

BOOK REVIEW

Mathematics classrooms that students love, grade 1: Numbers and operations by Jinho Kim (2023)

Sheunghyun Yeo¹

¹ Professor, Mathematics Education, Daegu National University of Education

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Abstract

Mathematics Classrooms that Students Love, Grade 1: Numbers and Operations is a book that reviews student-centered educational strategies in mathematics, contrasting the teacher-centered approach. The book included lesson plans, transcriptions, and annotated comments for imperative instructional practices. Drawing from a range of effective instructional practices, it explores how student engagement and enjoyment in mathematics can be fostered through innovative lesson structures, activities, and discussions.

Keywords: student-centered, instructional practices, engagement, discussion, elementary mathematics

I. INTRODUCTION

In the field of mathematics education, researchers have strived to find an answer to the question, *How can teachers teach an effective mathematics lesson?* Of course, they have yet to converge on a singular answer. However, consensus exists around two predominant perspectives (Campbell & Yeo, 2022; Munter et al., 2015; Yeo et al., 2023): the teacher-centered approach and the student-centered approach. The teacher-centered approach prioritizes typical instructional strategies that focus on efficient knowledge transfer via lectures. This would be what typical mathematics classrooms look like in Korea (Siraj-Blatchford & Nah, 2014). Teachers might write up the textbook problems and solutions on the blackboard, then students might jot down what teachers write on their notebooks. In such typical mathematics classes, teachers could plan and implement tasks tailored for students. However, since the tasks in the textbook might not take into account the different levels of students, students would easily divide into those who have reached the planned lesson goals and those who have not by taking an assessment.

In contrast, a student-centered approach advocates a more active role for students in the learning process. Students construct knowledge through collaborative activities in which they are actively involved, such as problem-solving, devising strategies, and using multiple representations (Campbell et al., 2023; Munter et al., 2015; Yeo et al., 2022). In particular, discussions are a vital part of this pedagogy. Keeping students engaged in mathematical discussions while making them meaningful could be challenging. Therefore, teachers are required to prepare for a lesson with the ability to implement a variety of productive practices, from creating a conducive mathematics classroom climate to designing suitable tasks and activities. Research has been conducted to highlight these aspects and to identify, through case studies, what makes for effective teaching (National Council of Teachers of Mathematics, 2014).

Author Jinho Kim wrote the book *Mathematics Classrooms that Students Love, Grade 1: Numbers and Operations*, to illustrate how to teach mathematics effectively from the student-centered approach. The book describes a series of classroom teaching by a mathematics education researcher. He draws on his own experience of teaching first graders in a local school to explore what kinds of mathematics lessons make students enjoy mathematics and, in particular, why this could happen in the classroom. This book represents a substantial contribution to the ongoing dialogue surrounding the student-centered approach and its implementations within mathematics classrooms. After a thorough review, it becomes evident that the text is not only a theoretical exploration but also a practical guide for teachers seeking to integrate these concepts into their teaching practices. In the following section, I briefly overview the structure of the book and characterize the tasks and activities.

II. BOOK OVERVIEW

The book unfolds across 11 chapters, each featuring tasks and activities designed to stimulate student engagement. Specific classroom examples are narrated first, followed by teaching and learning activities, teaching and learning guidelines, and potential discussion points that may arise along the way. The verbatim lesson transcripts provide a complete picture of the conversations between students and teachers. In particular, the author added his own commentary to the remarks. He also provides insights on what in-service teachers and preservice teachers should think about, focusing on the keywords of the 2022 revised mathematics curriculum in Korea, which is important in mathematics education.

For example, in Chapter 8, a comprehensive mathematics lesson covering a single topic over four periods is illustrated. The lessons focus on the story 'Ten Flashing Fireflies' to contextualize mathematical concepts for elementary students. The learning objectives encompass a range of foundational arithmetic skills including subtraction and addition, both with single and two-digit numbers, and the use of mathematical expressions to represent real-world situations.

The lesson spans 160 minutes, divided into four periods. The objectives are multifaceted, targeting various arithmetic skills:

- Subtract numbers less than or equal to 10 by decreasing by one.
- Add numbers from 0 to 10 by incrementing by one.
- Practice counting forwards and backward.
- Add two-digit numbers, with and without the inclusion of tens.
- Subtract two-digit numbers, with considerations for estimating.
- Identify commonalities across a spectrum of student-generated materials.
- Develop the ability to infer peers' mathematical thinking during their explanation.
- Articulate mathematical ideas in one's own language, based on peer explanations.

Instructional methods include the display of 'Ten Flashing Fireflies' book materials on a screen, with a focus on contextual numbers within the narrative. Students actively participate by embodying the fireflies, thereby enacting the story's scenarios. Mathematical expressions for addition and subtraction are visualized through charts, and students are tasked with an extension activity involving diagrammatic representation of numerical operations.

