Teachers as Participants in Textbook Development: *The Integrated Mathematics Wiki-book Project*

Ruhama Even and Shai Olsher

Abstract This chapter examines how the conventional relationships between teachers and textbooks may be expanded so that teachers become more genuine participants in the process of textbook development. The *Integrated Mathematics Wiki-book Project* is used as a vehicle for investigating this matter. First, the work environment provided for teachers is described. Then, the chapter focuses on the ways in which teachers participated in the joint editing of a textbook they were using in class, during the first year of the project. The analysis focuses on three aspects that characterize the unique work environment provided for the teachers: (1) designing a textbook for a broad student population, (2) preparing a new textbook by making changes to a textbook designed by expert curriculum developers, and (3) consulting with professionals that are not part of the teachers' usual milieu.

Keywords Textbook development · Teachers as curriculum developers · Teachers and textbooks · Wiki-book · Wiki

The relationships between teachers and textbooks are generally associated with curriculum enactment and teachers' use of curriculum materials. Less prevalent is the association of teachers with curriculum development and textbook preparation. The aim of this chapter is to examine how the conventional relationships between teachers and textbooks may be expanded so that teachers become more genuine participants in the process of textbook development. The *Integrated Mathematics Wiki-book Project* is used to examine how this challenge maybe addressed, focusing on the ways in which teachers participated in a unique opportunity made available to them to jointly edit a textbook they were using in class.

After appraising research on the relationships between teachers and textbooks, which provide a basis for conducting this work, we describe the *Integrated Mathematics Wiki-book Project*, in which this research is situated. Then, we report on the ways in which teachers participated in the joint editing of a textbook they were using in class, during the first year of the project. The study reported in this part

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of the chapter focuses not on the changes teachers suggested for the textbook, but instead on teachers' ways of participating in the joint editing of a textbook.

Background

Research on the relationships between teachers and textbooks usually focuses on how textbooks influence classroom instruction. This research examines how teachers use curriculum materials and how a written curriculum is transformed into classroom reality (e.g., Manouchehri and Goodman 1998; Remillard 2005; Remillard et al. 2009; Stein et al. 2007). Accumulating research in a number of countries suggests that curriculum materials, textbooks in particular, considerably influence classroom instruction: teachers often follow teaching sequences suggested by curriculum programs, and base class work mainly on tasks included in textbooks (e.g., Eisenmann and Even 2009, 2011; Grouws et al. 2004; Haggarty and Pepin 2002). Research also reveals discrepancies between the written and the enacted curriculum. For example, Stein et al. (1996) showed that cognitively challenging mathematical tasks tend to decline into less demanding, procedural exercises when implemented in class. Even and Kvatinsky (2010) suggest that teachers who adopt different teaching approaches, to some extent, make different mathematical ideas available for students to learn, even when they use the same textbooks. Such research on the relationships between teachers and textbooks reflects prevalent views and assumptions about the teacher's role, usually regarding the teacher as a curriculum enactor and user of curriculum materials furnished by expert developers.

Yet, in contrast to their central role in curriculum enactment, teachers usually play a rather insignificant role in the development of textbooks. Indeed, some textbook authors are teachers, and as part of the process of curriculum development, selected teachers are often recruited by curriculum developers to teach an experimental version of a new curriculum program in order to gather information about how students deal with the tasks posed, to estimate the time needed to work on tasks in class, and to construct a conjectured learning trajectory (Clements 2002; Cobb 1999; Gravenmeijer 1998; Hershkowitz et al. 2002; Schwarz and Hershkowitz 1999; Simon 1995). Still, obviously, only a minute number of selected teachers can actually participate in the development of textbooks in these ways. Thus, the voice of the vast majority of teachers remains unheard and most teachers rarely influence textbook preparation or development.

In reflecting on the insignificant role that teachers play in the development of textbooks and their central role in using them in class, we feel that the conventional relationship between curriculum developers and teachers is basically unidirectional—from curriculum developers to teachers. Teachers' aspirations about desired textbooks as well as adjustments that they make in textbooks—based on their experiences, their knowledge and beliefs about mathematics and its teaching and learning, as well as their acquaintance with the system in which they teach and with their own students—often remain unknown to curriculum developers.

The *Integrated Mathematics Wiki-book Project* aims to expand the traditional unidirectional connection between curriculum developers and teachers into a bidirectional relationship: to stem also from the teachers to the curriculum developers. Thus, it aspires to offer teachers a way to become more genuine participants in the process of textbook development. In the following section we first describe the *Integrated Mathematics Wiki-book Project*. Then we report on a preliminary study that examines teachers' ways of participating in editing and producing a wiki-based revised version of the mathematics textbook they used in class, in an environment offered to them during the first year of the project.

The *Integrated Mathematics Wiki-book Project*

Background

As a country with a centralized educational system, the Israeli school curriculum is developed and regulated by the Ministry of Education. In 2009 the Ministry of Education launched a new national junior-high school mathematics curriculum (Ministry of Education 2009). The new national curriculum comprises three strands: numeric, algebraic, and geometric. It stresses problem solving, thinking, and reasoning for all students, and approaches mathematics teaching in junior-high schools in a spiral approach.

