Hacettepe Üniversitesi Eğitim Fakültesi Dergisi (H. U. Journal of Education) 28(2), 152-165 [2013]

Teachers' Reflections on the Implementation of the New Elementary School Mathematics Curriculum in Turkey

Yeni İlköğretim Matematik Programı Hakkında Öğretmenlerin Görüş ve Değerlendirmeleri

Ali ERASLAN*

ABSTRACT: This study examines Turkish mathematics teachers' reflections on the implementation of the new elementary mathematics curriculum for grades 6-8 in a pilot school. For this aim, three mathematics teachers during the fall semester of 2007 were regularly observed in their classrooms and then interviewed at the end. The data collected from the interviews and observations revealed that teachers were in favor of the new mathematics curriculum; however, they mentioned a lack of initial training and asked for an ongoing in-service training at the school level. They also claimed some problems encountered in practice: (1) impediments to carry out activities in the class (2) a lack of sufficient knowledge on using alternative assessments, (3) a lack of parental support and involvement, and (4) interferences caused by national norm-referenced tests.

Keywords: curriculum reform, elementary school mathematics, in-service teacher

ÖZ: Bu nitel araştırmanın amacı yeni 6-8. sınıf ilköğretim matematik programı hakkında öğretmenlerin görüş ve düşüncelerini ortaya koymaktır. Bu amaçla bir pilot okulda çalışan üç matematik öğretmeni dönem boyunca kendi matematik sınıflarında düzenli olarak gözlemlenmiş ve dönemin sonunda kendileriyle birer saatlik yarı-yapılandırılmış görüşmeler yapılmıştır. Toplanan verilerin içerik analizi sonucunda, öğretmenler yeni matematik programı hakkında olumlu yönde görüş bildirirken diğer taraftan hizmet içi eğitimin yetersizliğini vurgulamış ve bu konuda daha sonra da herhangi bir tamamlayıcı eğitim almadıklarını ifade etmişlerdir. Ayrıca uygulama sırasında karşılaştıkları bazı problemleri şu şekilde dile getirmişlerdir: sınıf mevcudunun fazla olması, programın gerektirdiği materyallerin yetersizliği, tüm programı bitirme noktasında zaman yetersizliği, alternatif değerlendirme metotlarının kullanımı hakkında bilgi yetersizliği, yeni programa aile ilgisi ve desteğinin azlığı ve sene sonu uygulanan merkezi sınavların programa negatif etkisi.

Anahtar Sözcükler: matematik programı, reform, ilköğretim matematik, öğretmen görüşleri

1. INTRODUCTION

Over the last twenty years, many countries around the world have undertaken the process of massive curricular changes in schools, especially at the elementary and secondary levels. Various reasons prompt this development: dissatisfaction with previous curricula, poor performance of students as indicated by major international studies, the wish to improve the negative image of mathematics and science, and the call for more scientific and numerical literacy for all citizens (Bills & Husbands, 2005; Hanley & Darby, 2006; de Jong, 2004). The reform movements often coincide with new perspectives on teaching, for example, teaching strategies related to constructivist views on knowledge acquisition (e.g., active learning and cooperative learning), technology-assisted instruction, and the use of manipulatives and authentic tasks. For many teachers, implementation of all these innovations usually requires important changes in their instructional practices. They are expected to acquire sufficient knowledge of the new curricula's content and to develop appropriate competence to teach in new ways other than the traditional ones.

* Assoc. Prof., Ondokuzmayis University, Faculty of Education, Department of Elementary Mathematics Education, Samsun- Turkey, aeraslan@omu.edu.tr.

Curriculum reform literature highlights a number of factors that impact implementation of the new instructional objectives. Among the most frequently cited factors which create difficulty for implementing curriculum innovation in the classroom are teachers' beliefs about change, their training backgrounds, lack of professional support, the influence of new textbooks, as well as other variables such as large class sizes and insufficient, applicable materials. Researchers studying report the existence of these factors despite varying cultural contexts, including Turkey (Bulut, 2007; Gomleksiz & Bulut, 2007), China (Huang, 2004; Zhu, 2007), the Netherlands (de Lange, 1996), the UK (Wake, Haworth & Nicholson, 2004), the US (Desimone et al., 2005), Ghana (Mereku, 2004), Iran (Gooya, 2007), and South Africa context (Jita & Vandeyar, 2006). In Turkey research studies mostly using Likert-type rating scales reported that mathematics teachers: (1) favor the program with respect to its content (Aksu, 2008; Keles, 2009; Duru & Korkmaz, 2010), (2) lack adequate training and support (Halat, 2007; Keles, 2009; Birgin, Tutak & Turkdogan, 2009), and (3) express challenges in teaching due to the lack of materials, physical facilities, and time (Halat, 2007; Aksu, 2008; Keles, 2009, Duru & Korkmaz, 2010).

Studies of innovations in school curricula have shown that teachers' beliefs and understandings of the proposed changes have a significant role in the implementation of reform ideas (Carless, 1998; Thompson, 1984; Vandenberghe, 2002). Thus, this current study intends to examine mathematics teachers' reflections as they begin to adapt their practices in response to the demands of the new elementary mathematics curriculum. This study is significant because it has the potential to contribute to the literature of curriculum development as reflective practice of mathematics teachers. However, to be able to better understand the new changes in the mathematics curriculum in Turkey, a glance at the educational system in this country including an overview of the former and the current mathematics curriculum is necessary. This article, then, continues with sections dedicated to methodology and research findings.

