3 The Culture of Teaching

A Global Perspective

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THE CULTURE OF TEACHING: A GLOBAL PERSPECTIVE

Schooling must be one of the most successful innovations in the history of our planet. At some point schools did not exist. But now they are everywhere. There is hardly a place left in the world left untouched by the institution of schools (Baker, 2014; Boli, Ramirez, & Meyer, 1985; Ramirez & Boli, 1987). Although differences in schools surely exist from place to place, what is perhaps most striking is the commonality that has evolved: most schools are divided into classrooms, with students grouped together by age, with one adult (the teacher) working with many students. Teaching—the way this one adult works with students—is the central activity of schooling. Schools, and the teaching that goes on in them, have become highly stable cultural institutions. Their role in society is so pervasive that they determine, in large measure, the future quality of children’s day-to-day lives.

In this chapter, we report what we have learned in more than 30 years of observing classrooms, both in the U.S. and in countries around the world. We won’t get into the details, but instead present an overview of what we have learned from these experiences, and implications we see for future efforts to understand the relationship between classroom teaching and student learning. Much of our work together was in the context of the Trends in International Mathematics and Science Study (TIMSS) video studies. We will start by describing these studies, what motivated us to do them, and what we hoped to learn from them. We then describe what we believe are the most important lessons we learned.

Our own views have been greatly influenced by the TIMSS video work. Starting out searching for the holy grail of research on teaching—attempting to identify the features of instruction that predict student learning—we eventually came to see teaching as a complex cultural system whose effects are determined by the system as a whole, not by individual features. Teaching, itself, is a cultural activity, a set of routines that have evolved over long periods of time (Gallimore, 1996). The cultural routines of teaching, because they are cultural routines, often operate outside of our awareness, and are multiply determined. Consequently, they are highly stable and difficult to change. Unfortunately, current forms of teaching are not always optimal for learning. As the world changes and as students need different kinds of preparation, the traditional routines of teaching remain in place. Much of our story follows from these facts, and our attempts to take seriously their implications for improving teaching and learning.

Although our examples draw from eighth-grade mathematics classrooms, much of what we have learned is about teaching and learning more generally. Much of what we describe in this chapter could be applied across the school grade levels and in subjects other than mathematics.
BACKGROUND: TIMSS VIDEO

In the early 1990s, one of us was approached by the U.S. Department of Education, which was planning the Third International Mathematics and Science Study (TIMSS). The Department asked for help to design a questionnaire that could measure teaching quality across cultures. We suggested, instead, an ambitious plan for studying teaching cross-nationally never before attempted. Combining two distinct research traditions, we identified national probability samples of teachers (the hallmark of international survey research) but, instead of giving participants a questionnaire, we videotaped them teaching a single lesson in their eighth-grade classroom (a method that, until then, had been mainly used by researchers using small-scale qualitative and case-study methods). We initially studied eighth-grade mathematics classrooms in three countries—Germany, Japan, and the United States (Stigler, Gonzales, Kawanaka, Knoll, & Serrano, 1999)—and described the study in *The Teaching Gap* (Stigler & Hiebert, 1999). Later, we conducted a more ambitious study, adding the countries of Australia, the Czech Republic, Hong Kong SAR, Netherlands, and Switzerland (Hiebert et al., 2003) and expanding the work to include science classrooms as well (Roth et al., 2006).

Some might wonder: why collect videos of national random samples of eighth-grade mathematics lessons? We had two simple goals. First, we wanted a picture of what average teaching looks like in the United States. This is an odd concept to most people: why not videotape good teachers? Couldn’t we learn more by studying videos of excellent teaching? Although that, too, would be an interesting study, we wanted to learn about average teaching for one simple reason: most students, by definition, experience average teaching. If educators want to improve the quality of education, they need to understand what students’ typical experience looks like.

Our second goal was to compare mathematics teaching in different countries, especially those countries that produce high levels of achievement in mathematics and science. After a series of international studies in which U.S. students lagged behind those in other industrialized nations, it made sense to ask if others had figured out better ways than had U.S. educators to teach mathematics and science. We expected that teachers would teach mathematics and science in different ways in different countries, and we were curious to see how. But, as researchers, we knew that inferring causation from the patterns we found would be problematic, at best.