In response to the introduction of the new national junior-high school mathematics curriculum, the mathematics group in the Department of Science Teaching at the Weizmann Institute of Science began developing a new comprehensive junior-high school mathematics curriculum program entitled *Integrated Mathematics* (*Matematica Meshulevet*). The curriculum development team comprises experienced mathematics curriculum developers and mathematics teachers. At the time of this writing, the experimental edition is being used in more than 250 schools throughout Israel, and the team works closely with hundreds of teachers all over the country who need help in adapting to a new curriculum. The *Integrated Mathematics Wiki-book Project* uses the *Integrated Mathematics* textbooks as a point of departure. The first author is the head of the *Integrated Mathematics Project* and the *Integrated Mathematics Wiki-book Project*; the second author is a leading team member of the *Integrated Mathematics Wiki-book Project*.[1]

[1]The project is part of the Rothschild-Weizmann Program for Excellence in Science Teaching, supported by the Caesarea Edmond Benjamin de Rothschild Foundation. Other team members include Michal Ayalon, Gila Ozruso-Haggiag, and Edriss Titi.

Project Objectives and Focus

The main objective of the *Integrated Mathematics Wiki-book Project* is to expand the conventional relationships between teachers and curriculum developers, which are mainly unidirectional—stemming from curriculum developers to teachers. To this end, the *Integrated Mathematics Wiki-book Project* invites teachers who use the *Integrated Mathematics Program* to collaborate in editing the textbooks they use in their classes and to produce, as group products, revised versions of these textbooks—wiki-based revised textbooks that are suitable for a broad student population, and not only for students in a particular teacher's class.

An additional goal of the *Integrated Mathematics Wiki-book Project* is to foster teachers' professional development and growth. It is assumed that this kind of teachers' collaborative work has the potential to contribute to improving teachers' understanding of mathematics and the curriculum, to acquaint teachers with the use of a valuable technological tool and resource (Wiki) that allows easy collaborative creation and editing of teaching materials, and to support the development of a professional community whose members work collaboratively with colleagues on authentic tasks of teaching.

The Technological Platform

To enable collaborative textbook editing and the production of a joint revised textbook, we use, with some modifications, the MediaWiki platform and Wikibook templates for constructing the *Integrated Mathematics Wiki-book* website. The project website serves as an online platform for collaborative work on a common database (i.e., a textbook) and for discussions in a forum-like fashion.

Figure 1 shows part of the main page of a textbook on *the Integrated Mathematics Wiki-book* website. (The text in this, as well as in all other figures, is a translation to English of the original Hebrew text.) The main page includes standard MediaWiki tabs (top of the page) that allow performing actions (e.g., editing and requesting change notifications) or viewing pages related to a selected textbook unit (e.g., modifications made and discussions held). An abbreviated textbook table of contents is displayed (on the right) to enable easy access to textbook units. Also included in the main page of a textbook on *the Integrated Mathematics Wiki-book* website (as well as in all other pages) are navigation shortcuts to frequently used pages and tools (e.g., the latest modifications, technical support, and consultation with various professionals) as well as a link to a free-hand drawing applet embedded in the website (on the left).

To assist in the process of textbook editing, we added different kinds of buttons to the standard Wikitext editing toolbar. Some of these buttons were added before the project started, based on the project team's anticipation; other buttons were added as the editing work progressed, in response to participants' requests. One kind of added buttons is buttons that assist in general text editing. For example, a button

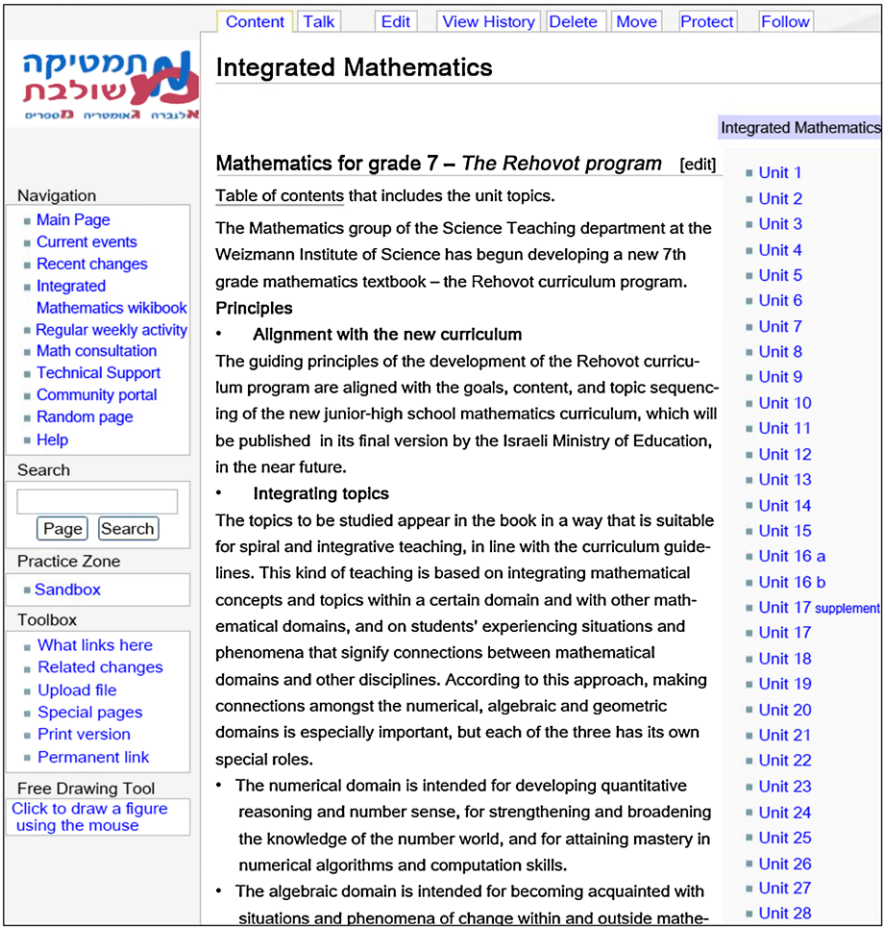


Fig. 1 Part of the main page of a textbook on the *Integrated Mathematics Wiki-book* website