1.1. A Glance at the Educational System in Turkey

In Turkey, the Ministry of National Education [MNE] centrally governs the schools. The MNE is responsible for making all policy decisions, developing and revising educational programs, and monitoring program implementation throughout the country. The previous educational system consisted of eight years of elementary, increased from five to eight years in 1997, four years of secondary, extended from three to four years in 2005, and four years of university education. Recently the new system of 4+4+4 has been implemented on April 2012, this system brings some changes on school year, compulsory education and starting age for first year of school. These are as follows (ERG, 2012): (a) the eight-year elementary schools are divided into two sections including four-year primary and four-year middle school. Middle schools are also divided into two: middle schools and Islamic middle schools, (b) the compulsory education is extended to 12 years from the previous 8 years, (c) 72-months-old requirement to enroll in primary school is reduced to 66-months and children can also start primary school at the age of five (60-months) based on the demand of their parents, and (d) 5^{th} grade primary students can chose elective courses as much as eight hours a week in the areas of foreign language, sport and art, Quran and Muhammad's life, science and mathematics. The twelve years of schooling are compulsory and free of charge in state schools. At the end of the middle school education, students have to take the Student Selection Examination [SSE] for high schools; success allows students to enter to a relatively few quality educational institutions at the high school level. The SSE is a standardized test measuring verbal and mathematical reasoning abilities. It is a very competitive nation-wide exam because of the limited number of available places in the more prestigious high schools. Students who do not attain acceptance in the better schools receive guidance to choose one of the two main paths for secondary education: a general high school, which prepares them for institutions of higher education, or a vocational high school, which

provides specialized education. The Council of Higher Education (CHE), which oversees the administrative and academic activities of the universities, and coordinates the universities' activities with other government agencies, governs all post-secondary programs defined as higher education (Yıldırım & Ok, 2002). Admission to higher education is based on a centralized, nation-wide examination administered once a year by the Student Selection and Placement Center affiliated to the CHE.

In the last two decades Turkey's education system has undergone some development and improvement efforts; however, the core educational practices, to a great extent, remain unchanged (Aksit, 2007). Results of international comparative studies, such as the Third International Mathematics and Science Study (TIMSS, 1999), the Progress in International Reading Literacy Study (PIRLS, 2001), and the Programme for International Student Assessment (PISA, 2006; OECD, 2004) have shown that Turkish students did not perform well in mathematics, science, and reading at the elementary school level. The students ranked below the international average among participated nations. These indicators forced the MNE to make a substantial change in the whole elementary school curriculum for grades 1-5. The modifications involve the subject domains of mathematics, science, social science, and Turkish. The basic idea behind these curricula reforms is to change the curriculum from a subject-centered model to a student-centered one and change the pedagogies from a behaviorist approach to a constructivist approach (Babadogan & Olkun, 2006). The new elementary curriculum, initially developed and piloted in 120 schools in nine cities in 2004-2005, underwent revisions the following academic year, followed by full implementation throughout the country. The purpose of the curriculum reform is to change the focus, delivery, and content of the entire nationally mandated curriculum. The main objectives of this reform curriculum are (Aksit, 2007; BOE, 2005):

- to reduce the amount of content and number of concepts
- to arrange the units thematically
- to develop nine core competencies across the curriculum
- to move from a teacher-centered didactic model to a student-centered constructivist model
- to incorporate information communications technologies into instruction
- to monitor student progress through formative assessment
- to move away from traditional assessment of recall, and introduce authentic assessment
- to establish a system of student representation, and engage students in community work

In the second stage, a new elementary mathematics curriculum for grades 6-8 has been developed and gradually implemented year by year in pilot schools since 2005. This process, completed in June 2008, instituted the reformed curriculum in all grades, 1-8, in elementary schools for the succeeding semester. The subsequent stage involves designing a new curriculum for the new four-year high school, the ninth grade of which is a common year for general and vocational high school students (BOE, 2005). In line with the new system of 4+4+4, updated primary mathematics curriculum for grades 1-4 will be fully implemented in the 2014-2015 academic year; on the other hand, updated middle school mathematic curriculum for grades 5-8 will be gradually implemented starting with 5^{th} grade in 2013-2014 and the process will be completed with 8^{th} grade in 2016-2017 (TTK, 2013).

1.2. The Former Mathematics Curriculum

From the traditional perspective, teachers are authorities who tell students what to do and how to do it. The teacher introduces new topics and follow-up examples, and then students practice with provided, similar examples. The role of the teachers is to transfer knowledge to

students who are passive receivers in the learning process. Mathematics, considered to be algorithms or a set of rules for solving problems (Berberoglu et al., 2003), places emphasis on the learning mathematics by applying and practicing mathematical rules many times with familiar problems. Thus, the emphasis is on a stepwise approach, memorization, and learning rules.

1.3. The Current Mathematics Curriculum

The new mathematics curriculum forms from the principle of "every child is able to learn mathematics" (BOE, 2005, p.41). The concept of learning, based on the constructivist approach, accounts students' differing abilities, learning styles, needs, and interests (Koc, Isiksal, & Bulut, 2007) and places students at the center of instruction as active constructors of knowledge, while teachers, in this process, act as guides or facilitators who focuses on student learning rather than content delivery (BOE, 2005). More emphasis accrues to process evaluation by means of projects, portfolios, and checklists rather than product evaluation (Babadogan & Olkun, 2006).