One final goal motivated our interest in the study. Anthropologists have long known that studying other cultures is one of the best ways to gain insight into one’s own culture. Applying this principle to teaching, we reasoned that spending time observing classrooms of other countries could yield new insights into U.S. classrooms, helping educators identify and question U.S. approaches to teaching. Within one’s own culture, much of what is done seems natural—to inhabitants of that culture. But when people look at other cultures and then back at their own, new things are noticed, an experience of “making the strange familiar, and the familiar strange” (attributed to the German poet, Novalis [1772–1801]).

This power of cross-cultural comparison became evident as the TIMSS video research team sat together watching the first videos from each country. At this early stage of the project, we were simply watching videos of lessons, subtitled into English, and discussing them within the research team, a team consisting of researchers from all the participating countries. We began by viewing a videotaped lesson from each country and asking each country representative to describe the lesson as we watched. Svetlana, the Czech representative, commented on the Czech lesson, which began like this:
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One girl was called to the front of the class and told that it was her turn to be “graded.” The teacher posed a problem—a hard one—and the girl started to work. After she had made some progress, the teacher began to quiz her, asking her to describe each step, explain why it made sense, and why she chose that approach to solve the problem. The rest of the class watched, and the segment went on for about 7 minutes. All was not smooth: at some points the girl struggled, and sometimes she had to retrace her steps in order to move toward a solution. When the girl was finished the teacher thanked her, then told her: “You get a grade of C for today.”

At this point, the representatives from the U.S., as well as some other countries were stunned: not only had we never seen anything quite like this, but we were pretty sure a teacher in our own country might get into trouble for such behavior. U.S. educators usually view grades as a private affair, something between the teacher and the student. Most would consider this kind of interaction risky and negative, potentially threatening to the child’s self-esteem. Interestingly, Svetlana wasn’t defensive. She hardly noticed the grading segment. It never occurred to her there was anything unusual about grading in this way. Even though the majority of Czech lessons began this way, Svetlana did not even list this as an important feature of Czech lessons. As she said later: “How else would you motivate students to prepare for class?”

This story illustrates the power of cross-cultural comparisons, and provides an early clue that teaching is a cultural activity. The details of cultural activities are hard for insiders to see, mainly because they are so pervasive within a culture. But, when you step outside your own culture, you not only can see how others approach similar tasks, you also become aware of the choices your own culture has made as it organizes its activities. This awareness, it turns out, is critical for any attempt to improve teaching. Routines that operate outside awareness appear natural, just the way things are—and must be. Bringing routines to awareness takes the mandatory and makes it optional, the first step for changing cultural routines.

TEACHING IS A CULTURAL ACTIVITY

In the mid-1990s, as we watched hundreds of hours of video arrive in our Southern California lab, we grew increasingly convinced of the cultural nature of teaching. It wasn’t the results of coding or quantitative analysis that convinced us. It was just our own perceptions that lessons within each country showed a particular pattern of routines, routines that varied relatively little within countries compared to the degree of variation across countries.

In hindsight, our Japanese collaborators in that first study anticipated this result. They asked why they needed to collect a national sample of lessons. “In Japan, we all teach the same way,” one of them explained. “You only need a few lessons to see how we teach.” Although we later found this to be true, we did not consider that a cultural pattern or code might be the underlying cause. Other explanations jumped to mind. For example, Japan has a comparatively homogeneous culture—ethnically, linguistically, and socioeconomically—and it also has a powerful centralized Ministry of Education.

So, it wasn’t the pattern of teaching routines in Japan that convinced us that teaching is a cultural activity; it was the homogeneity of routines in the U.S. This was surprising to us, especially given the belief, widely shared in the U.S., that teachers have the power to act with great autonomy. True, there is increasing pressure by states and districts to cover certain skills and concepts in the curriculum (e.g., National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). This gives at least an appearance of control over what teachers teach. But most people, including teachers, assume that teachers have control over how they teach. Our observations led us to refine this assumption.
Teachers might have control over how they teach, but to an uncanny degree, most teachers within the U.S. choose to teach in the same way. And the same appears true for other countries. It is as though the routines of teaching follow a script, generated by a hidden cultural code, a code that operates outside of teachers’ awareness but can be seen operating inside their classroom. This cultural script has a strong influence on teachers’ practice.