labeled *important* was added in response to participants' requests to easily highlight core parts of a textbook. However, unique challenges are associated with the task of editing a mathematics textbook that are not encountered in most other uses of Wikitext. These challenges are rooted in the need to type mathematical text and the desire to display mathematics problems in specific formats. Therefore, we added buttons to the standard Wikitext editing toolbar that enable the insertion of frequently used mathematical text templates and textbook problem templates. Figure 2 displays customized added templates.

Quite a few buttons were added in order to improve communication among the participants about proposed changes. This kind of buttons includes, for instance, buttons labeled *before* and *after* to signal whether a suggested editing action is based on anticipated or actual classroom teaching; buttons labeled *like* and *seen*

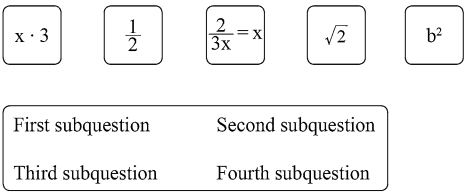


Fig. 2 Customized templates added to assist in the editing of a mathematics textbook

were added to enable easy positive and neutral responses (respectively); and a *smiling face* button was added to enable a softening of the "tone" of written messages.

Operating the Project

The *Integrated Mathematics Wiki-book Project* started in September 2010. At the time of writing this paper it has successfully concluded two years of operation and is embarking on the third year. Participation in this project consists of (1) on-going distance work, and (2) monthly face-to-face whole-group full-day meetings. These are elaborated on next.

The ongoing distance work includes textbook editing, reacting to other participants' suggestions, and discussions of mathematical and pedagogical issues. Figures 3–6 present various kinds of ongoing distance work. Figure 3 shows a Wiki-textbook page in which one of the participating teachers added a task (task 6). The new task asks students to work algebraically and to generalize their previous work on task 5, which involves work on several numeric cases. The teacher explained her suggestion to add a generalization task in the corresponding discussion page:

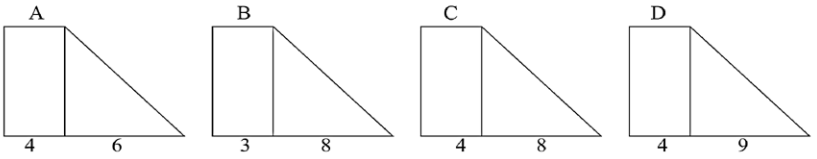
> I added an additional task following question 5 because in question 5 the students solve several examples regarding which of the figures has a larger area… so I thought to add a generalization question, where the side of the rectangle is x.

Figure 4 shows a teacher's proposal to change the phrasing of tasks in the textbook. In this example, a teacher added an organizational table (the second table in Fig. 4) to an investigation task that involves pattern finding and problem solving related to a series of "buildings" made from matches.

The reactions of other participating teachers to this suggested change in task phrasing were expressed in the corresponding discussion page (see Fig. 5). As shown, the suggestion to add an organizational table (by T1) received "like" responses from two other participants (T2 and T3).

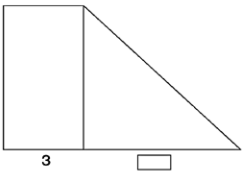
The discussion page in Fig. 5 includes only "like" responses; i.e., concise teachers' responses that require only a small effort. To respond in this way, the teachers needed only to click on a ready-made button. Figure 6 shows a discussion page of a different nature. This discussion page includes a debate among five teachers (T1-T5) regarding whether there was a need to change the structure of a certain unit in the 7th grade textbook.

5. a. Determine, in each drawing, which has a greater area, the rectangle or the triangle. Explain. (The drawings are not to scale)



b. In the following drawing, it is known that the area of the rectangle is equal to the area of the triangle.

What is the length of the edge marked with a box? Explain how you found it.



6. One of the edges of the rectangle is marked with an X (see drawing). Write an expression for the length of the edge marked with a box so that:

a. The area of the triangle will be greater than the area of the rectangle?

b. The area of the triangle will be smaller than the area of the rectangle?

c. The area of the triangle will be equal to the area of the rectangle?

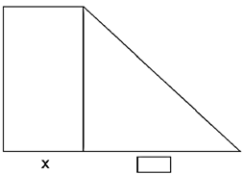


Fig. 3 Edited Wiki-textbook page—adding tasks

The monthly face-to-face whole-group meetings consist of collaborative work on advancing the textbook editing, discussions of mathematical and pedagogical issues, and formulation of community working norms. These meetings are built on the preceding teachers' distance work of textbook editing, and they also serve as departing points for subsequent distance work.