The vision of the reformed curriculum is that "students are able to use the mathematics in their lives, solve the problems, share their solutions and ideas, and enjoy learning mathematics" (BOE, 2005, p.41). In this perspective, constructive pedagogies such as active learning, cooperative learning, use of manipulatives, and the use of authentic tasks become the key components of instruction (Babadogan & Olkun, 2006). The applicability of knowledge in different situations and higher-order abilities such as critical thinking, problem-solving and reflective thinking are the main focus in learning and teaching mathematics (Koc, Isiksal, & Bulut, 2007). A summary of the major differences between the former and the current elementary mathematics curriculum in Turkey (BOE, 2005) are:

The current curriculum:

- follows a conceptual approach in order for students to be able to understand and make abstractions of mathematical ideas by using their own experiences and intuition;
- emphasizes the need for students to play an active role in the learning process;
- enables students to reveal their individual differences and abilities by means of projects and authentic assignments;
- aims to create an environment where students can do research, make discoveries, solve problems and share their ideas;
- enables students to develop psychomotor abilities by using appropriate materials at activities;
- aims to provide a meaningful mathematics with flexible activities that students can use it in different situations in which they live.

To be successful in the implementation of the updated elementary mathematics curriculum, an essential element is to reexamine it on a regular basis and identify its weaknesses and strengths from the perspectives of teachers who have directly applied it in their classrooms. In this respect, little research has concerned teachers' views of the new mathematics curriculum in Turkey (Bulut, 2007; Gomleksiz & Bulut, 2007). Both these previous studies, for only grades 1-5, examined the views of teachers on the implementation of the new mathematics curriculum. The present study addresses the assessment need by investigating mathematics teachers' views of the new elementary mathematics curriculum for grades 6-8. This goal requires considering the aspects of the new curriculum: (1) underlying philosophy, (2) strategies used in teaching, (3) alternative assessment techniques, (4) new roles of teachers and students, (5) strengths and weaknesses, and (6) support from surrounding community.

2. METHOD

The present study employs qualitative methodologies in order to obtain reflections of teachers' views on the implementation of the new mathematics curriculum. For this aim, data arises from observations of teachers' classroom instructions and semi-structured interviews. The observations, which took place three times during the semester for each teacher, intend to determine how each teacher developed a lesson from beginning to end. This includes the teacher' teaching strategies, classroom organizations, assessment techniques, use of materials and textbooks, and social contexts created for the presentation of the lesson. The classes were observed by the researcher for about 40 minutes each session. The observations included recording and collecting extensive field notes and written artifacts such as worksheets and assignments the students completed. In addition, during the observations period, short informal conversations occurred with the teachers during lunchtime and breaks. These interviews allowed development of a broader picture of the teachers and their practices.

The semi-structured, individual interviews, conducted in a pilot school in Samsun in Turkey, were approximately an hour in length and involved three mathematics teachers, pseudonymously named Arda, Bulent and Ceyda. Arda and Bulent are male teachers who instruct sixth, seventh and eighth grades, while Ceyda is a female teacher who instructs seventh and eighth grade classes. Their teaching experiences ranged from 26 to 28 years. According to Entwistle et al. (2000), teachers with a significant amount of teaching experience are the best position to evaluate, judge, and articulate their instructional practices. The school in the study is one of five pilot schools in which the new mathematics curriculum has been gradually implemented, year–by-year since 2005, in the grades six through eight.

All three mathematics teachers in this school voluntarily participated and were among those initially trained in the reformed curriculum by teacher-educators in an university. This teacher training course lasted fourteen days and included aspects of the new curriculum: the philosophy framed by the constructivist perspective, topics to be covered, guide books and manipulative materials to be used, in-class activities to be done, and alternative assessments to be used. During the interviews, the teachers provided their perspectives of the differences between the old and new curricula in terms of the philosophy, teaching strategies, alternative assessment techniques, and the roles of teachers and students. They also responded to questions focusing on the problems they faced and the support they received from the surrounding community during the implementation of the new curriculum. All interviews, which took place in a quiet room at the end of the fall semester of 2007, were audio-taped and then transcribed. Data analysis sought patterns and themes in relation to each aspect of the new curriculum (Miles & Huberman, 1994). In addition to the researcher, two other colleagues examined the coded and categorized data in order to ensure the reliability of coding. After modifications were made where there were disagreements, the results of independent coding indicated a very high agreement between the researchers. The findings, presented within the framework established by the aspects of the new mathematics curriculum, use direct quotations from the teachers.

3. FINDINGS

For the new mathematics curriculum, the following themes, identified by all teachers of the study, arise from analyses of the data.

3.1. Tendency to Favor the New Mathematics Curriculum

All of the mathematics teachers in this study were in favor of the new mathematics curriculum. They expressed enjoyment from practicing the new mathematics curriculum because they thought that it makes the teaching and learning enjoyable and meaningful by increasing

students' involvement and engagement with their lessons, as well as helping students make connections between the subject and their real lives. Arda articulated these points:

> *The main thing I like is that now mathematics is visual and related to students' daily lives. This is something in their lives not just something in the book… Students are active in the learning process; they are asking questions, doing activities, investigating and measuring things. They are learning as doing, no more memorizing things... I see how much they enjoy it. Now learning is not only easy but also so much fun for my students.*

Compared with previous years of teaching mathematics, Bulent thinks that the new mathematics program gives him a new role and that makes his job easier:

> *I have been teaching mathematics for 26 years but I realized that what I did was the most difficult part of the teaching, what I was trying to succeed at was the most difficult because in the classroom I was doing everything for myself. Now I am somehow a guide to help them to explore, challenge them, and let them engage in activities to find the answer to their questions…Sharing responsibility with students makes teaching easier for me.*

Similarly, Ceyda stated, "I see that students learn better when they are active and engaged with the lesson and I am very happy about that." As indicated by these quotations, the teachers have positive attitudes toward the new mathematics curriculum framed by a student-centered and constructivist way of teaching in the classroom (Gomleksiz & Bulut, 2007; Aksu, 2008; Keles, 2009; Duru & Korkmaz, 2010). During the classroom observations, all teachers began their lessons with real life examples with much enthusiasm and sustain this momentum throughout the entire period of the lesson.

