Principles and Processes for Publishing Textbooks and Alignment with Standards: A Case in Japan

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Mathematics textbooks play a central role in mathematics classrooms throughout the world. Shimahara and Sakai (1995) noted that teachers in both the United States and Japan depended on their textbooks to teach mathematics. Although the exact ways teachers use textbooks in teaching mathematics may vary, it is safe to say that textbooks are an important bridge between the intended curriculum, i.e., *standards*, and the implemented curriculum. In this paper, we will discuss how mathematics textbooks are produced in Japan, whose curriculum is often cited as an example of a focused, rigorous, and coherent curriculum.

1 Background

Schools: Japanese schools are divided into three categories: elementary (Grades 1 through 6, 6 years old through 12 years old), lower secondary (Grades 7 through 9, ages 13 through 15), and upper secondary schools (Grades 10 through 12, ages 16 through 18). Elementary and lower secondary schools compose the compulsory education; however, virtually all students go on to upper secondary schools, some of which are specialized high schools focusing on agriculture, commerce, or industrial technologies. Starting in the 2009 Upper Secondary School Course of Study, all 10th graders are required to take Mathematics I instead of selecting either Mathematics I or "Fundamental Mathematics," which was designed for non-college-intending students. Although Mathematics I is to be taken during Grade 10 in general, the new course of study allows some schools to cover the content in 2 or more years.

Teachers: In Japan, in order to teach in elementary and secondary schools, one has to obtain a teaching license issued by the Prefectural Education Board. To obtain the license, a candidate must complete a teacher education program at a college that is approved by the Ministry of Education, Culture, Sports, Science, and Technology (the Ministry of Education, hereafter), and then he or she will have to pass the teaching licensure test offered by the Prefectural Education Board. Of approximately 1 million elementary and secondary school teachers, about 80% are full time faculty members, while the remaining 20% are part-time lecturers. However, a teaching license is required for both groups. More recently, in order to utilize human resources beyond schools, some people without a teaching license have been hired to teach certain courses alongside of licensed teachers.

Japanese elementary school teachers are generalists who teach all subject matters while teachers in lower and upper secondary schools are content area specialists. Thus, at any given elementary school, only about one or two teachers received specialized training in mathematics during their teacher education programs or participate in a mathematics study group is limited. However, since about 90% of elementary school teachers teach mathematics, those teachers with a

specialized training play important roles in helping other teachers improve their mathematics teaching.

Textbooks: In Japan, textbooks are published by private publishers based on the *Course of Study* and the accompanying *Teaching Guide*, published by the Ministry of Education. All textbooks must pass through the textbook authorization process overseen by the Textbook Authorization Council. Currently, there are 6 publishers who publish mathematics textbooks for elementary and lower secondary schools -- all 6 publishing textbooks for both levels.

An overview of the textbook production is as follows. First, each publisher develops a draft version, which takes about one year. The draft version is then submitted to the Ministry of Education for its examination. Based on the comments received, the publisher edits the draft version and re-submit the revised version to the Ministry. This process will continue until sufficient revisions are completed. Typically, the textbook authorization process takes about 10 months. Once the textbooks are authorized, the publisher will produce the sample textbooks to be examined by local educational agencies, who will make the final decision on which series is to be adopted. The textbook adoption process takes approximately 6 months, and the new textbooks will be used in schools in the new school year immediately following the adoption decision. Therefore, it takes about 3 years between the time publishers begin producing their textbooks and the time they begin actually being used in classrooms.

As the previous discussion of the textbook production process clearly shows, both commercial publishers and the Ministry of Education play important roles in the production of textbooks in Japan. In the following sections, we will articulate their roles in more detail.

2 Roles of the Ministry of Education

There are three major roles in the production of textbooks in Japan: creation of the Course of Study, publishing the *Teaching Guide*, and the textbook authorization process.

Course of Study: The Course of Study is created by the Ministry of Education. Typically, there is a writing team consisting of about 15 members for each subject area at each school level, and a ministry official oversees the writing process. The writing team members include university professors, school administrators, and classroom teachers. The writing team drafts the course of study for each subject area by carefully examining the recommendations by the Central Education Council. After the Ministry of Education reviews the drafts from all writing teams, examining coherence across subject areas and appropriateness as a legal document, the draft is released to the public for their comments. Upon completion of the public comment period, the final document is released as a law. Typically, this process takes about 2 years.

Because the Course of Study specifies the content at each grade level, it clearly plays a major role in the textbook production. However, it is still a collection of grade-by-grade learning expectation statements. Sometimes the statements in the Course of Study are ambiguous and require further clarification. For that purpose, the Ministry of Education produces a separate document, typically called a *Teaching Guide*.