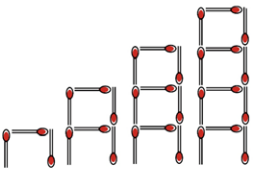
Participating teachers are provided with two kinds of support that accompany both the distance work and the face-to-face meetings. One is technical support in using the technological platform for textbook editing. The aim of this support is to provide a smooth running work environment that enables teachers to perform desired editing without having to deal with, or be constrained by, technological difficulties.

Lesson 1. Building with matches

Finding the rule of a series of match structures and building an algebraic expression

Constructing "buildings" from matches.
In a one-story building – three matches
In a two-story building – six matches
In a three-story building – nine matches

Let us find the connection between the number of stories and the number of matches.



1. a. How many matches are required for constructing a 5-story building? 11-story building? How did you find the number of matches?

b. How many matches are required to build a 100-story building? Explain.

c. Complete the table.

Number of matches	Number of stories
	4
	7
30	
	23

d. Yuval has 51 matches, Maayan has 61 matches, Shaked has 71 matches, and Omer has 72 matches. Each of them is trying to construct a building that is as tall as possible. Who will not have any matches left? Explain.

Childrens' names	Number of matches	Number of stories	Matches left
Yuval			
Maayan			
Shaked			
Omer			

e. Noa constructed a building from the matches she had. She had two matches left. Give an example for the number of matches that Noa had.

f. To construct an *x*-story building ,3x matches are required. How many matches are required for constructing an *a*-story building?
A building requires *3b* matches to be built. How many stories does it have?

Fig. 4 Edited Wiki-textbook page—change of task phrasing

The other kind of support is related to conceptual issues that emerge as part of the editing work. To address that, participating teachers are offered the opportunity to consult with various professionals throughout their ongoing distance work and the monthly face-to-face meetings. The professionals made available for consultation include authors of the textbooks, a research mathematician, and researchers in the field of mathematics education. To enable easy access to these professionals, a va-

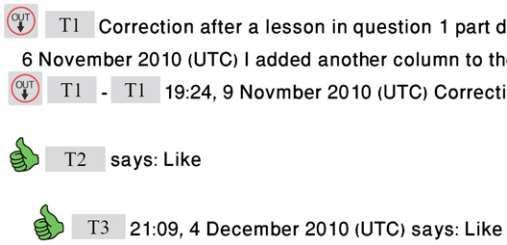


Fig. 5 Discussion page: "Like" responses to a suggested change in task phrasing

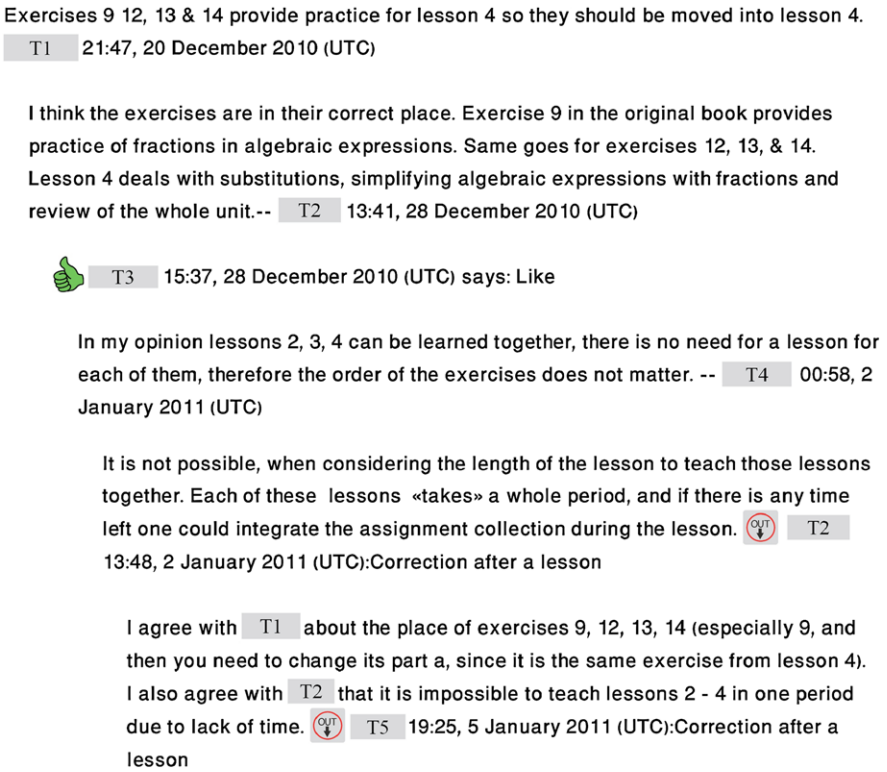


Fig. 6 Discussion page: debating the structure of a certain textbook unit

riety of consultation channels are offered via the *Integrated Mathematics Wiki-book* website, regular e-mail, Skype chats and calls, and face-to-face meetings.