COMPARING TWO CULTURAL TEACHING ROUTINES

The differences in instructional routines across countries can be quite significant. Let’s take the case of mathematics teaching in the U.S. and Japan. As seen in the TIMSS videos, a mathematics lesson in the U.S. typically follows this sequence: the teacher begins by going over the homework from the day before, putting problems on the board and correcting answers. Then the teacher introduces the new skill to be taught, usually by working through a sample problem on the board. Often the teacher will ask students to suggest what the next step might be. Rarely will the teacher explain how the procedure relates to important mathematics concepts. Once the whole class has gone through an example together, the teacher asks students to try a few problems on their own, walking around to help students who are having trouble. The teacher then assigns more problems of the same kind as homework.

A Japanese classroom looks very different. Lessons, especially those near the beginning of a unit, often begin with the teacher posing a challenging problem for students to work on, either alone or in groups. Significantly, the problem is one that students have not been taught how to solve. In the United States, teachers rarely give students a problem to solve before they have been taught, step-by-step, how to solve that type of problem. Many Japanese students struggle with the problem and some appear confused. The teacher walks around the room and records what students are doing, often on a clipboard, sometimes offering hints but not suggesting solution methods.

After students have come up with some solutions, the teacher calls several students in order, based on methods they used during work time, to present their methods at the chalkboard. Sometimes teachers even ask a student to present a solution method they know to be incorrect, something that virtually never happens in U.S. classrooms. The teacher then leads a discussion of the different methods, all still showing on the board. The teacher asks students to compare the different methods, to describe and explain similarities and differences, and then helps students to connect their ideas with previously learned mathematical concepts and procedures. The teacher often ends the lesson with a brief lecture that summarizes and ties together what has been learned.

Clearly, these two different teaching patterns offer different affordances for student learning—not just how much students learn, but what they learn. When teachers were asked, after the videotaping, what they wanted students to learn from the lesson, 61 percent of U.S. teachers mentioned skills whereas only 25 percent of Japanese teachers mentioned skills. A typical U.S. teacher might say: “I want students to learn how to calculate the sum of the interior angles of a polygon.” Japanese teachers, in contrast, cited things they wanted students to understand at the end of the lesson (73 percent of Japanese teachers vs. 22 percent of U.S. teachers). Japanese teachers might say: “I want students to understand that any polygon can be subdivided into triangles, and that the number of triangles is always two less than the number of sides in the polygon.”

The different teaching patterns also socialize U.S. and Japanese students into different views of what it means to work on mathematics. For American students, mathematics must look like a subject that involves learning the steps required to solve each type of problem, steps that are demonstrated by the teacher. For Japanese students, mathematics must look like a subject
in which they are to figure out what approach might work when faced with a novel problem. The teacher might help them check whether their approach works, and the teacher is likely to compare one student’s approach to the approaches of other students, some of which are more advanced or efficient. But, while working on the problem, the student cannot count on the teacher to say which specific steps are the right ones.

We believe these daily routines have a far greater impact on students’ lives and on their learning than is usually acknowledged. People often remember the great teachers, and the unusual events, and we acknowledge that these have a profound influence on people’s lives. But our contention is that the events readers don’t remember or even notice—the ones that happen the same way every day over long periods of time—are the ones that influence students the most.²

THE PERSISTENCE OF CULTURAL ROUTINES

Cultural activities are learned implicitly through years of participation as students. Teachers might be trained in various methods and techniques during their teacher education, but the main influence on how teachers teach is the way they were taught as students (Lortie, 1975). It doesn’t take long for students to internalize the script that defines a mathematics lesson in their culture, and once it is internalized, it seems as if it’s the natural way to teach. Cultural routines themselves evolve over long periods of time and are multiply determined; everything, it seems, conspires to keep them in place—curriculum, textbooks, student expectations, parents’ beliefs about learning, and so on. And, because they are multiply determined, they are hard to change, as anyone who has ever tried to change the way teachers teach, or to change their own teaching, can testify.