Teaching Guide: After the Course of Study is publicly released, the Ministry of Education forms committees to draft a *Teaching Guide* for each subject area at each level of schooling. Typically,

the members of this committee are the same as the writing team for the course of study. In about a year, the document is published through a private company as it is not a legal document. *Teaching Guide* clarifies the Course of Study by providing additional specifications and examples, as well as rationale for decisions the writing team made. Textbook publishers will examine both the Course of Study and the *Teaching Guide* as they create their textbooks. For both the Course of Study and *Teaching Guide*, go to the APEC HDR Working Group web page, Mathematics Standards in APEC Economies.

Textbook Authorization: The current textbook authorization process has been in place since the end of the World War II. Before then, textbooks were published by the government, and there was only one official textbook series in each subject area. The process of the textbook authorization at the Ministry of Education is as follows. The draft textbooks submitted by commercial publishers, typically called "white-cover edition," they are sent to appropriate Ministry officials and anonymous group of collaborators such as university professors. These reviewers will examine the draft textbooks following the guidelines for textbook authorization established by the Ministry of Education. The Ministry officials organize the comments submitted by the reviewers, then the draft version is officially judged by the Textbook Authorization and Research Council composed of scholars and called by the Minister of Education. The Council will then judge whether or not each series will be authorized, upon completion of required revisions. When publishers make the necessary revisions, the series is officially authorized. In recent years, no textbook series has failed the authorization process.

3 Roles of Commercial Publishers

Organization: The exact process of textbook production varies among publishers. However, most publishers organize a textbook writing committee which will determine the organization and sequencing of the content in each grade and allocation of lessons and the number of pages for each unit. Although the Course of Study dictates the placement of a specific content in a particular grade level, the Course of Study does not specify the sequence of topics within each grade level. Therefore, it is up to each publisher to determine a coherent organization of content within a grade level. The number of lessons in each grade level is determined by the School Law, and publishers typically try to keep the number of lessons in their textbooks to be several lessons fewer so that teachers can plan their instruction more flexibly. The committee will examine the coherence of each grade, within each content domain, and the series as a whole. Actual writing is done by subcommittees, which may be based on grade levels, content domains, or some other considerations.

Authors: Each publisher employs a team of authors to create its mathematics textbook series. These authors may be university professors, mathematics supervisors for local education agencies or classroom teachers. The list of authors is submitted to the Ministry of Education along with the draft version when it is submitted for the Ministry's review. In general, school teachers are prohibited to have a second job, but being a member of textbook authoring team is considered acceptable. Moreover, the fact that textbooks are written by a team that includes a number of experienced classroom teachers, not by professional writers who may or may not have any classroom teaching experiences, ensures that textbooks reflect the reality of classrooms.

Securing good authors is a very important task for any publisher. Therefore, publishers are always looking for young promising teachers, and that is one of the reasons members of editorial department attends various lesson study meetings. Some publishers try to nurture young teachers by engaging them in some preliminary work of textbook writing.

Teachers Manuals: Teachers manuals are purchased by each school. Teachers will use the manuals to construct their daily, unit, and yearly instruction plans. More recently, publishers began to provide some materials on CD or DVD as well as introducing web-based on-line support system. The members of editorial office will attend teacher study groups throughout Japan to monitor how teachers are using their textbooks and listen to their needs, which may be reflected in a newer edition of textbooks and their teachers manuals.

4 Issues and Future Prospects

Textbooks have changed significantly over the past several decades. Those changes reflect the changes in education philosophy and the advance in technologies involved in textbook production. They also reflect the needs and desires of users as well. Moreover, textbooks continue to change. In Japan, several factors seem to be pushing mathematics textbooks to include more and more materials.

In 2003, the Ministry of Education released a partial revision of the Course of Study in response to concerns for declining achievement due to a severe reduction in content and the number of class periods in the 1998 revision. Up till that point, the content of the Course of Study was what every student studied, and textbooks could not include content from later grades. However, with the partial revision of 2003, the Ministry of Education approved the inclusion of advanced materials so that those materials can be used with those students who have mastered the grade-level materials. In other words, not everything in textbooks is for all students. The 2008 Course of Study continues with this practice even though the content and the number of class periods have returned almost to the 1989 level.

Grade	Age (years old)	Standard number of class periods per year in the Course of Study						
		1951	1958	1968	1977	1989	1998	2011
elementary								
1	6	77	102	102	136	136	114	136
2	7	123	140	140	175	175	155	175
3	8	138	175	175	175	175	150	175
4	9	160	210	210	175	175	150	175
5	10	160	210	210	175	175	150	175
6	11	160	210	210	175	175	150	175
Lower secondary								

1	12	140	140	140	105	105	105	140
2	13	140	140	140	140	140	105	105
3	14	140	105-175	140	140	140	105	140

Table 1 Standard numbers of mathematics class periods in the Course of Study from 1951 through 2011.