Several changes occurred in the project between the first and the ensuing years of operation. During the first year of operation (starting in September 2010), the project team purposely avoided any intervention with, commenting on, or evaluation of the teachers' work, besides instructing the teachers on how to use the *Integrated Mathematics Wiki-book* website. The role of the project team during that year was to

provide a smooth running work environment and to moderate, but not direct, the monthly face-to-face meetings. Similarly, during this year, the consultants associated with the project were explicitly instructed not to initiate any intervention with, comment on, or evaluate the teachers' work. Instead, the consultants were directed to respond only when explicitly approached by the teachers, and to address only queries related to the following areas: reasons for specific choices made in the textbook by the textbook authors, the mathematics in the curriculum, and research in mathematics education. In particular, the consultants were instructed not to comment on or evaluate particular teachers' editing suggestions, even when requested to do so by the teachers.

In the second year of the project the participating teachers (some newcomers and some continuing participants) continued to receive an autonomous work environment wherein they could freely edit the textbooks as they wished. However, the work environment was slightly modified. For example, the opportunities to interact with professionals that are not part of the teachers' usual milieu were expanded. Thus, a sizable part of the monthly face-to-face meetings during the second year was devoted to semi-structured discussions with the textbook authors and with the mathematician. Also, the consultants associated with the project were allowed to freely comment on the teachers' editing suggestions and could freely address any query raised by the teachers. Moreover, during the second year of the project the project team initiated various activities that purposely addressed important issues related to the teachers' work, such as aspects of argumentation in mathematics classes. Finally, as the number of participating teachers grew considerably, some of the editing work was conducted in small groups, according to different focus preferences. Each small group had a group leader, who also participated in the planning of the project activities together with the project team. A similar work environment is planned for the third year of the project.

As can be seen, several characteristics of the work environment offered by the *Integrated Mathematics Wiki-book* project are not usually part of teachers' practice. This includes, for example, designing a textbook for a broad student population instead of focusing on the specific student population taught, generating a textbook by making changes to a textbook designed by expert curriculum developers, and consulting with professionals that are not part of the teachers' usual milieu. The next part of the chapter focuses on ways in which the first-year teachers participated in the joint editing of a textbook that they were using in class, in this unique work environment.

First-Year Teachers' Ways of Participating in Textbook Editing

Most of the first-year teachers participated in the distance editing of the textbook on a regular basis. Yet they varied regarding the extent and nature of their work on the *Integrated Mathematics Wiki-book* website. Some used the website extensively, making or suggesting changes, commenting on colleagues' suggestions, or

discussing mathematical or pedagogical issues. Others were less active in using the website. All teachers, however, actively participated in the face-to-face monthly meetings; some explained that they could express themselves better in these meetings than on the website.

At the beginning of the year, teachers moved rather hastily from one unit to another, not achieving closure on suggested changes, and leaving some issues raised by other teachers unaddressed. Moreover, different teachers frequently worked on different textbook units, which resulted in less collaborative editing. Therefore, after a few months, the project team included in each monthly face-to-face meeting a session that focused on addressing changes suggested and issues that were raised in previous distance work, in relation to only one or two textbook units.

Next, we present a preliminary study that focused on the ways in which teachers participated in the joint editing of a textbook that they were using in class during the first year of the project, stressing three characteristics that are not usually part of teachers' practice. Where appropriate, we added relevant information from the second year of the project's operation.

Methods

Participants in the first year of the project consisted of nine 7th grade teachers, all of whom used the 7th grade *Integrated Mathematics* textbook (Bouhadana et al. 2009a, 2009b) in class. The teachers came from different parts of the country, from Jewish and Arab sectors, and from orthodox religious and secular sectors. Their teaching experience varied considerably, from 6 to 29 years. All of the participants held a first degree either in mathematics or in a mathematics-related field, such as a B.Ed. with a major in mathematics. Five held a masters' degree, not necessarily in mathematics or mathematics education. None of the participants had any prior experience in editing texts using a wiki-based platform; however, most were familiar with Wikipedia as a source of information. The teachers received grants as well as course credits that would count towards a salary increase.

Data sources include the following: (1) the *Integrated Mathematics Wiki-book Project* website, which contains the wiki-based textbook with all changes made, their corresponding discussion pages, and online forum-like discussions, (2) video-documentation and field-notes of the monthly whole-group meetings, (3) individual semi-structured interviews with the teachers, at the end of that year, (4) individual papers written by the teachers as a final assignment, and (5) a journal kept by the second author in which he documented informal conversations with project participants, and added ideas and reflections.

Data analysis focused on the ways in which the teachers participated in the joint editing of a textbook that they were using in class during the first year of the project. The analysis focused on the following three aspects:

- Designing a textbook for a broad student population.

- Preparing a textbook by making changes to a textbook designed by expert curriculum developers.
- Consulting with professionals that are not part of the teachers' usual milieu.

For each of the first two aspects, we scrutinized the following data sources: discussion pages and online forum-like discussions on the *Integrated Mathematics Wikibook Project* website, field-notes of the monthly meetings, transcripts of the interviews, final papers, and the researcher's journal. We searched for instances related to each of the two aspects. We then examined and interpreted them. We took into account how each instance is connected to others and how it is linked in the overall activity of each relevant teacher and of the whole group of teachers.

For the third aspect, we identified and examined all recorded interactions with a representative of the textbook authors, the research mathematician, and the researcher in mathematics education. We then interpreted those interactions.