In the first period of the lessons, the author addresses the challenging yet enjoyable nature of the mathematics lessons evidenced by Irin's remarks. The author annotates his reflection on the atypical yet positive student responses to the mathematics lessons:

Annotation 8-1: Math time is challenging but fun.

I'm glad to hear the students' reactions. This reaction of students is generally not expected in the classroom where the math class is taught in the math school. Irin's reaction is 'It's so hard. But it's fun.' Let's think about it again. All teachers expect these reactions from students in math classes, but that expectation is always only an expectation, and it is very rare that it is realized....

He noted that the experimented class differs from typical mathematics instruction

through its emphasis on student agency in knowledge construction. It is posited that enjoyment in mathematics can lead to independent study habits outside the classroom. The goal, as described, is to induce intellectual euphoria without the need for extrinsic motivation, suggesting that students are intrinsically engaged when lessons are conducted in such an immersive manner.

III. STUDENT-CENTERED TASKS AND ACTIVITIES

When you look at a lesson, you can ask yourself who is the main character of the lesson. It can be a simple question. However, the answer to this question still requires a lot of discussion. However, the benefits of having a student-centered discussion in math class are self-evident. There is nothing stopping students from feeling the joy of discovery, the joy of participation, and becoming the protagonists of their own lessons.

The educational features of tasks and activities are distinguished by several notable features.

Connecting to Student Experience: The tasks are based on scenarios directly applicable to the students' lives. In the Korean mathematics textbook for Grade 1, students learn counting with objects that students may encounter in their lives. In the same vein, in Chapter 1, a unit for first graders on the numbers from 1 to 10 utilizes familiar contexts, such as counting family members' body parts, to introduce counting concepts. This approach not only validates students' prior experiences but also serves as a gateway to more complex numerical concepts.

Integrating with School Context: The activities are designed to resonate with the student's school context. For example, creating an April calendar in Chapter 2 is an event that connects to the fact that the first graders actually begin in April. Even though first graders enter schools in March, they spend a whole month for orientation as new students. Throughout the stories, students consider and make connections to mathematics classroom culture. While mathematics classrooms are often thought of as discovering mathematical patterns, this lesson starts with a different approach. Instead of looking for a given rule on a calendar, students construct and create the rules for a new calendar. In the process, students listen carefully to each other to understand each other's rules. The mathematics classroom in this book is a place where students construct and create new rules, not memorize given rules. The creation of an April calendar, coinciding with the start of the academic year for elementary mathematics, prompts students to engage with the subject matter in a culturally and temporally relevant manner. Eventually, this method encourages students to construct and infer mathematical rules rather than memorize them, thus fostering a deeper understanding and ownership of mathematical principles.

As another example, the 10-student museum field experience in Chapter 4 asks students to think about the activity of decomposing and composing 10. Rather than simply providing students with a number and showing them that 10 is the result, they are asked to come up with different ways to make the number 10, which gives them the experience of making 10 on their own through exploration. This field experience is also a part of school

context, which elicit students' genuine interest in context of tasks.

Bridging of Storytelling to Mathematical Learning: In Chapter 3, the use of a mathematics storybook, 'One Gorilla', serves as an example of integrating mathematical learning with storytelling and creative drawings. By engaging with the story and discussing various strategies for addition, students can explore mathematical concepts in a narrative context, thereby strengthening their computational thinking. The gorilla story becomes a new math story in which students develop their addition power without being locked into typical addition.

Multiple Entry Points for Mathematical Exploration: For example, in Chapter 7, 'Today's Number', students choose a number between 10 and 20 and create mathematical expressions using their own methods. As students explored different strategies, they were able to spontaneously discuss the fundamental principles of operation such as the commutative property. When a student discovers that the sum of two numbers is 10, the sum does not change when the order of addition is reversed, meaning that the commutative property of addition is something that students are able to discuss and construct as their own knowledge. There are also examples of students who are still first graders who are able to work with large numbers or use other operations beyond addition and subtraction. In exploring these different strategies, students have the experience of entering with different entry points and then exploring different ways of unfolding.

III. CONCLUSION

The transition to a student-centered approach in mathematics education from typical instruction has been strived through a significant shift in pedagogical practice. A student-centered approach highlights the importance of student agency and the role of educators in facilitating an environment where students can engage with mathematical concepts from multiple perspectives. In the book, as an effort of the approach, the tasks and activities not only enhanced student engagement but also promoted a deeper and more personal understanding of mathematics. It also offers a compelling argument for a student-centered approach to mathematics education. By presenting tasks that cater to a wide spectrum of entry points, the book provides a blueprint for educators to create lessons that not only engage students but also allow them to construct their knowledge, thereby fostering a deep and intrinsic motivation for learning mathematics. I do recommend this book to any teacher and teacher educator who would like to employ student-centered instructions.

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