Furthermore, in recent years, there is an increased interest in textbooks that students can use to study on their own. Traditionally, textbooks were created with the assumption that teachers will use them to guide students' learning. However, more recent textbooks include suggestions to promote students learning more explicitly instead of relying on teachers to provide those suggestions during mathematics lessons. Moreover, with the change in teacher demographics, it is anticipated that the number of less experienced teachers will increase dramatically. Thus, supporting young teachers has become an important consideration for publishers.

In many Japanese classrooms, ancillary materials such as workbooks are used along with textbooks. Some materials are produced by publishers while other materials are produced different publishers, sometimes following a specific publisher's textbook series very closely. The decision to use such materials is made by each school, or sometimes by each individual teacher. However, some believe that textbooks should contain enough materials so that ancillary materials are not needed.

All of the factors discussed above will necessitate an increased amount of content in textbooks and accompanying teachers manuals. Although such an increase may provide teachers with more options, teachers will also have to examine textbooks and make choices carefully.

5 Conclusions and Recommendations

The process of textbook production in Japan, along with some of the issues facing Japanese publishers point to a few suggestions and recommendations to other APEC economies.

Teaching Guide: A curriculum standards is a document reflecting our value judgment. As such, the authors of the document make a number of choices - in what grade should we introduce topic X, how much relative emphasis should be placed on topic Y, etc. The rationale for those choices should be made as explicit as possible so that textbook authors can respect the spirit of the standards. Therefore, we recommend that those who develop mathematics standards to also provide in-depth elaboration of the decisions they made.

For example, in the United States, the Common Core State Standards Initiative is developing a grade-by-grade mathematics standards for Kindergarten through Grade 12. Although the draft standards have not been released at the time of this writing, it is anticipated that the writing team will use its web page to provide more detailed articulation of the standards than what has typically been the case in many U.S. states. It will be useful for publishers, education officials, and classroom teachers to further consider what types of information is particularly useful in supporting mathematics instruction.

Careful Review of Textbooks: Whether this review is conducted by a government agency or by the publishers themselves, it is critical that a textbook series presents mathematics coherently. An extra care should be taken across different levels of schools (elementary, middle/lower secondary, high/upper secondary schools). Some publishers may publish textbooks only at a particular level, thus some forms of an external agency may be needed to conduct such a review. Moreover, those publishers who publish textbooks at only a particular level must carefully examine textbooks at other levels so that students' learning can be smoothly facilitated.

Furthermore, such a review will also consider the coherence with other school subject matters. Mathematics is an important tool for science, and many statistical ideas are used in social studies. For example, the concept of density is an important idea in physical sciences, and it is an example of ratios of two quantities from two distinct measurement fields. Thus, teaching of density in science should be carefully coordinated with the teaching of ratios in mathematics. Students should not encounter a mathematical idea they have yet to learn in other content areas. At the same time, mathematics textbook authors may want to consider how to utilize those situations as the motivation for a new concept.

Classroom Tested: Many curriculum developers conduct a pilot study as they develop their textbook series. However, no textbook is perfect, and they require an on-going revision. Textbook publishers should gather data from those who are using their textbook series to continuously learn things to improve. In the case of Japan, lesson study seems to serve as one mechanism to provide an on-going feedback to improve textbooks. (For more detailed discussion on lesson study, click here.) Research lessons often try to address students' learning difficulties that classroom teachers feel textbooks are not effectively addressing. As noted earlier, members of the textbook editorial office frequently attend these lesson study meetings and observe the lesson and listen to teachers' discussion afterward. Therefore, lesson study provides publishers opportunities to see new ideas in action, not just in theory.

Teacher Learning: Although the quality of textbooks has increased significantly, and although textbooks are no longer limited to the print medium, there are still a variety of constraints that have yet to be overcome. Thus, how well textbooks can support students' learning depends heavily on professional knowledge of teachers who use the textbooks to teach those students. A common saying among Japanese teachers is that "we don't teach the textbook, rather, we teach with textbooks." (See the paper by Takahashi in this monograph for more detailed discussion of this saying.) It is inevitable that new textbook series will include more resources that can support teachers' work. However, that will also mean teachers to make more decisions about the way they will use (or not use) textbooks. Thus, if we want teachers to "teach with textbooks" more effectively, we must support teachers' on-going professional development. Textbook publishers must, therefore, keep teachers' learning in their minds as they produce their textbooks, and particularly the teachers manuals.

Although the appearance of textbooks may change from printed books to multi-media packages, we believe they will still play the central role in mathematics instruction. We hope that this paper will provide useful ideas for those who are responsible for producing textbooks in their own economies.

References

Shimahara, N., & Sakai, A. (1995). *Learning to teach in two cultures*. New York: Garland.