grade elementary teachers generally could not adapt the practices in the new curriculum and the content of the NC completely and couldn't overwhelm previous experiences.

The participants pointed out that crowded classrooms were not suitable to implement instructional activities, confirmed by a previous study (Bal, 2008). It was seen that elementary teachers did not have enough information about how instructional activities should be carried out and how planning should be done. Moreover, how the new curriculum should be implemented in crowded classrooms is an important question that should be answered. Ersoy (2006) also pointed out that teachers' guide book should especially provide guidance about how activities and practices could be implemented in crowded classrooms. These findings showed that the teachers needed more explicit guidance in implementing the NC requirements especially in crowded classrooms.

The participants also mentioned the difficulty in the implementation of the NC in multi-grade classrooms. This finding contradicted with the statements of

the Ministry. The Ministry of Education claimed that the most suitable schools to implement the NC were the schools with multi-grade classrooms since constructivist learning theory asserted that the students would construct the knowledge actively in these classrooms because students spend most of time by learning and studying by themselves (MNE, 2005a). This showed that the realities of the multi-grade classrooms were different than how they were considered by the Ministry and the teachers needed extensive guidance in teaching through the NC in multi-grade classrooms.

The participants addressed that when schools' physical facilities were not suitable, it was difficult to implement the NC. Participants pointed out the lack of materials such as manipulative and software CDs and that it was difficult to implement the NC when they lacked the necessary facilities, materials, and the technology, as confirmed by other Turkish studies (e.g., Kartallıoğlu, 2005; Yenilmez & Çakmak; 2007 Yılmaz, 2008). In Kartallıoğlu'(2005) study, and Yılmaz'(2008) study, elementary teachers (grades 1-5) also addressed that the materials and the schools' psychical facilities especially in terms of technology were not enough in order to implement new curriculum The major problem with the materials was the lack of information about how these materials should be used and the lack of sufficient number of concrete materials. The teachers commented that although there were concrete materials in appendices of the teachers' guide book, sample activities about how concrete materials should be used were not enough. They suggested that the classrooms should be equipped with technological devices and mathematics laboratories should be established (Yenilmez & Çakmak, 2007).

Briefly, it can be suggested that teachers needed less students in the classroom in order to implement the NC effectively. The curriculum studies about how to carry out instructional activities should be done according to the numbers of students in classrooms and multi-grade classrooms, and thus teachers should be informed about in this subject.

5.7 Teachers' suggestions

The participating teachers forecasted that the new elementary mathematics curriculum would be successful, but they stressed that new curriculum should be

improved continuously. While the participants complained about some of the missing or contradictory components during the implementation of the new curriculum, they expressed positive views about the success of the NC. Actually this belief, it can be speculated positively from the point of the view of the future of the new curriculum. In this regard, in order not to disappoint the teachers, MNE should perform its duty on providing the necessary support. The participants also advised to be supported by manipulative and software, establishment of mathematics laboratories, and effective seminars about the requirements of the NC. They suggested that village conditions should be seriously considered by MNE.

The participants also recommended an increase of the duration of mathematics lessons in order to implement measurement and assessment studies and instructional activities completely. They suggested that the consistency between curriculum and time should be provided. In Erbas and Ulubay's (2008) study, teachers complained about the shortage of class time to cover all the content objectives with activities suggested in the curriculum and to use various alternative assessment strategies. Erbas and Ulubay (2008) commented that curriculum developers and policy makers should seriously consider narrow the content and allow teachers and students more time to study with the concepts. However, Erbas and Ulubay (2008) commended that an increase in the duration of the mathematics lesson is unrealistic within the weekly program of 6–8 grades.