3.2. Lack of Teachers' Initial Training and the Need for an Ongoing In-service Training

All three teachers in this study had a common view that they did not have enough training prior to full implementation of the new mathematics curriculum. They expressed their concern for having limited information about the reformed curricula and its components. Ceyda claimed this:

> *I only had two weeks training. It was in the Middle East Technical University in Ankara. It was about the philosophical approach underlying the new program, topics to be covered, activities to be applied, new textbooks to be used, and a couple of sample lesson and activities. To me, it was too short and everything was too fast to figure out all the ways of the new program.*

Emphasizing the importance of having a longer and effective, ongoing professional support, Arda said:

> *The biggest problem is the lack of training at the beginning. We need a longer and most importantly continuous training through workshops, not just one-shot training… in the program there are many things to learn and practice; new teaching methods, new activities, new assessments, and new materials.*

Similar to Ceyda and Arda, both of whom expressed their concerns about lack of initial training and asked for a continuous professional support in a longer period, Bulent claimed that "I feel alone in this process. I do not think everything will work itself out without any help. There is no information sharing, no support, no control, and nobody you can ask a question". These explications indicate that the teachers seek support and guidance to make decisions about the curriculum they teach, the choice of instructional strategies and activities they use, and the judgments made about the new alternatives assessments. Some studies also reported data for insufficient initial training and short implementation (Malderez & Wedell, 2007; Gooya, 2007; Jita & Vandeyar, 2006; Halat, 2007; Keles, 2009; Birgin, Tutak & Turkdogan, 2009).

3.3. Impediments to Completing Activities in the Class

The teachers claimed the following elements as difficulties or challenges to completing activities in the classroom: large class size, lack of curriculum materials, and time constraints for covering curriculum content. Arda articulated some of these points:

> *It is very difficult to do any activity with 40 students in a small classroom; take the scissor, draw the line, cut the paper and then tape it. It gets a little loud and creates chaos in the class…It [doing an activity] takes too much time, after that it is hard to catch up with the curriculum.*

To be able to create extra time for covering curriculum content requirements, Ceyda assigned classroom activities as a homework:

> *To be able to do an activity, the ideal class has to have 20 or 25 students, but now I have more than 40 students… I generally choose not to do an activity or group work in the class; instead, I give some activities to students as homework. In this way, I can have more time to cover the curriculum.*

In terms of emphasizing lack of teaching materials, Bulent said, "We have limited number of materials in the school; for instance, you may be out of materials if another teacher gets the materials first." This shows that in order to implement lessons as intended, considerable investments are necessary from the school's infrastructure (Bulut, 2007; Keles, 2009; Duru & Korkmaz, 2010). Classroom observations also indicated that teachers in many cases skipped activities and collaborative group work and allowed students to work individually at their seats in order to save time for instruction.

3.4. Lack of Sufficient Knowledge on Using Alternative Assessments

All three teachers suggested a lack of information about the new assessment techniques in terms of their design and use as well as their incorporation into instruction. With regard to evaluating students' performance with the new assessment tools, Bulent said:

> *One of the biggest problems with this program is the assessment and evaluation. In the seminar in Ankara, we were not well-informed about it. The guy who was expert on this issue was not able to explain exactly what projects and portfolios were. Now I really do not know how I am going to use them in the class. So, I am following the old program as*

an assessment. For instance, I use and grade student notebooks as performance assessment.

Similarly, Ceyda indicated that:

The biggest problem I have is the assessment issue. The whole program was redesigned but I am doing the same things as I do previously for the student assessment. When I asked for more information about it, they just sent us some paper documents, but I do not think that works for me.

As opposed to the other two, Arda tried to assign the projects from the textbook, but he said:

Students did not do the way I wanted, they do not follow the project guidelines I gave them; they just get on the internet, copy and paste it. It is like they do it as they are used to doing their semester homework. So I graded them according to the old system.

The above excerpts and classroom observations indicate that teachers' assessment practices rarely transcended paper-pencil testing. The teachers lack a satisfactory understanding of the new, alternative assessments and competencies to practice them (Gomleksiz & Bulut, 2007; Aksu, 2008; Keles, 2009; Duru & Korkmaz, 2010). When teachers are not confident and articulate their practices and the mathematical value of what they do, they can easily abandon the reform ideas and return to the traditional approaches instead of taking a firm stance and explaining the goal of the new assessment techniques to students.

3.5. Lack of Parental Support and Involvement

All of the teachers indicated that students' families are not supportive and do not become involved with the new program because of an assumption that the new mathematics program does not prepare their children for national norm-referenced tests which decide entry to a relatively few quality educational institutions at the high school level. Ceyda drew attention to the role of parents' perceptions in the new curriculum:

Parents are very concerned with their kids' successes in the national examinations. They want to know whether or not their kids will succeed in the SSE exam with this new program, rather than that their kids learn mathematics for understanding. They do not believe that the new program prepares students for those tests; because of this, they also send their kids to private coaching schools.

Regarding the new curriculum, teachers were also being challenged by parents. For example, Arda claimed:

A student family came to me and said, "You are saying that the new program is very good; but, my kid and some his friends in this school scored the lowest in the exam administered by the private coaching school. How did this happen?"

Bulent emphasized the lack of parental involvement with the issue of the new assessments:

> *Out of class, there are projects, group activities, and performance assignments. On these [activities] we need to work together with the families. We expect to get support from them in terms of helping their kids to reach resources, providing materials for in-class activities, and actively taking part of student assessment processes.*

As seen from the above quotations, parents' approaches to the new curriculum are mainly based on its usefulness in helping their children's success in national examinations. They believe that the new curriculum is less effective than the traditional curriculum in terms of preparing students for standardized tests. Thus, they send their children to private coaching schools in order to prepare them for those examinations. Consistent with this result, Hopkins & Levin (2000) and Roger (1995) also emphasized that parents' support played an important role in the implementation of the new program.

