

Foreword

Perhaps the major challenge facing those who wish to improve the mathematics learning of U.S. students is taking seriously the fact that teaching must change. Teaching is increasingly recognized as the key lever for improving learning, but changing teaching means something quite different from what the popular press would lead us to believe. It *does not* mean raising the certification requirements for teachers, creating alternative routes to licensure, or even recruiting more qualified candidates. Although recruiting talented teachers is always welcome, changing *teaching* is not about changing *teachers*—it is a different kind of task and requires different kinds of actions. Changing teaching requires, first and foremost, treating teaching as an object of study, a complex skill that can be studied and improved.

Treating teaching as an object of study is not common in the United States. Teaching usually is seen as the prerogative of individual teachers. Behind classroom doors, each teacher must figure out what works best for him or her. Naturally gifted teachers, says this folklore, blossom into effective teachers, and the profession just needs to find more of them. But this view means the profession can never improve beyond what a minority of teachers can figure out on their own. Even more damaging, this view denies two basic truths about teaching. The first is that teachers do not invent the methods they use—they inherit them from having watched their teachers teach when they were students. This means those naturally gifted teachers often use the same methods as everyone else. The second truth is that all teachers, gifted and not-so-gifted, can improve their practice. They can do so by studying carefully what they do and learning how they can do it better. By engaging all teachers in studying teaching, the profession as a whole can improve, and the learning opportunities of students in all classrooms can improve.

The uncommon value of this book is found in the way it treats teaching as an object of study. It engages all teachers in studying and improving teaching. It focuses directly on the details of teaching and on the methods used to interact with students about the content. It is these details that make all the difference. How teachers pose problems to students; how they work on problems with students; and how they engage students in analyzing and discussing and solving problems—these are the details of teaching that determine students' opportunities to learn. These are the details of teaching that matter. And these are the details explored throughout this book.

Why are the details of working on math problems the details of teaching that matter? Because students spend most of their time in math class working on problems, and, consequently, that's what sets the boundaries on what students will learn. One of the first things that the research team working on the TIMSS 1999 Video Study noticed was that eighth-graders all over the world—in countries as different as Australia, the Czech Republic, Hong Kong, Japan, the Netherlands, Switzerland, and the United States—spend an average of 80% of their time in math class working on math problems (see also Hiebert et al., 2003).

Here is where the details matter. What differed across countries was *how* the students worked on the math problems. In some countries, students did most of the mathematical work; in other countries, teachers did most of the work for the students. In some countries, students were asked to wrestle with problems they didn't already know how to solve; in other countries, students first watched the teacher demonstrate a solution procedure and then practiced the same procedure on similar problems. Imagine being a student in these different classrooms. The experiences would be completely different. The subject of mathematics would look completely different. The opportunities to learn would be completely different. This is how much teaching matters. The way in which the same topics are taught can change completely what students learn.

The framework the authors of this book provide for analyzing how problems are worked on during class beautifully captures the major differences we saw among the countries in the TIMSS Video Study. The framework directs attention to those exact details of teaching that shape the learning opportunities for students: what mathematical thinking is required by the problem, how this thinking is affected by how the problem is posed, and how this thinking is supported or undermined by the way in which teacher and students interact about the problem during class. To repeat, for emphasis, the critical questions are: What mathematical learning opportunities does the problem afford, and how are these opportunities sustained or diminished as the problem is posed and worked on during class?

If the learning goals for U.S. students include understanding concepts, using procedures flexibly, or even remembering procedures from year to year, then the results from the TIMSS Video Study along with numerous previous descriptions of math classrooms show that students need different opportunities from the ones provided in most U.S. classrooms on most days. Math problems need to be worked on in different ways. Teaching needs to change in just the ways highlighted in this book.

But how can teaching change? How can teachers who are currently teaching in one way learn to teach in a different way? The answer is simple to say

but really hard to do—by studying teaching and improving one’s practice a little each day, each week, each month; by *learning* how to teach differently. The contribution of this book is that it directs teachers’ attention to exactly those aspects of teaching that teachers must learn to do differently. It focuses teachers’ study of teaching on how to work on math problems with students. It brings these details of teaching to awareness and reveals that these are conscious, deliberate choices teachers can make, and that it is these choices that matter most for students’ learning.

But the authors do more than focus teachers’ attention on the key details of teaching. The authors respect both the complexity of teaching *and* the capabilities of teachers. They treat teaching as an object of study *and* they treat teachers as professionals who can study and improve their own practice. Of course, teachers are the only ones who can improve teaching; no one else can do this for them. But too often, educators suggest either that improving teaching is easy or that improving teaching is beyond the “pay-grade” of teachers. The authors of this book trust teachers to engage in the difficult work of changing their own teaching and, in turn, transforming the standard practice of the profession.

The authors succeed by applying their principles for helping students learn mathematics more deeply to the materials in this book in order to help teachers learn about teaching more deeply. How can students’ learning be facilitated? By being clear about the learning goals for students, by planning instructional activities aligned with these goals, and by implementing these activities in ways that do not diminish the cognitive and mathematical demands of the activities. How can teachers’ learning be facilitated? By being clear about the learning goals for teachers, by planning activities that are aligned with these goals, and by engaging teachers in work that does not diminish the intellectual demands of teaching. The authors apply these principles with equal effectiveness in both contexts.

Teaching is a complex, intellectually demanding skill. It will improve only through the hard and unrelenting work of teachers who study their practice and improve it over time. The authors of this book provide a guide that directs teachers to study the details of practice that matter for students. It is a book that offers the best kind of help—pointing teachers to the aspects of teaching that matter, refusing to diminish the intellectual challenge of this work, and investing in teachers to lead the profession toward a higher level of standard practice.

—James Hiebert