5.8 Conclusion

In this study, the participating teachers expressed positive views about instructional activities and approaches in the NC and their impact, teachers' and students' new roles, curriculum materials such as course book and work book, the content, student motivation, and projects, performance tasks ,and the SBS. They expressed that the new elementary mathematics curriculum would be successful in making students learn mathematics. On the other hand, the participants expressed their challenges and negative views about instructional activities, teachers' roles, lack of materials and physical facilities, the content, the implementations in multi-grade and crowded classrooms, time management, projects and performance tasks, the SBS, teachers' efficiency, and the support system. The participants

mostly learned how to implement the NC by trial and error. Therefore, they made suggestions for the improvement of the new curriculum including how the content of support should be, increase in the duration of mathematics lesson, and improvement of school physical facilities and curriculum materials.

One of the most important issues that the findings of this study raised was the applicability of the NC in small towns and rural settings. In these settings, teachers had problems during the implementation of the NC. These problems were related to lack of curriculum materials and resources, lack of the Ministry and peer support, and the applicability of projects and performance tasks in multi-grade classrooms. Teachers' views indicated that the new curriculum did not consider the local differences. Local resources might not always be sufficient in especially rural settings for the implementation of the NC. Therefore, this study provided information to the curriculum developers about the applicability of the NC in small towns and rural settings.

The findings of this study showed that the participating teachers reported that they adopted the new curriculum to a great extend. However, they had difficulty in changing their practices. There might be several reasons for this. First of all, although they said that they adopted the NC ideas, they might not be aware that they did not adopt practically. Teachers' claims showed that they still maintained old teaching practices probably because they believed that these experiences, such as the need for solving more questions in the mathematics lessons, were effective for students' learning. These tendencies were expected because there is always resistance to change when it comes to teaching practice (Cohen, 1990). However, there is not enough data in order to confirm this claim, because teachers were not observed in this study for their practices. Second reason is that although they adopted the NC, they had difficulties because of lack of adequate training, material, support, schools' psychical facilities, time, and because of crowded and multi-grade classrooms. Therefore, it can be speculated that although they adopted the NC, they could not implement the NC completely. It might be concluded that the participants had adapted their existing teaching practice to the requirements of the NC, instead of adopting it completely. That is, teachers might develop several hybrids of student-centered NC practices and teacher-centered previous curriculum practices in order to implement the NC,

since they might have believed that these practices would be effective, as documented by previous studies (Gipps, McCallum, & Brown, 1999). Therefore, within the limitations of participants' views, this study contributes to the literature about the teachers' views of the new elementary mathematics curriculum in Turkey with the conclusion that, although the participants adopted the NC conceptually, they did not realize the practices and tried to implement the NC by doing hybrid practices. The study showed that there is a need for more actual practice of NC requirements for teachers, before they implement it in the classrooms. Teachers' views found in this study showed that they would like to receive workshops about the NC practices, rather than presentations, in order to implement the NC effectively.

5.9 My learning as a researcher and a teacher

During my education, I learned that when students are mentally active, use concrete materials, and learn by doing, the learning becomes meaningful and permanent. I believe that the new elementary mathematics curriculum was based on these approaches. However, according to my observations, adopting the teaching of mathematical concepts based on these approaches will take time, because I think that leaving the old experiences will be difficult for teachers. It is possible that teaching based on old experiences is seen as an easy way for teachers. Also, as I observed seminars related to the new curriculum, in which both the trainer and the teachers were not serious and teachers wanted to go home. I don't believe that these types of seminars will be useful ever.

As an elementary mathematics teacher, I have similar concerns with the participants in this study. Since I worked in a village school, sometimes I could not implement some activities as I wished because of lack materials and inadequate physical facilities in my school. Also, I completely agree with the participants that time is not enough in order to perform the requirements of the NC. Similar to the participants' views, I want from curriculum developers to reduce the intensity of NC in order to decrease time management problems and also revise textbooks.

5.10 Recommendations for further researches

Results of this study offer some recommendations for further researches. These recommendations were presented in this section.

The interview and written responses to interview questions was used for data collection way in this study. A similar study can be conducted by both interviewing and observing mathematics lessons by video-recording in order to compare teachers' views expressed in the interviews and their practices in the mathematics lesson.