Although teachers might innovate and tinker and push around the edges of their cultural routines—and many teachers do just that (Cuban, 1993)—educators should not under estimate the pervasive influence of the teaching routines themselves. Many U.S. policies to improve teaching focus on attracting better people into the profession: young people who are experts in the subject they would teach, people who score high on measures of scholastic aptitude, and so on (Kennedy, 2010). Of course, everyone wants the best and the brightest young people to become teachers: what could be more important for the future of society? But teaching will not change just by changing who teaches. Even the most brilliant of America’s young people, when faced with their first class of students, will act in the ways that seem most natural to them, enacting the routines they experienced as students (Branson & Grow, 1987; Lortie, 1975).

If this is true, then we need to shift our focus from teachers to teaching. If it’s the script, not the teacher, that most determines patterns of teaching in the classroom, then researchers need to identify those scripts that are most effective in promoting the desired student outcomes, and figure out how to adopt similar routines in their own culture. This was the main motivation for undertaking the second, larger video study. In the first study, Japan was the only high-performing country. But what about other high-performing countries? Would their cultural scripts be similar to Japan’s? We decided to find out. It was time to go hunting for the best ways to teach mathematics.

DISAPPOINTMENT ON THE ROAD TO BEST PRACTICES

The reason most people are interested in teaching is because they are interested in learning. We, too, started our work in different cultures because we wanted to understand why
mathematics achievement is so much higher in some countries than in others. The logic runs like this: if teaching is the component of the educational system directly designed to facilitate learning, then let’s look at teaching in high-achieving countries because they might have figured out what kind of teaching is most effective for student learning. On the surface, our initial work comparing instruction in Japan with the U.S. fit well into this research agenda because Japanese students score significantly higher than American students on mathematics tests, and Japanese teachers teach differently to U.S. teachers. Maybe we should adopt Japanese teaching routines. The research design, however, did not allow us to reach this conclusion. Japan was the only high-achieving country in our sample. It’s possible that Japanese achievement is caused by its teaching routines, but it’s also possible that it is something else that accounts for the difference—for example, maybe Japanese students work harder than American students, a hypothesis that is also consistent with previous research (Hess & Azuma, 1991; Stevenson & Stigler, 1992).

To investigate the relationship between teaching and learning using cross-national data, we needed to study a variety of high-achieving countries and see whether their teaching practices have something in common that differentiate them from lower-achieving countries such as the United States. If we found common practices in high-achieving countries, this still would not prove these practices caused better student learning (other factors still might be responsible), but these findings would provide some informed hypotheses that could be tested under more controlled conditions. We thus undertook a much larger study in which we compared the United States to six higher-achieving countries: the Czech Republic, Netherlands, Switzerland, Hong Kong, Australia, and Japan (Hiebert et al., 2003).

Is One Set of Cultural Teaching Routines Better Than Others?

Did the other high-achieving countries use teaching methods similar to those used in Japan? In a word, no, they did not. What we found instead was great variation in teaching among the high-achieving countries for most of the variables we measured. In other words, there was not just one set of teaching routines associated with high achievement. Teachers in the Czech Republic and Hong Kong, for example, spent much of their time teaching the whole class, whether through lecture or recitation. Teachers in the Netherlands, on the other hand, often had students work independently for much of the lesson, sometimes intervening very little in the flow of work. Japanese teachers seemed to fall in the middle on this dimension, as did American teachers. Many of these surface-level features of teaching, which reformers have spent so much time debating in the U.S., appear unrelated to levels of student achievement cross-nationally.