3.6. Interferences Caused by the National Norm-referenced Test

All three teachers agreed that the national norm-referenced examination administered at the end of the eighth grade interferes with the effective implementation of the new mathematics curriculum. Students' families consider the time and effort required for completing the new tasks, such as in-class activities, checklists, projects, or performance assignments, are perceived as being time-consuming and unnecessary activities. Bulent referred to this view:

> *Families think that the traditional system is more effective and meaningful for these kinds of examinations. So, at the school they want to see their kids get more involved with the tests rather than projects, activities, or group assignments… some parents took their kids away from our school and registered in the other non-pilot schools because of SSE exams.*

Ceyda explained the dilemma that teachers and students face every day:

> *In the classroom, what we are doing is letting students learn by doing, investigating, and discovering. In the private coaching schools, what they are doing is the traditional method; memorize the rules, take tests, pick the correct answer. Students do something in regular school, while they do something else in the private coaching schools. At the end, everything you are trying to do in the school becomes meaningless for them.*

Arda shares this dilemma when he claimed that "they [students] are assessed by the number of correct answers in SSE exams, not to how to do it or how to think of it." As indicated by the earlier excerpts, students and their parents have worries about SSE exams, in which students have to be successful to enter to a relatively few prestigious high schools. The placement of students in these schools is based on the points they receive from this examination. Since a limited number of places exist in these schools, students and their families come under pressure to be well-prepared for this exam, and they think that the new mathematics program which gives more emphasis to process evaluation rather than product evaluation does not prepare them for this standardized multiple-choice tests.

4. DISCUSSION and RESULTS

This qualitative study examined mathematics teachers' reflections on the implementation of the new elementary mathematics curriculum. The results of the study indicate that the new mathematics curriculum, framed by a student-centered and constructivist approach, has the potential to help both teachers and students in experiencing engaging, involving, enjoyable, and meaningful lessons. In parallel with the findings of Gomleksiz and Bulut (2007), Aksu (2008), Keles (2009), Duru and Korkmaz (2010), the teachers of this study positively perceived the new curriculum and are in favor of its educational value in elementary schools. This is very important because, according to Hill (1997), teachers first must believe that what they do is worthwhile before putting time and effort into learning and practicing the new ideas. On the other hand, this study also shows a number of impediments to effectively implementing this reformed curriculum: the class size of the school, time constraints, and the lack of curriculum materials. These findings are consistent with the work of Bulut (2007), Halat (2007), Keles (2009), Duru and Korkmaz (2010) who reported that teachers had difficulty completing activities in crowded classrooms and complained about the new books and materials which were not provided in a timely manner during the implementation process. To be able to successfully implement this new curriculum, the MNE should provide more financial support for restructuring schools such as featuring classes with no more than 30 students and arranging subject classrooms in which sufficient curriculum materials are present: overhead projectors, computers, and internet access. However, until meeting all these needs, teachers should know how to deal with the large class size and insufficient materials as well as other constraints that make their work difficult.

In this process, as emphasized by the teachers of this study, one of the most important issues is lack of initial training and the need for ongoing in-service teacher training. The curriculum innovation literature has well documented that initial teacher training is insufficient, and implementation timelines are short (Gooya, 2007; Huang, 2004; Jita & Vandeyar, 2006; Wake, Haworth & Nicholson, 2004; Halat, 2007; Keles, 2009; Birgin, Tutak & Turkdogan, 2009). Remillard and Geist (2002) emphasized the importance of receiving enough professional support when using new curriculum materials or experimenting with new practices. In-service education of teachers needs to be continuous and developmental rather than one-off (Malderez & Wedell, 2007). This can be provided by the MNE, local educational authorities, and universities or teachers' associations. In particular, universities can play a major role in developing centers for continuing education and offering workshops for teachers in summer schools. In these organizations, teachers should practice and gain first-hand experience by completing in-class activities, doing research, applying different assessment techniques (e.g., projects, portfolios, self-evaluation, peer evaluation, and checklists), and engaging in discussions at the end in terms of what worked or did not work. In this way, teachers can have specific development opportunities for themselves in the area of alternative assessment techniques, which are the most problematic issue of the new mathematics curriculum (Gomleksiz & Bulut, 2007, Aksu, 2008; Birgin, Tutak & Turkdogan, 2009). On the other hand, obviously, the new mathematics curriculum asks teachers to contribute more time and effort during the process of implementation. Thus, to encourage and compensate this extra effort, teachers who join in-service teacher training and workshops and then practice the reformed curriculum in their classrooms should be recognized and financially rewarded.

Although teachers are the main actors to make educational reforms successful, they also need full support from both parents (Hopkins & Levin, 2000; Roger, 1995) and other members of the school and surrounding community such as school administration, universities, and affiliated ministries (Huang, 2004; Lunenburg & Ornstein, 1996). As suggested by the participating teachers, the faculties of educational institutions should be actively involved in training in-service teachers, encouraging graduate students to do their theses or dissertation on different aspects of the reformed curriculum, continuously share information (e.g., good examples and interesting

activities) by means of student-teachers doing practice teaching in the classrooms of these schools, and donating curriculum materials developed by student-teachers taking the course of Instructional Technologies and Developing Materials in their undergraduate programs. Also teacher-educators have to make sure that pre-service teachers get the opportunity to examine the content of the new curriculum, analyze the goals of the new mathematics program, and develop some knowledge of how to use the reformed curriculum in meaningful contexts.