This study analyzed mainly teachers' views about the new elementary school mathematics curriculum. A similar study might be conducted by investigating the effects of the new curriculum on student achievement and teachers' concerns about learning mathematics. Moreover, no study has been found related to the level examination (SBS) and how actually the assessment procedures are implemented in the classrooms by the teachers. With the findings about the teachers' views about the SBS, this study constitutes a starting point for future studies.

This study was conducted only in the schools in a district. This study could be repeated in both city and village settings and the effects of certain factors might be compared in order to document the differences.

The current study was conducted with elementary teachers and mathematics teachers when the new curriculum was implemented only in 6^{th} and 7^{th} grades. Therefore, this study could be conducted with mathematics teachers by considering the changes in the 8^{th} grade mathematics curriculum.

REFERENCES

Anderson, R. S. (1998). Why talk about different ways to grade? The shift from traditional assessment to alternative assessment. *New Directions for Teaching and Learning, 74,* 5-16.

Babadoğan, C., & Olkun, S. (2006). Program development models and reform in Turkish elementary school mathematics curriculum. *International Journal for Mathematics Teaching and Learning.* Retrieved December 15, 2006 from http://www.cimt.plymouth.ac.uk/journal/default.htm.

Bal, P. (2008). *Yeni ilköğretim matematik öğretim programının öğretmen görüşleri açısından değerlendirilmesi* [The evaluation of new mathematics curriculum in terms of teachers' views]. *Adana Çukuova Üniversitesi Sosyal Bilimler Dergisi, 17*, 53-68.

Ball, D. L. (2001). Teaching, with respect to mathematics and students. In T. Wood, B. S. Nelson, & J. Warfield (Eds.), *Beyond classical pedagogy: Teaching elementary school mathematics* (pp. 11–22). Mahwah, NJ: Lawrence Erlbaum.

Bıkmaz, F. H. (2006). New elementary curricula and teachers. *Ankara University, Journal of Faculty of Educational Sciences, 39*, 99- 116.

Bulut, M. (2007). Curriculum reform in Turkey: A case of elementary school mathematics curriculum. *Eurasia Journal of Mathematics, Science & Technology Education*, 3, 203-212.

Bulut, S. (2004). İlköğretim programlarında yeni yaklaşımlar, matematik(1-5), *Bilim ve Aklın Aydınlığında Eğitim Dergisi*, 54-55.

Bulut, S., & Koç, Y. (2006).The new elementary school mathematics curriculum. *Çoluk Cocuk*", *61*, 27-32.

Cheng, M. H. (2006). Junior secondary science teachers' understanding and practice of alternative assessment in Hong Kong: Implications for teacher professional development. *Canadian Journal of Science, Mathematics and Technology Education, 6, 227*-243.

Christou, C., Eliophotou-Menon, M., & Philppou, G. (2004).Teachers' concerns regarding the adoption of a new mathematics curriculum: An application of CBAM. *Educational Studies in Mathematics, 57*,157- 176.

Cohen, D. (1990). A Revolution in one classroom: The case of Mrs. Oublier. *Educational Evaluation and Policy Analysis, 12*, 311-329.

Culbertson, L. D., & Wenfan, Y. (2003). Alternative assessment: Primary grade literacy teachers' attitudes and practices. *Paper presented at the annual meeting of the American Educational Research Association, April, 2003*.

Çakır, A. (2006*). İlkögretim dördüncü sınıf matematik ders kitapları ile ilgili ögretmen görüsleri* [The teacher opinions about the fourth grade mathematics textbooks in elementary schools]. Unpublished master's thesis, Eskişehir Osmangazi Üniversitesi, Eskişehir, Türkiye.

Drake, C. (2006). Turning points: Using teachers' mathematics life stories to understand the implementation of mathematics education reform. *Journal of Mathematics Teacher Education*, *9,* 579–608.

Drake, C., & Sherin M. G. (2006). Practicing Change: Curriculum adaptation and teacher narrative in the context of mathematics education reform. *Curriculum Inquiry*, *36*, 154-187.

