A STUDY ON MATHEMATICS TEACHERS’ USE OF TEXTBOOKS IN INSTRUCTIONAL PROCESS

Meriç Özgeldi1, Erdinç Çakıroğlu2

1Mersin University, 2Middle East Technical University

This paper provides an analysis of mathematics teachers’ use of curriculum materials. 13 elementary mathematics teachers participated in the interviews for how they used the curriculum materials, specifically textbooks. The purpose of this study is to examine what mathematics teachers do with curriculum materials and how they use them for mathematics. The results of the interviews indicated that mathematics teachers used different textbooks to make instructional decisions, and they mostly adapted problems and examples in a constructive way.

INTRODUCTION

One crucial role teachers play in the school context is to transform and implement curricular ideas in classrooms. In their implementation processes, they often benefit from different types of curriculum materials, including textbook and other written resources. Curriculum materials are an integral part of teachers’ daily work and offer ongoing support for pedagogy and subject matter content throughout an entire school year (Collopy, 2003). They provide ideas and practices which frame classroom activity via text and diagrammatic representations and help teachers in achieving goals that they presumably could not or would not accomplish on their own (Brown, 2009). Certainly, the written curriculum materials such as the textbook, worksheet, and teachers’ guide are mostly used curriculum materials in the school context. Particularly, textbook is one of the widely used and trusted curriculum materials that are directly related to teacher’s teaching and student’s learning (Beaton, Mullis, Martin, Gonzalez, Kelly, & Smith, 1996). Although the term ‘curriculum materials’ have a general meaning involving a variety of resources, the current study focused on mathematics textbooks and accompanying student workbooks, teacher guidebooks, and other written resources that are available to teachers.

In general, the mathematics curriculum materials such as textbooks, texts, computer software, and geoboards are built into mathematical and instructional intentions and possibilities for school mathematics (Adler, 2000). Mathematics curriculum materials have been viewed as a critical resource for students’ learning of mathematical content and teachers’ mathematical instructional decisions; and
teachers are accustomed to using them to guide instruction (Stein & Kim, 2009). In this sense, mathematics textbook is used “as source of problem and exercises, as reference book, and as a teacher in themselves” (Howson, 1995, p.25) because teachers often rely heavily on textbooks for many decisions such as what to teach, how to teach it, what kinds of tasks and exercises to assign to their students (Robitaille & Travers, 1992). It is reasonable to argue, therefore, mathematics textbook is an important part of mathematics learning and teaching context in which students and teachers work.

Studies over 25 years on characterizing and studying how curriculum is actualized in schools addressed the teachers’ interactions with curriculum materials and the role of the curriculum materials. The critical point for understanding the curriculum use depends on the process of understanding what teachers do with mathematics curriculum materials and why as well as how their choices influence classroom environment (Remillard, 2009). Their value is likely to depend on the ways they are used (Cohen, Raudenbush, & Ball, 2003). In this sense, understanding the use of textbooks and other relevant written resources by teachers plays an important role in exploring the pedagogies used in the classroom.

Research has shown that when teachers interact with curriculum materials, they do so in dynamic and constructive ways rather than a straightforward process (Brown, 2002; Davis & Krajcik, 2005; Remillard, 2005). Teachers frequently make changes in the curriculum intentions and modify them according to the structure and the purpose of lessons. In doing so, the availability, quality, and flexibility of the curriculum materials plays a critical role in teachers’ decisions. In general, teachers transform the curriculum ideas, lesson plans, and mathematical tasks into real classroom (Remillard, 2005). Therefore, understanding the teachers’ interactions with curriculum materials requires an integrated analysis of their uses in the classroom teaching and learning context. For example, Brown (2009) has revealed a way of interaction between teacher and curriculum materials which involves multiple steps. According to this interaction, teachers first select materials; however the selection is often decided by others. Second, they interpret these materials in planning and during instruction with regard to their perception of materials. Third, they reconcile their perceptions of the intended plan with their own goals and with the limitations of the setting. Fourth, they accommodate the students’ interests, experiences, and limitations. Finally, they modify the setting according to their own decisions and to their students’ capacities. In fact, these steps proposed by Brown partly reflect the dynamic and constructive relationship between teachers and textbooks.

In sum, understanding teachers’ use of textbooks and other relevant curriculum materials provides insight into the contribution of such materials into the classroom
learning. In this context, the purpose of this study was on what curriculum materials—specifically the textbooks—are crucial to mathematics teachers, and how they utilize them for mathematics. The specific research problems addressed in this study are the following:

- What are the uses of written curriculum materials (mathematics textbooks and accompanying student workbooks, teacher guidebooks, and other written resources) in classroom mathematics by the middle grades mathematics teachers?

- For what reasons and purposes do mathematics teachers select and utilize the written curriculum materials?