Designing a Textbook for a Broad Student Population

The task for the group of nine teachers was to produce, as a group product, one—and only one—wiki-based revised textbook that would be suitable for a broad student population, and not only for students in a particular teacher's class. In general, the first-year teachers embraced this approach and conceived their role as preparing a textbook that would be suitable for any 7^{th} grade class in the country. This is illustrated by the following episode that took place during the third monthly face-to-face meeting. The group of teachers discussed a particular change one of them had suggested. Feeling that the modification suggested might not be appropriate for a general student population, one teacher commented that the textbook they were preparing should be appropriate for the whole population of 7^{th} grade students in the country. Her colleagues agreed with her.

T1: We are making a book that is not suitable for us individually.
T2: [puzzled] Why?
T1: But a book that should be appropriate for the whole country.
T2: Right.

To write a textbook that is suitable for a broad student population, the teachers often introduced, and insisted on adopting changes that emerged from their personal teaching context. For example, one of the teachers that taught only lower-achieving classes for several years continually stated that one of her goals was to make the 7^{th} grade *Integrated Mathematics* textbook more suitable for the low-achieving students in her classes. She consistently suggested modifications based on her teaching experience in those classes. For example, explaining why she revised the table in a textbook task that dealt with the number of marbles a child [Noi] had in a variety of situations, the teacher wrote in the corresponding discussion page that this revision helped students in her class who have difficulties. She also indicated that the change she made would be appropriate for higher-achieving students as well, signaling that she was aware that the textbook needed to be appropriate for other classes too:

> I changed Noi's table, I recorded [in the table] the example exercise that the students had to fill in. It was very helpful for students in my class who have difficulties; by the way I think that one example wouldn't harm strong students as well.

Throughout the year this teacher suggested and initiated numerous changes with the goal of making the textbook more suitable for low-achieving students. The majority of these suggestions were rejected by most other participants as not suitable for the broader 7th grade student population. Eventually, to resolve the continual tension that the group experienced when producing a generic textbook and dealing with the requests of one teacher to introduce modifications that specifically attend to the lower-achieving students, the group decided that there was a need for an additional version of the textbook, designed specifically for low-achieving students. The teacher who was interested in this modification began to develop such a version by herself. In the second year of the project she became a leader of a group of teachers who collaborated on editing a version of the 8th grade *Integrated Mathematics* textbook that was intended by the curriculum developers for classes of low-achieving students. She will continue to lead a group of teachers similarly during the third year of the project.

However, another case in which a teacher repeatedly initiated changes that suited her unique teaching context ended up differently. This teacher, who had easy access to a computer lab for her class, stated that her main objective was to find ways to include in the textbook technology-based activities so that her students could use computers as they learned mathematics. Her view, which she continually expressed throughout the year, was that integrating computers into school mathematics is important for all students (i.e., not only for her students). This view was clearly expressed, for instance, in the paper she wrote as a final assignment:

> Educators in this country and around the world agree that the mathematics curriculum should address the needs of a modern society in the 21st century, therefore, the right thing to do is to integrate computer technology into the textbooks, technology that will challenge and lead students to better learning. The Wikibook framework promotes the integration of interactive tools that provide intriguing stimuli and provide a sense of control with the learning.

This teacher devoted a great deal of her time to work in this direction during the first year of the project. She continued to do so during the second year as well, in addition to serving as a leader of a small group of participating teachers. The authors of the *Integrated Mathematics Program* liked the applets she developed, and decided to display them on the *Integrated Mathematics Project* website, in her name, making them available to all users of the *Integrated Mathematics Program*.

Unlike the case of attending to the needs of low-achieving students described before, the suggestion to incorporate the use of technological tools into the textbook was embraced by the other participants. They agreed with the teacher who initiated the integration of advanced technological tools that this is important to all students. Thus, they supported revisions in this direction even though the use of computers in

mathematics lessons in Israel is sparse. For instance, in her final paper, one of the other teachers wrote:

> It is important to say that not in all schools from which the participants come there is an adequate technological infrastructure for such work, and therefore the integration of technology was irrelevant for them... My feeling is that in this topic, the integration of technological tools into mathematics teaching, there was a consensus about its importance.

Making Changes to a Textbook Designed by Experts

Most teachers actively participated in the joint editing of the textbook. Yet, making changes to a textbook written by expert curriculum developers was a role that not all teachers easily embraced. In the following illustrative excerpt, taken from an interview with one of the participating teachers at the end of the year, the teacher described how she felt at the beginning of the year. Responding to the interviewer's opening question: "Tell me how the project was for you, in general," the teacher replied:

> T: It took some time to get going.
> I: Okay, what does it mean?
> T: It took some time to get going. Uh, I remember that the moment I introduced the first change, I said: 'What? Can I introduce changes? Can I here?' It was not obvious to me. And, at least at the beginning, it took some time [to realize] that you can make...

As the work progressed, the teachers generally seemed comfortable introducing changes to the textbook. Nevertheless, a few episodes occurred later in the year, indicating that teachers sometimes refrained from making changes because of their respect for the decisions and choices of the textbook's authors. For example, commenting on a debate among three teachers regarding several significant changes that they had suggested in a specific textbook unit, another teacher wrote in the discussion page:

> In my opinion the changes are exaggerated here. I would like to emphasize a sentence that was stated in the last meeting and that Shai didn't like: There are professional people who wrote the book with a broader and more secure view. I do believe that change begins in the field but we need a solid basis.