Eğitim Reformu Girişimi (2005). Yeni öğretim programlarını inceleme ve değerlendirme raporu. Retrieved 8 March 2007 from http://www.erg.sabanciuniv.edu.

Erbas, K., & Ulubay, M. (2008). Implementation of the new Turkish elementary education mathematics curriculum in the sixth grade: A survey of teachers' views. *The New Educational Review, 16*, 51-75.

Erdal, H. (2007). *İlköğretim matematik programının ölçme değerlendirme kısmının incelenmesi (Afyonkarahisar ili örneği)* [Examination of the measurement and evaluation parts of the curriculum for elementary schools in the Afyonkarahisar province]. Unpublished Master's thesis, Afyon Kocatepe University, Afyon, Turkey.

Ersoy, A. (2007). The opinions of parents on the implications of the elementary school (1-5 grades) curriculum. *Educational Sciences: Theory & Practice, 7*, 753-763.

Ersoy, Y., 2006. *İlköğretim matematik öğretim programındaki yenilikler-I: Amaç, içerik ve kazanımlar* [The innovations in the mathematics curriculum for elementary schools-I: Aims, content and acquirements]. *İlköğretim Online 5*, 30–44. Available from: http://ilkogretimonline.org.tr/vol5say1/v5s1m4.pdf. Access date: September 21, 2007.

Franke, L., & Kazemi, E. (2001). Learning to teach mathematics: Focus on student thinking. *Theory into Practice*, *40*, 102-109.

Gipps, C., McCallum, B., & Brown, M., (1999). Elementary teachers' beliefs about teaching and learning. *The Curriculum Journal 10*, 123-134.

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report, 8*, 597-607.

Gömleksiz, M. N., & Bulut, İ. (2007). An evaluation of the effectiveness of the new elementary school mathematics curriculum in practice. *Educational Sciences: Theory & Practice,* 7(1), 81–94.

Günay, Z. (2006). 2005–2006 öğretim yılında uygulamaya başlanan ilköğretim programlarına yönelik öğretmen görüşlerinin çeşitli değişkenler açısından karşılaştırmalı olarak incelenmesi. Unpublished master's thesis, Dokuz Eylül Üniversitesi, İzmir, Türkiye.

Halat, E. (2007). Yeni ilköğretim matematik programı (1–5) ile ilgili sınıf öğretmenlerinin görüşleri. *Afyon Kocatepe Üniversitesi Sosyal Bilimler Dergisi*, *9*, 63–88.

Handal, B., & Herrington, A., (2003). Mathematics teachers' beliefs and curriculum reform. *Mathematics Education Research Journal 15*, 59–69.

Kalin, J., & Zuljan, M.V. (2007). Teacher perceptions of the goals of effective school reform and their own role in it. *Educational Studies*, *33*, 163-175.

Kartallıoğlu, F., 2005. Yeni ilköğretim programlarının uygulandığı pilot okullardaki öğretmenlerin yeni program ve pilot çalışmalar hakkındaki görüşleri [The opinions of the teachers working in the piloting schools about the new elementary school curricula and pilot studies]. Unpublished Master's thesis, Abant Izzet Baysal University, Bolu, Turkey.

Kaya, K. (2005).Birleştirilmiş sınıflar ile bağımsız sınıflarda ilk okuma yazma öğretiminde karşılaşılan sorunların karşılaştırmalı incelemesi. *Kayseri Erciyes Üniversitesi, Sosyal Bilimler Enstitüsü Dergisi, 2, 1–26.*

Koç, Y., Işıksal, M., & Bulut, S. (2007). Elementary school curriculum reform in Turkey. *International Education Journal*, *8*, 30-39.

Korkmaz, İ. (2006). Yeni ilköğretim birinci sınıf programının öğretmenler tarafından değerlendirilmesi. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi. 16,* 419–431.

Kyriakides, L., Charalambous, C., Philippou, G., & Campbell, R. J. (2006). Illuminating reform evaluation studies through incorporating teacher effectiveness research: A case study in mathematics. *School Effectiveness and School Improvement*, *17*, 3 – 32.