**METHOD**

**Textbooks in Turkish Schools**

Any textbook to be used in Turkish elementary schools need to be officially approved by the Turkish Ministry of Education. The state publishes textbooks for each subject matter including. In addition, private publishers may also publish textbooks for schools. Among the approved textbooks, the ministry of education decides which textbook to be used by which schools and distributes free of charge to students and teachers. Specifically, a set of mathematics textbooks include student course book and student workbook, as well as a teacher guidebook.

**Participants**

In this study we collected data through interviews. For interviews, all middle grades mathematics teachers working in 11 different schools selected from a district of western Turkish town İzmir were invited to participate in this study. Among them, 4 male and 9 female mathematics teachers were invited to participate in the study. A purposeful sampling method was used to ensure that a variety of teachers which had different teaching experience were questioned. The interview participants had minimum 5 years of experience in mathematics teaching. In particular, 7 teachers have taught for over 10 years, and 2 teachers have taught for 25 years or more at the elementary school level. At the time of the data collection, the teachers were working at sixth through eighth grade levels. Also, they were using mathematics textbooks from the same publisher.

**Data Collection**

During the fall semester of 2009, 13 mathematics teachers were interviewed about how mathematics textbooks were used, and what other resources were used to plan and implement the mathematics lessons. The interviews were conducted for the purpose of obtaining data about how teachers used mathematics textbooks for
planning, implementing, evaluating the lesson in context of Turkish school culture, as well as their perception of the textbook. Interviews were conducted in teachers’ schools and took about 40 to 60 minutes with each teacher. Teachers were asked semi-structured questions. Interviews were tape recorded and transcribed verbatim for the data analysis.

Data Analysis
The researchers drew on the interview data to identify the use of textbooks by mathematics teachers. In analyzing the interviews, teachers’ utilization of student course book, student workbook, teacher guidebook, and other resource books were analyzed in light of the research questions. Particularly, the researchers analyzed their use in the process of planning, preparing, enactment, and assessment of mathematics instruction.

RESULTS AND DISCUSSION
Results of the analysis indicated that mathematics teachers were using student course book (CB), workbook (WB), teacher’s guidebook (TG), and other resource books (OB). The reports of teachers showed that teachers generally utilized TG and CB in preparing the mathematics lesson. Moreover, they looked at TG to make possible a connection between the curriculum intentions and classroom activities. They stated that their first resources for making decisions which topics to teach and how to present them were TG and CB. As Ms. Aksu stated:

I use the guidebook very frequently because I think that the guidebook gives useful information. For example, it provides information about how I can teach the lesson.

In this case Ms. Aksu is using the teachers’ guidebook for making decisions about how to teach the topic. Similarly, Mr. Çelik stated that he uses TG for the purpose of determining content boundary in his classes. He stated that:

How the subject is covered [in the textbook], how it is explained, what are the levels of the examples, what kind exercises are there? [I use the course book] to get an idea about where the unit starts and ends, I mean, in order to determine a framework [for the class].

Mr. Çelik’s use of TG was limited to determine the level and depth of topic to be taught. Other participants also made use of TG or CB in order to review the lesson objectives. Mr. Salih, on the other hand, focused more on the CB. He stated that he usually searches for engaging and sense-making activities from the CB.

I try to start my instruction with activities and real life connections as this makes it easier to reach my students. I use textbook for trying to reach ideas for this.
Similar to Mr. Salih, other participants preferred to situate the problems in a real-life context from CB. Particularly, one of the most important uses of the TG and CB were about the selection of in-class questions and exercises to be studied. For instance Mr. Emre stated that:

We first solve the examples, questions in the course book together with students, and then after teaching the topic, I definitely make my students solve the “your turn” part in the book. For the higher-level students, I solve problems from the test books after covering the rules from the course book.

In this case, Mr. Emre used the CB as the main source for examples and problems and looked for OB to find different and upper level problems. Mr. Hüseyin also mentioned that the teaching experience he had was very crucial in adapting the problems and examples for the level of students in his classroom. He stated that:

The level of the students is important for sure. I select more advanced books if the level is high, and easier books if the level is low… I arrange it by myself, actually based on my experiences. For example, sometimes I change a question while I am writing it. I change the questions considering the level (of the students). Because I feel, I can see where a student can get it and where s/he cannot.

In this case, Mr. Hüseyin, who had nearly 25 years of experience in mathematics teaching, expressed that he makes use of his teaching experience in selecting the problems and modifying the setting according to his own decisions and to his students’ capacities. Similarly, the other participants reported that they created problems and questions using those textbooks, and made adaptations to problems and questions in CB, WB, and OB. As Mr. Sinan expressed, he focuses more on the WB and creates his own problems by the help of questions in the textbook. He stated:

I change the form of the questions in the course book, or I write sub-questions for the questions in the book and pose them to students.