A similar episode occurred during the third whole-group face-to-face meeting. One of the teachers suggested to the group that a label be added to each "owl" icon, to indicate whether it is important or not ("owl" icons were used in the original textbook to signify lesson summaries, definitions, comments, and clarifications). Another teacher objected to labeling some "owls" as unimportant: "I think that if they [the textbook authors] decided to include it in the owl then it is probably important."

Moreover, most teachers introduced changes directly in the textbook, inserting new text, as well as changing or omitting existing text. Yet some teachers tended to suggest changes as ideas, describing them in the discussion pages, or in online forum-like discussions that accompanied the wiki-based textbook. In addition to technical difficulties that were the main source for this behavior at the beginning, sometimes, especially later in the year, this behavior was rooted in the participating teachers' perception of their role in producing the edited textbook. For example, one teacher continually stated that she only suggests ideas for changing the textbook, whereas it is the professional curriculum developers' task to carry them out—if they thought the ideas were good—and execute the actual editing of the book. For instance, in her interview at the end of the year, this teacher said:

T: Even changes to the textbook… because, really, it's, like, it is difficult for me to make any changes. No, not technically.
I: Why?
T: I don't know. Like, who am I, like, it is difficult for me, I don't want, like, to make changes. So I propose, and if it's good then
I: Then what?
T: Then they will take this idea.
I: Who?
T: The team of curriculum developers…

Consulting with Professionals Not Part of the Teachers' Usual Milieu

The project offered the first-year teachers the possibility of consulting with three professionals that are not part of the teachers' usual milieu: a representative of the textbook authors, a research mathematician, and a researcher in mathematics education. This consultation was restricted to queries related only to the following areas: reasons for specific choices made in the textbook by the textbook authors, the mathematics in the curriculum, and research in mathematics education. There were about twenty explicit requests for consultation during the year, most of which were directed to the representative of the textbook authors; none were directed to the researcher in mathematics education. All but two of the requests for consultation occurred during whole-group face-to-face meetings.

Most of the requests for consultation were directed to the representative of the textbook authors, who played a double role, since she was also a full member of the *Integrated Mathematics Wiki-book Project* team. Thus, she was present in all face-to-face meetings. As intended, almost all the queries to her were related to reasons for specific choices made in the textbook by the textbook authors. For example, teachers asked her why the authors did not provide captions to the different kinds of "owls", whether all the drawings in the textbook are supposed to be precise, what is the role of a specific part of a unit, why there is no definition of function in the

textbook, etc. Rarely, teachers also sought approval for their suggested changes. The most salient example was when one teacher, who suggested a complete change in the national curriculum so that it would be based on a functional approach, presented her suggestion in one of the whole-group meetings, and later repeatedly pressed for the textbook writers' opinion.

Seldom did the first-year teachers use the opportunity to consult with the mathematician who, unlike the representative of the textbook authors, was not part of the ongoing work. The teachers met the mathematician only once, when he introduced himself at a whole-group meeting, but he was available to answer questions via email and video chat using Skype. The teachers approached the mathematician three times, using the project team as mediators, mainly as a referee in cases when they strongly disagreed with each other (not necessarily about mathematics per se). For example, when the group of teachers could not reach a consensus regarding which of two textbook problems was more difficult for students, or which definition of the algebraic activity of substituting numerical values into expressions should be included in the textbook, if at all.

Conclusion

In this chapter we used the *Integrated Mathematics Wiki-book Project* to examine how the traditional unidirectional relationships between curriculum developers and teachers can be expanded into a bidirectional relationship: also from the teachers to the curriculum developers. The first year of the project provided an autonomous intervention-free work environment for teachers to freely edit the textbook as they wished, restricting—somewhat artificially—the scope of their interactions with other professionals. Thus, the project team offered extensive technical support but purposely avoided and even impeded any involvement with, commenting on, or evaluation of the teachers' work.

The initial examination of the ways in which the first-year teachers participated in the joint editing of a textbook they were using in class focused on characteristics that are not usually part of teachers' practice. The findings revealed that most teachers accepted the role of preparing a textbook that would be suitable for a broad student population rather easily. To this end, the teachers often used the knowledge that they had acquired from their own teaching experience as a springboard for textbook modifications, but took into account a variety of teaching contexts as well as different needs and preferences of various teachers, students, and the educational system at large (e.g., when considering the needs of both mainstream and lower-achieving classes, and when deciding to integrate the use of computers into the textbook).

Most teachers accepted their role in making changes to a textbook written by expert curriculum developers rather well; yet, a few did not. At times, some teachers refrained from making changes because of their respect for the expertise of the textbook's authors. Those teachers either protested against suggested changes that

appeared to contradict the intention of the textbook's authors' (e.g., labeling some "owls" as unimportant) or in general perceived their role as a suggestion maker for changes in the textbook, but leaving the decision of whether and how to carry out those changes to the experts.

The work environment provided to the first-year teachers purposely prevented them from freely interacting with professionals that were not part of the teachers' usual milieu. This kind of environment enables one to study changes that a group of teachers suggest to make in a textbook they use in class, without being intimidated by interventions and criticisms of people who might be perceived by the teachers as authority figures. This is the focus of another study that we are currently conducting. However, the work environment provided to the first-year teachers is rather artificial, and perhaps is not as beneficial, when the second goal of the *Integrated Mathematics Wiki-book Project*, which is promoting teachers' professional development, is considered. Not only might improving teachers' understanding of mathematics and of the curriculum be less successful this way, but this kind of work environment also prevents teachers from interacting with professionals who are not part of the teachers' usual milieu in more authentic ways. As described in this chapter, in the second and third years of the project this deficiency is addressed by modifying the teachers' work environment. Yet the findings of this preliminary study suggest that careful attention should be given in designing the work environment, so that it nourishes teachers' participation in the development of textbooks in ways that help them feel qualified to face other professionals.