Manouchehri, A., & Goodman, T. (2001). Mathematics curriculum reform and teachers: Understanding the connections. *The Journal of Educational Research*, *92*, 27-41.

McLaughlin, M.W. (1987). Learning from experience: Lessons from policy implementation. *Educational Evaluation and Policy Analysis, 9*, 171-178.

Memon, M. (1997). Curriculum change in Pakistan: An alternative model of change. *Curriculum and Teaching, 12*, 55-63.

Miles, M.B. & Huberman, A.M.(1994). *Qualitative data analysis: An expanded sourcebook (2nd ed.).*Thousand Oaks: Sage.

Ministry of National Education [MNE] (2005). *İlköğretim matematik dersi (1-5.Sınıflar) öğretimi programı*. [Elementary school mathematics curriculum and guide (grades 1-5)]. Ankara, Turkey: Author.

Ministry of National Education [MNE] (2005a). İlköğretim 1-5 sınıf programları tanıtım kitapçığı. Ankara, Turkey.

Ministry of National Education [MNE] (2006). *İlköğretim matematik dersi (6-8.Sınıflar) öğretimi programı*. [Elementary school mathematics curriculum and guide (grades 6-8)] Ankara, Turkey: Author.

Ministry of National Education [MNE] (2007). Ölçme değerlendirmede tereddütler edilen hususlar. İlköğretim Genel Müdürlüğü Genelgesi.

Ministry of National Education [MNE] (2009). *64 soruda ortaöğretime geçiş sistemi*. Retrieved January 30, 2009, from http://oges.meb.gov.tr/docs/64_soru.pdf

Orbeyi, S., & Güven, B. (2008). Teachers' perceptions related to the evaluation component of the education program of elementary school education mathematics studies. *Journal of Theory and Practice in Education*, *4*, 133-147.

Orrill, C. H., & Anthony, H. G. (2003). Implementing reform curriculum: A case of who's in charge. *Paper presented at the American Educational Research Association's Annual Meeting*, April, 2003.

Patton, M. Q. (2002). *Qualitative research and evaluation methods (3rd edition).* Thousand Oaks, California: Sage Publications.

Peresini, D. D. (1998).The portrayal of parents in the school mathematics reform literature: Locating the context for parental involvement. *Journal for Research in Mathematics Education*, *29*, 555- 582.

Pligge, M.A., Kent, L. B., & Spence, M. S. (2000). *Examining teacher change within the context to mathematics curriculum reform: Views from middle school teachers*. (ERIC Document Reproduction Service No: ED443726).

Ponte, J.P., Matos, J.F., Guimarães, H. M., Leal, L. C., & Canavarro, A.P. (1994).Teachers' and students' views and attitudes towards a new mathematics curriculum: A case study. *Educational Studies in Mathematics, 26, 347-365.*

Ryan, T. G., & Joong, P. (2005). Teachers' and students' perception of the nature and impact of large-scale reforms. *Canadian Journal of Educational Administration and Policy, 38.* Retrieved October 30, 2006, from http://www.umanitoba.ca/publications/cjeap/articles/ryan_joong.html

Soycan, S. B., 2006. *2005 Yılı ilköğretim 5. sınıf matematik programının değerlendirilmesi* [Evaluation of the 2005 Fifth grade mathematics curriculum]. Unpublished master's thesis, Uludağ University, Bursa, Turkey.

Toptaş, V. (2008). An Examination of the Teaching – Learning Process and Teaching Materials used in the Instruction of Geometry Sub-Learning Fields in a First Grade Classroom. *Ankara University, Journal of Faculty of Educational Sciences, 41, 299-323.*

Uçar, N. (2007). Elementary school teachers' views about their implementation of the assessment techniques recommended in the new mathematics curriculum. Unpublished doctoral dissertation, Orta Doğu Teknik Üniversitesi, Ankara, Turkey.