Moreover, the participants expressed strong messages about the importance of addressing students’ needs for preparing high stake national exams-namely SBS in Turkey. They adapted and supplemented the questions in the course book to be in line with the national examinations in order to help students achieve better test scores. As Ms. Mine stated:

I always make my students solve the problems at the end of each unit in the course book. I make use of the book, because it is based on the curriculum and because I do not want my students miss any questions in SBS

In addition, Ms. Tülin stated that:

In my classroom exams I ask similar questions to the national test.
Similar to those cases, the participants aimed not only the preparation for high stake tests, but also for in-class examinations. Generally, the participants utilized CB, WB, and OB to select problems and applications for in-class assessment. They generally used these materials to give homework and prepare the exam questions. As Mrs. Akif stated that:

I generally use the work book to assign homework. Most of the questions (in the work book) are not like the traditional ones such as ‘what is x?’, but there are figures and tables in them. The questions in the course book and the student workbook are similar, so I assign the work book to the students.

Similar to Mrs. Akif, the other participants used WB in their classrooms to ask similar problems in CB and they gave the problems in WB as homework.

CONCLUSIONS

According to Remillard (1999), when teachers read the textbook, they attend to the some parts of text and dismiss others. They bring their interpretation to what they read. This is because reading text involves “a series of tacit decisions about what to attend to and how to interpret it” (Remillard, 1999, p.324). In this current study, mathematics teachers focused on the mathematics textbooks and accompanying student workbooks, teacher guidebooks, and other written resources in order to make particular decisions about the instruction. For example, they selected the real-life examples from student course book and decided on the problems from student work book or other source book. Therefore, the use of textbooks by mathematics teachers was based on their interpretations of textbooks in this study.

The results of the study indicated that teachers mostly relied on the official course books and accompanying teacher guidebooks for planning and preparing mathematics instruction. They were generally helpful for teachers about what topics to teach and how to make connections with real life and the other lessons. During the instruction, teachers preferred to use again the course books for more process oriented activities such explaining topics, focusing on concepts, and assigning projects. For evaluating mathematics instruction, teachers preferred to utilize the course books, work books, and the other resource books in order to evaluate students and give homework.

The data indicated that most of the teachers stated that they followed the mathematical content and sequence presented in CB by a little change. Teachers reported that they adapted the tasks from CB and OB to give examples, exercises, and problems. For example, according to teachers, they felt that they had to review problems and examples in all resources because the classroom settings (e.g. the level of the students or time) always restricted teachers. Most of the teachers also stated that they looked at OB considering that they could not find challenging
problems in CB. Therefore, they stated that they used OB when they preferred to solve different kinds of problems. Particularly, teachers mostly adapted problems and examples when they were enacting in classroom and evaluating students. This would eventually indicate that teachers interacted with textbooks in a constructive way rather than a straightforward process.

Furthermore, teachers used CB, WB, and OB to select problems and applications for assessment and evaluation. For instance, they stated that they generally utilized them to give homework and prepare the exam questions. Most of the teachers reported that they created problems and questions using those textbooks, and others made few or no adaptations to problems and questions in the textbooks.

A general conclusion in this study is that teachers mostly rely on the course book and the other resource books for selecting problems to work in class or use in examinations. These resources are mostly the self-study books that aim to prepare students to high stake exams. The scope of such books is usually focused on the preparation for the tests and the problems are usually in multiple choice format.

REFERENCES


What Does It Take to Teach for Mathematical Proficiency? Teaching in the ways portrayed in chapter 9 is a complex practice that draws on a broad range of resources. Despite the common myth that teaching is little more than common sense or that some people are just born teachers, effective teaching practice can be learned. In this chapter, we consider what teachers need to learn and how they can learn it. The pedagogical function makes textbooks teaching aids. The essential role of mathematics textbooks in Swedish mathematics classrooms is an important background to this study on analyzing mathematics textbooks from a teaching perspective. This study intends to discover pedagogical content knowledge by means of looking for embedded teaching trajectories related to algebra content concerning quadratic equations. This is based on an assumption that textbooks have embedded teaching trajectories to present subject content according to certain orders. The term of embedded teaching trajectory in this... Teaching Mathematics â€“ a guide for postgraduates and teaching assistants. Preface.Â The terminology in small group teaching in mathematics is also not universally agreed, but usually by an exercise class we mean one in which students work through problems together with help and support available from an expert tutor or teacher. This sort of class is dealt with in Chapter 2. By small discussion groups, covered in Chapter 3, we are considering â€œrealâ€™ group teaching where the objective is to develop interactions between students and tutors to facilitate learning.Â You may look into the history of the topic, or use a relevant and possibly amusing anecdote. Above all, be prepared for the constant student question â€œWhy do we need to do this?â€™