The *Integrated Mathematics Wiki-book Project* was founded on the premise that teachers should become more genuine participants in the process of textbook development. The unique design of the *Integrated Mathematics Wiki-book Project* sets the stage for new and exciting ways for all teachers to actively participate in textbook development, and for professional curriculum developers and policy makers to learn about teachers' needs, desires, and aspirations.

This project also provides a unique research setting for examining important issues that presently are not well-understood or easily accessible to study. These include, for instance, teachers' expectations and aspirations for desired textbooks, the types of changes teachers think should be made in textbooks they use, and the contribution of specific work environments to teachers' joint editing of textbooks (affordances and limitations). This chapter lays the groundwork for such future research studies.

References

Bouhadana, R., Friedlander, A., Koren, M., Ozruso-Haggiag, G., Robinson, N., & Taizi, N. (2009a). *Integrated mathematics (Matematica Meshulevet): 7th grade—part A*. Rehovot: Weizmann Institute (in Hebrew).

Bouhadana, R., Friedlander, A., Koren, M., Ozruso-Haggiag, G., Robinson, N., & Taizi, N. (2009b). *Integrated mathematics (Matematica Meshulevet): 7th grade—part B*. Rehovot: Weizmann Institute (in Hebrew).

Clements, D. H. (2002). Linking research and curriculum development. In L. English (Ed.), *Handbook of international research in mathematics education* (pp. 599–630). Mahwah: Laurence Erlbaum.

Cobb, P. (1999). Individual and collective mathematical development: the case of statistical data analysis. *Mathematical Thinking and Learning*, *1*(1), 5–43.

Eisenmann, T., & Even, R. (2009). Similarities and differences in the types of algebraic activities in two classes taught by the same teacher. In J. T. Remillard, B. A. Herbel-Eisenmann, & G. M. Lloyd (Eds.), *Mathematics teachers at work: connecting curriculum materials and classroom instruction* (pp. 152–170). New York: Routledge.

Eisenmann, T., & Even, R. (2011). Enacted types of algebraic activity in different classes taught by the same teacher. *International Journal of Science and Mathematics Education*, *9*, 867–891.

Even, R., & Kvatinsky, T. (2010). What mathematics do teachers with contrasting teaching approaches address in probability lessons? *Educational Studies in Mathematics*, *74*, 207–222.

Gravenmeijer, K. (1998). Developmental research as a research method. In A. Sierpinska & J. Kilpatrick (Eds.), *Mathematics education as a research domain: a search for identity* (Part 1, pp. 277–296). Dordrecht: Kluwer Academic.

Grouws, D., Smith, M., & Sztajn, P. (2004). The preparation and teaching practices of United States mathematics teachers: grades 4 and 8. In P. Kloosterman & F. Lester Jr. (Eds.), *Results and interpretations of the 1990 through 2000 mathematics assessments of the National Assessment of Educational Progress* (pp. 221–267). Reston: National Council of Teachers of Mathematics.

Haggarty, L., & Pepin, B. (2002). An investigation of mathematics textbooks and their use in English, French and German classrooms: who gets an opportunity to learn what? *British Educational Research Journal*, *28*(4), 567–590.

Hershkowitz, R., Dreyfus, T., Ben-Zvi, D., Friedlander, A., Hadas, N., Resnick, T., Tabach, M., & Schwartz, B. (2002). Mathematics curriculum development for computerized environments: a designer-researcher-teacher-learner activity. In L. English (Ed.), *Handbook of international research in mathematics education* (pp. 657–694). Mahwah: Laurence Erlbaum.

Manouchehri, A., & Goodman, T. (1998). Mathematics curriculum reform and teachers: understanding the connections. *The Journal of Educational Research*, *92*, 27–41.

Ministry of Education (2009). Math curriculum for grades 7-9. Retrieved from http://meyda.education.gov.il/files/Tochniyot_Limudim/Math/Hatab/Mavo.doc (in Hebrew).

Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research*, *75*, 211–246.

Remillard, J. T., Herbel-Eisenmann, B. A., & Lloyd, G. M. (Eds.) (2009). *Mathematics teachers at work: connecting curriculum materials and classroom instruction* (pp. 152–170). New York: Routledge.

Schwarz, B. B., & Hershkowitz, R. (1999). Prototypes: brakes or levers in learning the function concept? The role of computer tools. *Journal for Research in Mathematics Education*, *30*, 362–389.

Simon, M. (1995). Reconstructing mathematics pedagogy from a constructivist perspective. *Journal for Research in Mathematics Education*, *26*(2), 114–145.

Stein, M. K., Grover, B. W., & Henningsen, M. (1996). Building student capacity for mathematical thinking and reasoning: an analysis of mathematical tasks used in reform classrooms. *American Educational Research Journal*, *33*, 455–488.

Stein, M. K., Remillard, J., & Smith, M. S. (2007). How curriculum influences student learning. In F. K. Lester (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 319–369). Charlotte: Information Age.