Watt, H. M.G. (2005). Attitudes to the use of alternative assessment methods in mathematics: A study with secondary mathematics teachers in Sydney, Australia. *Educational Studies in Mathematics, 58,* 21-44.

Yapıcı, M., & Leblebiciler, N. H. (2007).Teachers' views with regard to new elementary school curriculum. *Elementary Education Online*, *6*, 480-490.

Yenilmez, K., & Çakmak, G. (2007). *Yenilenen ilköğretim matematik programındaki alt öğrenme alanlarının öğretiminde karşılaşılan zorluklar* [Difficulties in teaching sub-learning domains in the new elementary mathematics curriculum]. *e-Journal of New World Sciences Academy Social Sciences*, *2,* 167-178.

Yılmaz, T. (2006). *Yenilenen ilköğretim matematik programı hakkında öğretmen görüşleri (Sakarya ili örneği).* [Teachers' views about the new elementary mathematics curriculum.[The case of Sakarya Province]. Unpublished master's thesis, Sakarya Üniverstesi, Sakarya, Turkey.

APPENDICES

APENDIX A

The permission got from Ministry of National Education

T.C.
ALACA KAYMAKAMLIĞI
İlçe Milli Eğitim Müdürlüğü

SAYI :B.08.4.MEM.4.19.01.01./ 153 11 -01- 2008
KONU :Tez Uygulanması.

..... MÜDÜRLÜĞÜNE
ALACA

İlgi: Milli Eğitim Bakanlığına Bağlı Okul ve Kurumlarda Yapılacak Araştırma ve Araştırma Desteğine Yönelik İzin ve Uygulama Yönergesi.

Orta Doğu Teknik Üniversitesi Fen ve Matematik Eğitimi Anabilim Dalı Yüksek Lisans Programı Öğrencisi Özkan KELEŞ'in 2007-2008 eğitim-öğretim yılı güz ve bahar döneminde yüksek lisans tezi kapsamında "Yeni İlköğretim Matematik Dersi Programı Hakkında Öğretmen Görüşleri" konulu tezi ilgi yönerge kapsamında komisyonumuz tarafından incelenmiş olup uygulanmasında sakınca görülmemiştir.

Söz konusu tezin çalışma takviminde belirtilen aylarda İlçenize bağlı ekli listede isimleri belirtilen 27 resmi ilköğretim okullarında görev yapan toplam 20 sınıf ve matematik öğretmenine uygulanması ile ilgili İl Makamının 04/01/2008 tarih ve 228 sayılı onayı ilişikte gönderilmiştir.

Bilgilerinizi, adı geçen tarafından uygulanacak olan tezin ilgi yönergenin 5/m ve 13/d-g maddelerini yerine getirmek şartı ile uygulanmasını önemle rica ederim

Serçuk GÜNEŞ
İlçe Milli Eğitim Müdürü

EKLER :
1- İl Onayı (1 Adet)
2- Okul İsim Listesi (1 Adet)
3- Çalışma Takvimi (1 Adet)

DAĞITIM :
Okul İsim Listesinde Olan Okullar

APPENDIX B

Interview protocol

Sevgili meslektaşımız,
Ben Orta Doğu Teknik Üniversitesi İlköğretim ve Matematik ve Fen Eğitimi bölümünde Yüksek Lisans yapmaktayım. Yeni İlköğretim Matematik Programı hakkında görüşlerinizi öğrenmek istiyorum. İstediğiniz zaman görüşmeyi yarıda kesebilir, beğenmediğiniz sorular hakkında görüş belirtmeyebilirsiniz. Kişisel bilgileriniz ve yeni program hakkında görüşleriniz kesinlikle gizli tutulacaktır.

Teşekkür ederim.