Another major barrier to the new mathematics curriculum is the SSE examination. The content of the SSE should parallel the objectives of the new mathematics curriculum. In other words, questions in this exam should be open-ended and evaluative, as emphasized by the reformed curriculum, focusing on students' high levels of thinking, abilities to solve problems, and skill of reasoning, rather than multiple choices, which are only concerned with the results. Otherwise, as happened in this study, teachers, and students will be challenged and under constant conflictive pressure between student-centered instruction that emphasizes higher-order and critical thinking skills in schools, and teacher-centered instruction that stresses rote learning and memorization in private coaching schools. Importantly, the results of this study reflect the views of three mathematics teachers who have more than 25 years of teaching experience, each, as compared to the average mathematics teacher. According to Rhoton and Stiles (2002), teachers at different stages in their teaching careers demand different needs for their professional development. Thus, this study should be extended by obtaining not only more teachers' perceptions of the new reformed curricula, but also other stakeholders' views such as students, parents, and school administrators.

In conclusion, this study identifies serious difficulties confronting the new mathematics curriculum reform as tens of thousands of teachers are waiting to receive enough training through workshops and then adapt the changes to their classrooms. The success of this reformed curriculum is mainly dependent on how teachers perceive, evaluate, and use reformed-based materials (Manouchehri, 1998). Thus, greater attention must be devoted to teachers' professional development including pre-service teacher education and in-service teachers' training in line with the reformed curriculum (Dori & Herscovitz, 2005; Huang, 2004). Obviously, many years are necessary to change teachers' beliefs and practices, and change requires a huge infrastructure investment to effectively implement the new curriculum in the entire elementary school system throughout the country.

5. REFERENCES

Aksit, N. (2007). Educational reform in Turkey. *International Journal of Educational Development* , 27, 129-137.

Aksu, H.H. (2008). Teachers' opinions of the new primary mathematics programme. *Abant izzet Baysal University of Journal of Education*, 8(1), 1-10.

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

Berberoğlu, G., Çelebi, O., Özdemir, E., Uysal, E., & Yayan, B. (2003). Factors affecting achievement levels of Turkish students in the Third International Mathematics and Science Study (TIMMS). *Educational Sciences and Practice*, 2(3), 3-14.

Bills, L., & Husbands, C. (2005). Values education in mathematics classroom: subject values, educational values, and one teacher' articulation of her practice. *Cambridge Journal of Education*, 35(1), 7-18.

Birgin, O., Tutak, T., & Turkdogan, A. (2009). Primary school teachers' views about the new Turkish primary school mathematics curriculum. *E-Journal of New World Sciences Academy*, 4, 2, 270-280.

(Board of Education). (2005). Handbook of elementary school curricula (1-5th grades). Ankara: MNE.

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

Carless, D. R. (1998). A case study of curriculum innovation in Hong Kong. *System,* 26, 353-368.

Desimone, L. M., Smith, T., Baker, D., & Ueno, K. (2005). Assessing barriers to the reform of U.S. mathematics instruction from an international perspective. *American Educational Research Journal,* 42(3), 501-535.

Dori, Y. J., & Herscovitz, O. (2005). Case-based long-term professional development of science teachers. *International Journal of Science Education,* 27(12), 1413-1446.

Duru, A., & Korkmaz, H. (2010). Teachers' views about a new mathematics currıculum and difficulties encountering curriculum change. *Hacettepe University of Journal of Education*, 38, 67-81.

Eğitim Reformu Girişimi (ERG). (2012). *4+4+4' e geçiş*. İstanbul: Sabancı üniversitesi.

Entwistle, N., Skinner, D., Entwistle, D., & Orr, S. (2000). Conceptions and beliefs about good teaching: An integration of contrasting research areas. *Higher Education Research and Development,* 19(1), 6-26.

Gomleksiz, M.N., & Bulut, I. (2007). An Evaluation of the Effectiveness of the New Primary School Mathematics Curriculum in Practice. *Educational Sciences: Theory and Practice,* 7(1), 81-94.

Gooya, Z. (2007). Mathematics teachers' beliefs about a new reform in high school geometry in Iran. Educational Studies in Mathematics, 65(3), 331-347.

Halat, E. (2007). The views of elementary school teachers on the new elementary school mathematics curriculum. *Journal of Social Sciences of the Afyon Kocatepe University,* 63-88.

Hanley, U., & Darby, S. (2006). Working with curriculum innovation: Teacher identity and the development of viable practice. *Research in Mathematics Education,* 8(1), 53-65.

Hill, L. (1997). Just tell us the rule: learning to teach elementary mathematics. *Journal of Teacher Education,* 48, 211-221.

Hopkins, D., & Levin, B. (2000). Educational reform and school improvement. *NIRA Review*, 7(3). http://www.nira.go.jp/publ/review/2000summer/hopkins.pdf.

Huang, F. (2004). Curriculum reform in contemporary China: seven goals and six strategies. *Journal of Curriculum Studies,* 36(1), 101-115.

Jita, L., & Vandeyar, S. (2006). The relationship between the mathematics identities of primary school teachers and new curriculum reforms in South Africa. *Perspectives in Education,* 24 (1), 39-52.

de Jong, O. (2004). Curriculum reform and rew practices in classrooms and teacher courses. *International Journal of Science and Mathematics Education,* 2(4), 431-434.

Keles, O. (2009). *An investigation of elementary and mathematics teachers' views about the new elementary school mathematics curriculum*. Unpublished master's thesis, Middle East Technical University, Ankara, Turkey.

Koc, Y., Isiksal, M., & Bulut, S. (2007). Elementary school curriculum reform in Turkey. *International Education Journal,* 8 (1), 30-39.

de Lange, J. (1996). Using and applying mathematics in education. In *International Handbook of Mathemtics Education, Part one,* eds. A.J. Bishop, M.A. Clements, C. Keitel, J. Kilpatrick and C. Laborde, 49-97. Dordrechht: Kluwer.