This finding was disappointing to many who were hoping for a list of best practices that would provide U.S. educators with a recipe for high achievement. But this finding should not come as a surprise. The history of research on teaching has produced few observable measures of teaching that successfully predict student learning (Nuthall, 2005). When correlations are found they are usually quite small, meaning that most of the variation in student learning is not related to anything researchers have yet measured about teaching practice. The Bill and Melinda Gates Foundation recently confirmed this result, but on a much wider scale. They invested a huge sum of money in a large video study designed to validate measures of teaching quality by relating them to value added estimates of student learning based on standardized tests (Bill & Melinda Gates Foundation, 2012). Again, the results were disappointing. Small correlations were found, but did not yield the kind of information that could guide educators who wish to significantly improve teaching and learning.
This leaves researchers with a significant challenge: it is well known that teaching matters, and also that it is one of the main levers educators can control if they want to improve students’ learning. But, it also appears there are many ways to teach effectively. It’s true that U.S. teaching routines do not seem to facilitate mathematics learning to high levels. But, because there seem to be many routines associated with high achievement, it’s not clear what, exactly, U.S. teachers should change if they want to improve students’ learning.

An additional complicating fact is that, just as there are many ways to teach effectively, the same teaching strategy might have different effects in different cultural contexts. Take, for example, the finding from our earlier work that Japanese teachers often begin lessons by posing problems that are rich, challenging, and novel for students. In Japan, the students usually dive in and begin working. But in the U.S., teachers who take this approach often report to us being met with empty stares, confusion, or protests.

Looking More Closely at the Details of Teaching

The fact that quite different teaching routines are associated with high achievement, and the fact that the same routines can have different effects in different contexts, left us wondering whether we could take away anything from the TIMSS video studies that could guide educators wishing to improve classroom teaching. A breakthrough in our own thinking came as we reflected further on the findings from the video studies, looking again at one of the only analyses that revealed a commonality among the high-achieving countries. This commonality was not in a surface feature of teaching, but in the details of how teachers worked with students on mathematics problems.

We classified all the problems presented during class time into three types: Stating Properties, Using Procedures, and Making Connections (Hiebert et al., 2005). Stating Properties were the simplest problems, for example, “What is the formula for the area of a triangle?” Using Procedures were the most common problems in most countries and involved practicing procedures students had already been taught. For example, the teacher might hand out a worksheet with ten triangles, dimensions labeled, and ask students to use the formula to calculate the area of each triangle.

Making Connections were rich problems that seem to hold more potential for engaging students in deep thinking about mathematics concepts. As an example, consider again finding areas of triangles. A Japanese teacher was observed to start the first lesson on area of a triangle by handing out a large piece of chart paper to each student. On the chart paper were printed line drawings of triangles of different types: acute, scalene, equilateral, right, and so on. Significantly, no dimensions were labeled: no numbers indicated the length of sides, no dotted lines indicated height. Students were told they could cut, draw, fold, or take a second sheet of triangles if they wished. Their task was to find a method for calculating the area of the triangles, not just any method but a method they could convince their peers would work for any triangle. Notice, students were not asked to calculate any of the areas—only to find a method that would work. Reasoning through this problem led students to consider the composition and decomposition of various geometric shapes, and led them to conjecture a formula that would work for all types of triangles.

The two most common types of problems presented across all countries (Using Procedures and Making Connections) are presented in Figure 3.1 (Hiebert et al., 2005). One thing is clear: Japan is an outlier in terms of the percent of problems classified as Making Connections. Japan is the only country for which the majority of problems presented were of this type. All countries presented some Making Connections problems, but in every country except Japan, the most commonly presented problems were Using Procedures. In fact, Hong Kong, the
other very high-achieving country in this sample, is at the opposite end of the extreme. And the U.S. is in the middle of the range, similar to other high-achieving countries.

The finding in Figure 3.1 was surprising to us because, as we watched the videotapes, we detected something different going on in the U.S. classrooms compared to those of its higher-achieving peers. We looked deeper, below the surface, beyond the types of problems presented, and examined in detail how teachers worked on the problems with their students. The problem presented—the one in the textbook, for example—is not necessarily the one with which students engage. Interacting with students about the problem is where teaching routines work their magic, connecting students with the real work of mathematics. In other words, it is how the teacher treats the problem, not the problem itself, that creates the real learning opportunities for students.