Özkan KELEŞ
ODTÜ Yüksek Lisans Öğrencisi

GÖRÜŞME SORULARI

Kişisel Bilgiler

Branşınız:
Kaç yıldır öğretmenlik yapıyorsunuz?
Hangi üniversiteden mezunsunuz?
Yaşınız:

1. Matematik öğretiminin amacı nedir? Niçin matematik öğretiyoruz?
2. Bir matematik dersinizi anlatabilirsiniz.
   a) Matematiği nasıl öğretmeye çalışıyorsunuz?
   b)Yeni program öğretim tarzınızı nasıl etkiledi? Eskiden nasıl anlatıyordunuz?
   c) Öğrencinin rolü ve öğretmenin rolü nedir?
   ç) Öğrencilerin öğrenip öğrenmediğini nasıl anlıyorsunuz?
   d) Dersi nasıl bitiriyorsunuz?
3. Yeni matematik programı ile ilgili genel görüşleriniz nelerdir?
   a) Öğretmen program kitabını incelediniz mi?
   b) Neden bir değişikliğe gerek duyuldu?
4. Yeni matematik programına göre hazırlanmış öğretmen kılavuzu, ders ve çalışma kitapları hakkında ne düşünüyorsunuz?
   a) Öğretmen kılavuzunda ve ders kitabında yer alan etkinlikler öğrencilerin matematik konusunu kolay kavraması sağlıyor mu?
   b) Etkinlikler öğrencilerin matematiği anlamlı bir şekilde öğrenmesini sağlıyor mu?
   c) Etkinliklerin uygulamasında kılavuzda belirtilen zaman yeterli mi?
   d) Etkinlikleri düzenli bir şekilde uygulayabiliyor musunuz?
   e) Bütün etkinlikleri yapmaya gerek var mı?
   f) Öğretmen kılavuzunu kolay takip edebiliyor musunuz?
5. Proje ve performans görevi hakkında ne düşünüyorsunuz?
   a) Öğrencilere katkısı olduğunu düşünüyor musunuz?
   b) Siz hangi amaçla kullanıyorsunuz?
   c) Nasıl notlandırıyorsunuz? Önerileriniz neler?
6. Yeni matematik programı, öğrencilerin derse ve okula karşı ilgilerinde önemli bir değişikliğe neden oldu mu? Örnek verebilir misiniz?

7. Yeni matematik programındaki matematik bilgisinin yeterliliği hakkında ne düşünüyorsunuz?

a) Yeni programda matematik bilgisi yeterli mi, değilse hangi konular eklenmeli? Örnek verebilir misiniz?

8. Yeni matematik programının uygulanmasına kendinizi yeterli hissediyor musunuz?

a) Yeni programda bilmediğiniz ya da dersi işlerken öğrendiğiniz matematik konuları var mı?

b) Yeni programda örüntü, dönüşüm geometrisi, tahmin ve benzeri yeni eklenen matematik konuları hakkında ne düşünüyorsunuz?

c) Origami yapmayı biliyor musunuz?

ç) Yeni programda belirtilen matematik dersine ait somut materyallerin hepsinin nasıl kullanılacağını biliyor musunuz?

d) Materyallerin kullanılmasıyla ilgili eğitim aldınız mı?

9. Yeni matematik programının uygulanmasında güçlükler yaşıyor musunuz? Varsa bu güçlüklere örnekler verebilir misiniz?

a) Yeni programı ne tür değişiklikler yaparak uyguluyorsunuz? Neleri tam uyguluyorsunuz? Neleri tam uygulayamıyorsunuz?

b) Programda olmasına rağmen nelere yeterine zaman ayıramıyorsunuz?

c) SBS sınavları hakkında ne düşünüyorsunuz? Yeni programla ilişkisi yönünden değerlendirir misiniz?

10. Yeni matematik programının uygulanmasında yeterli destek alabiliyor musunuz?

a) Yeni program hakkında yapılan tanıtım seminerlerinin yeterli olduğunu düşünüyor musunuz?

b) Okul yönetiminden, öğretmenlerden ve velilerden yeterli destek alabiliyor musunuz? Veliler bu programa alışabildiler mi?

11. Yeni matematik programının başarılı olacağına inanıyor musunuz?

12. Bu programı geliştiren insanlara bir mesajınız var mı?