Lunenburg, F.C., & Ornstein, A.C. (1996). *Educational Administration: Concepts and Practices.* Belmont CA: Wadsworth Publishing Company.

Malderez, A., & Wedell, M. (2007). *Teaching teachers: Processes and practices*. London: Continuum.

Manouchehri, A. (1998). Mathematics curriculum reform and teachers: What are the dilemmas? *Journal of Teacher Education,* 49(4), 276-286.

Mereku, D. K. (2004). Methoda in Ghanaian primary mathematics textbooks and teachers' classroom practice. *Research in Mathematics Education,* 6(1), 157-173.

Miles, M., & Huberman M. (1994). *Qualitative data analysis: an expanded sourcebook.* Thousand Oaks CA: Sage.

Organisation for Economic Cooperation and Development (OECD). (2004). *Learning for Tomorrow's World. First Results from PISA 2003*. Paris: OECD.

Progress in International Reading Literacy Study (PIRLS). (2001). *PIRLS 2001 International Report.* http://timss.bc.edu/pirls2001.html.

Programme for International Student Assessment (PISA). (2006). *PISA 2006 National Report*. http://www.acer.edu.au/news/2007_PISA.html.

Remillard, J.T., & Geist, P.K. (2002). Supporting teachers' professional learning by navigating openings in the curriculum. *Journal of Mathematics Teacher Education*, 5(1), 7–34.

Rhoton, J., & Stiles, K.E. (2002). Exploring the professional development design process: bringing an abstract framework into practice. *Science Educator*, 11(1), 1–8.

Rogers, E.M. (1995). *Diffusion of Innovations.* New York: Free Press.

Talim Terbiye Kurulu (TTK). (2013). *Ortaokul Matematik Dersi (5, 6, 7 ve 8. Sınıflar) Öğretim Programı*. Ankara: MEB.

Third International Mathematics and Science Study. (1999). *TIMSS 1999 International Mathematics Report*. http://timss.bc.edu/timss1999i/math_achievement_report.html

Thompson, A. (1984). The relationship of teachers' conceptions of mathematics and mathematics teaching to instructional practice. *Educational Studies in Mathematics*, 15, 105-127.

Vandenberghe, R. (2002). Teachers' professional development as the core of school improvement. *International Journal of Educational Research*, 37(8), 653-659.

Wake, G., Haworth, A., & Nicholson, S. (2004). Applying mathematics in the post -16 curriculum: Teachers practices, student perspectives and emerging issues. *Research in Mathematics Education*, 6(1), 77-98.

Yıldırım, A., & Ok, A. (2002). Alternative teacher certification in Turkey: Problems and issues. In *Teacher Education in the Mediterranean Region: Responding to the Challenges of Society in Transition*, ed. R. G. Sultana, 259-275. New York: Peter Lang Inc.

Zhu, M. (2007). Recent Chinese experiences in curriculum reform. *Prospects*, 37(2), 223-235.

Uzun Özet

Geçen yirmi yıl içerisinde dünyanın birçok ülkesinde önemli boyutlarda öğretim programlarında değişiklikler olmuştur. Bu değişiklikler özellikle okulların ilköğretim ve ortaöğretim seviyelerinde gerçekleşmiştir. Bir önceki programın yeterli olmayışı, büyük uluslararası çalışmalarda öğrencilerin başarılı sonuçlar alamaması, matematik ve fen bilgisinin sahip olduğu negatif imajın düzeltilmesi bu değişikliklerin yapılmasının nedenleri arasında sayılabilir. Üçüncü Uluslararası Matematik ve Fen Çalışması (TIMSS) ve Uluslararası Öğrenci Değerlendirme Programı (PISA) gibi büyük ölçekli karşılaştırmalı çalışmalarda Türk öğrenciler gerek matematikte gerekse fen bilgisinde ortalamanın altında kalmışlardır. Bunun dışında ulusal değerlendirme raporları, bilimsel araştırmalar, öğretmenlerin deneyimleri, mevcut matematik programıyla ilgili illerden gelen raporlar ve sivil toplum örgütlerinin tespitleri okullarda matematik öğretiminde sorunlar olduğunu ortaya koymuştur. Bu gelişmeler karşısında, Milli Eğitim Bakanlığı bir ile sekizinci sınıfları içine alan tüm ilköğretim programında çok önemli değişikliklere gitmiştir. Bu değişikliklerin biri de matematik programında olmuştur. Matematik reformunun temelindeki yenilik programı ders temelli yaklaşımdan öğrenci merkezli hale getirmek ve öğretimde davranışçı yaklaşımdan daha çok yapılandırmacı yaklaşımı ön plana çıkarmak olmuştur. Bu yeni yaklaşımın vizyonu, "hayatında matematiği kullanabilen, problem çözebilen, çözümlerini ve düşüncelerini paylaşan, matematik öğrenmekten zevk alan bireyler yetiştirmektir" şekline ifade edilmiştir. Her çocuk matematik öğrenebilir ilkesiyle orta konan yeni programın daha önceki programdan temel farklılıkları şu şekilde özetlenebilir: Öğrencilerin; (1) öğrenme sürecinde aktif katılımcı olmalarını esas alması, (2) proje ve ödevlerle bireysel farklılıklarını ve yeteneklerini ortaya çıkarabilmelerine imkan sunması, (3) deneyimlerinden, sezgilerinden yararlanarak matematiği anlamaları ve soyutlama yapabilmeleri için kavramsal bir yaklaşımın izlenmesi, (4) araştırma yapabilecekleri, keşfedebilecekleri, problemlerin çözümlerini tartışabilecekleri ortamlar hazırlamayı hedeflemesi, (6) etkinliklerde materyal kullanarak psikomotor becerilerinin gelişmesini sağlaması, (7) farklı çevre ortamlarına adapte edilebilir etkinlik örnekleri ile yaşadıkları ortama uygun bir eğitim almalarına fırsat verilmesi.