When we looked more closely at the Making Connections problems and how they were implemented during instruction, we saw that despite variations in teaching routines across the higher-achieving countries, all these routines created a common kind of rich learning opportunity for students. This can happen because, once a Making Connections problem is presented, it can be implemented by the teacher in a variety of ways, all of which maintain its making-connections potential. However, Making Connections problems also can be implemented in ways that completely change the learning opportunities they afford. For example, take the area-of-a-triangle problem described previously. A teacher might provide hints about things students learned in previous lessons, such as how to find areas of other figures, like rectangles. On the other hand, a teacher could become concerned about the confusion that momentarily appeared among students and say something like: “this problem seems to be very difficult for many of you. You might try \( \frac{1}{2} b \times h \) if you get stuck.” Clearly, this would change the problem from one that required deep thinking and struggle to one that required filling in numbers in a formula and calculating the result. The learning opportunities afforded would be completely different.

As Figure 3.2 shows, this kind of transformation of the problem happened frequently in the United States but much less frequently in the high-achieving countries. Compare Hong Kong and Japan. Whereas in Figure 3.1 these countries looked quite different, in Figure 3.2 they look almost identical. This shows that the two highest-achieving countries in our study differed markedly in the percentage of Making Connections problems they presented but were quite similar in how they implemented the problems once they were presented. In both Hong Kong
and Japan, nearly half of the Making Connections problems were implemented as such, providing students with the opportunity to struggle with important mathematics concepts and make connections among important facts, procedures, and concepts. The Netherlands and the Czech Republic showed a similar pattern. But the United States was a distinct outlier: essentially none of the Making Connections problems presented during the lessons were worked on as such. No students in these classrooms had the opportunity to think hard about the mathematical ideas or make connections that could further their understanding.

There are many interesting implications of this finding, not the least of which is the degree to which reform efforts (such as embedding more rich problems into the mathematics curriculum) can be completely over-run by the power of cultural teaching routines. Many educators in the U.S. have worked hard to create better curriculum materials that give students more opportunities to develop understanding of mathematical concepts and ideas. This work showed up in Figure 3.1 as the kinds of problems presented to students. Though a substantial number of such problems are implemented as intended by teachers in other, higher-achieving countries, they appear to be transformed by U.S. teachers, implemented as problems solved step-by-step procedurally, a common characteristic of U.S. teaching routines (see also Cohen & Ball, 1990; Hiebert & Stigler, 2000; Sarason, 1971).

**A SHIFT FROM TEACHING BEHAVIORS TO LEARNING OPPORTUNITIES**

Now we can see more clearly how to address the challenge posed earlier—how to guide educators to improve teaching if no one best method exists. Our response is: it is not the teaching routines themselves that will predict student learning, but the combination of the routines and the ways they are implemented in the classroom that create learning opportunities for students. Yes, different cultures have different teaching routines. But in cultures that produce high levels of mathematics learning, teachers use their cultural routines, implement them with their particular curriculum, consider their students’ backgrounds and tendencies, and then put all this together to effectively create the kinds of experiences from which their students can learn. Although teachers across the high-achieving countries employed a variety of teaching strategies
and routines, the effect of these strategies and routines across the high-achieving countries was to create similar learning opportunities that engaged students in actively grappling with core mathematics ideas and building relationships between facts, procedures, and concepts. The key seems to be creating these opportunities for students.

Based on results from the TIMSS video studies, much additional research, and our own experiences, we feel confident in proposing three distinct types of learning opportunities that are necessary to produce high levels of learning in mathematics and, we believe, in other subjects as well: productive struggle, explicit connections, and deliberate practice. Let us say a little about each of these, and why they made our list.

Productive Struggle

Most people wish that learning were easy. In our own culture, educators often seek ways to make learning more fun and enjoyable for students. But in at least some Asian cultures, struggle, more than fun, is seen as central to learning (Li, 2012). Mounting evidence from the learning sciences supports this view, finding that learning is hard work, resulting more often from long periods of struggle and confusion than from the kind of Eureka! moments educators strive to create (Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer, 2008; Kapur & Bielaczyc, 2012; U.S. Department of Education, 2013). Bjork (1994; see also Bjork & Bjork, 2011) coined the term “desirable difficulties” to refer to a body of research showing that introducing difficulties into the learning process can produce deeper and longer-lasting learning, even though the students give lower ratings to this process both with regard to their enjoyment and what they think they learned. If we want students to learn, we need to find ways to engage them in struggle and hard work.