Okul programına getirilen yenilikler konusunda uluslararası literatür öğretmenlerin bu konudaki inanış ve algılamalarının programın uygulamasında hayati öneme sahip etmenlerin başında geldiğini

göstermektedir. Türkiye'de ise bu konuda sınırlı sayıda çalışma mevcut olup, yapılan bu çalışmalar özellikle matematik programının 1 ile 5'nci sınıflarda uygulanan kısmına yönelik öğretmen görüşlerinden oluşmaktadır. Bu yüzden bu çalışma 6 ile 8'inci sınıflarda yeni ilköğretim matematik programı çerçevesinde uygulamaya konulan yenilikler üzerinde öğretmenlerin görüş ve değerlendirmelerini ortaya koyarken bu konuda literatürü daha derin ve zengin kılacaktır. Bu araştırmanın amacı uygulamaya konan yeni matematik programını (6-8 sınıflar) oluşturan şu altı ana unsur üzerinde öğretmenlerin görüş ve düşüncelerini ortaya koymak, eğer varsa programın eksik veya aksayan yönleri belirlemektir: (1) programın dayandığı temel felsefe, (2) öğretimde kullanılan stratejiler, (3) alternatif değerlendirme metotları, (4) öğretmen ve öğrencinin yeni rolleri, (5) programın zayıf ve kuvvetli yönleri ve (6) okul ve ailenin programa desteği.

Araştırmada yaklaşım olarak durum çalışması kullanılmıştır. Bir pilot okulda çalışan üç matematik öğretmeni dönem boyunca kendi matematik sınıflarında düzenli olarak gözlemlenmiş ve dönemin sonunda kendileriyle birer saatlik yarı-yapılandırılmış görüşmeler yapılmıştır. Verilerin analizinde, öncelikle her bir öğretmen için yeni matematik programının belirlenen unsurları çerçevesinde kodlama ve kategoriler oluşturulmuş daha sonra bunlar diğer öğretmenlerle karşılaştırılarak ortak ana temaların belirlenmesi sağlanmıştır. Yapılan bu kodlama ve kategori işleminin güvenirliliğini arttırmak için, veriler ve kategoriler araştırmacının dışında aynı üniversitede görev yapan eğitim doktorasına sahip iki çalışma arkadaşı tarafından incelenmiş, karşılaşılan anlaşmazlıklar tartışılarak giderilmiş ve bu şekilde kodlama ve kategori üzerinde yüksek oranda ortak bir mutabakata varılmıştır. Bulgular yeni programın belirlenen unsurları çerçevesinde öğretmenlerin doğrudan alıntıları kullanılarak sunulmuştur.

Bulgulara göre öğretmenler yeni matematik programı hakkında olumlu yönde görüş bildirirken diğer taraftan kendilerinin başlangıçta yeteri kadar hizmet içi eğitim almadıkları gibi ihtiyaç duydukları bu eğitimin daha sonra devamının da gelmediğini vurgulamışlardır. Ayrıca uygulama sırasında karşılaştıkları bazı problemleri şu şekilde dile getirmişlerdir: sınıf mevcudunun fazla olması, programın gerektirdiği materyallerin yetersizliği, tüm programı bitirme noktasında zaman yetersizliği, alternatife değerlendirme metotlarının kullanımı hakkında bilgi yetersizliği, yeni programa aile ilgisi ve desteğinin azlığı ve sene sonu uygulanan merkezi sınavların programa negatif etkisi.

Araştırma sonuçları yeni matematik programının önünde ciddi zorlukların bulunduğunu ortaya koymuştur. Bu yeni programın başarısı esas olarak öğretmenlerin bu programı nasıl algıladıkları, nasıl değerlendirdikleri ve yeni programın sunduğu araç, gereç ve materyalleri nasıl kullandıklarıyla yakından ilgilidir. Dolayısıyla en büyük zaman ve yatırım yeni programın çizgisinde gerek görev yapan öğretmenlerin gerekse üniversitelerde öğretmen olacak öğrencilerin yetiştirilip geliştirilmesine yapılmalıdır. Bunun dışında Milli Eğitim Bakanlığı okulların fiziki yapısını yeni programın istediği şartlara getirmeli yani sınıfları 30 kişiden fazla olmayacak şekilde düzenlemeli, okullarda matematik sınıfı, fen bilgisi sınıfı gibi özel branş sınıfları oluşturmalı ve bu sınıfları yeterli materyal ve teknik donanıma sahip hale getirmelidir. Ayrıca önceden planlanmış düzenli toplantılar yoluyla eğitim-öğretimin önemli paydaşlarından olan aileler, okul yönetimi ve üniversitelerin destekleri sağlanmalıdır. Son olarak sene sonunda uygulanan merkezi değerlendirme sınavlarının içeriğinin yeni matematik programının amaçlarıyla paralel hale getirilmelidir. Başka bir deyişle, sadece sonuca odaklanan çoktan seçmeli sorular yerine öğrencinin problem çözme, akıl yürütme, analitik düşünme yeteneklerini ölçen açık uçlu sorulardan oluşturulmalıdır.

Citation Information:

Eraslan, A. (2013). Teachers' reflections on the implementation of the new elementary school mathematics curriculum in Turkey. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi [Hacettepe University Journal of Education], 28*(2), 152-165.