Explicit Connections

Of course, just struggling won’t produce learning unless the struggle is focused on the right things. Learning with understanding isn’t just hard labor but requires actively connecting together just those skills, concepts, and patterns that constitute expertise in a domain (National Research Council, 1999). These connections don’t usually spring forth spontaneously. Teachers must point them out to students at the right time and in a form they can understand. Explanations, comparisons, analogies, and visual representations are all tools that, when used effectively, can help students create connections and develop deeper understanding (Richland, Holyoak, & Stigler, 2004; Richland, Stigler, & Holyoak, 2012). Teaching in this way requires considerable skill. As some have noted, deep content knowledge related to classroom practice can facilitate the development and deployment of these teaching skills to support students as they struggle to make connections to core concepts (Ball & Bass, 2000; Hill et al., 2008; Ma, 1999).

Deliberate Practice

This term comes from research on expertise (Ericsson, 2006), and on the kinds of experiences that produce high levels of expertise. It is widely assumed that learning takes time, and practice makes perfect. But the research shows it is not just any kind of practice. Repetitive practice of the sort mathematics teachers often assign for homework—solving, for example, 40 nearly identical problems on a worksheet—does not produce the kind of deep learning educators would like. Learning of this kind occurs when each new problem is different from the one before in some way that makes it more challenging (yes, and produces more opportunity for
struggle). Teachers must find ways to sequence and shape the problems and assignments they give their students to create high levels of challenge and deliberate practice.

The identification of three kinds of learning opportunities provides a useful way of describing the cause–effect relationships between teaching and learning. And it offers a way of addressing the challenge posed earlier: different teaching routines can produce the same learning outcomes, and the same routines can produce different outcomes. The concept of learning opportunities allows us to reconceptualize the relation of teaching and learning by noting it is not just the teaching strategies that matter, or the way a strategy is implemented, but the combination of these two processes that create the thing that matters most for the nature and degree of students’ learning—the opportunities students have to learn.3

CONCLUSION: CHANGING THE CULTURE OF TEACHING

Through our journey we have come to a very different point than readers might have anticipated. Things would be much simpler if we could identify specific teaching routines associated with high levels of student learning. Then, we could suggest a clear direction of change to improve the learning of U.S. students. Instead we have arrived at a different place. Teaching is guided by cultural routines, so it is not as easily controlled by the teacher, or as easy to change, as one might think. In addition, there are a variety of different routines associated with high student learning in different cultures. Although some cultural routines might be limited (e.g., the U.S. routines for teaching mathematics), the key to successful teaching is not just to adopt routines that can produce better learning, but to learn how to implement these routines in a given context so as to create productive struggle, explicit connections, and deliberate practice—the kinds of learning opportunities required to produce deep learning.

The implications for policy and research are as follows. First, we must shift our focus from teachers to teaching. So much of the current policy discussion centers on the teacher herself or himself—how to recruit better ones, how to incentivize them, and how to keep them teaching for longer (Education Week, 2008; National Commission on Mathematics and Science Teaching for the 21st Century, 2000). Teachers certainly vary in their expertise and, all other things being equal, it’s smart to recruit more able teachers into the profession. However, in the end, variation in teachers’ subject expertise can be dwarfed by the methods of teaching. We have seen many examples of competent teachers implementing well a teaching routine that is inherently limiting. At least as much attention should be paid to improving the quality of the methods teachers use—the routines that govern what happens in classrooms—as to the teachers themselves.

Second, we must shift our research focus from studying teaching behaviors to studying the learning opportunities afforded in classrooms, and how these opportunities vary both within and across cultures. We propose that a new conceptual layer be added to our thinking about the relationship between teaching and learning. The causal chain from individual teaching behaviors to student learning outcomes will never be a direct one. Instead, teachers in different cultures, teaching different subject matter to different students, will use a variety of strategies to create what seem to be universal and essential conditions for learning. If the goal is deeper learning, this is where researchers and educators should concentrate their improvement efforts.

Finally, teachers must be given time and support to work on designing and implementing routines that create these critical learning opportunities in their classrooms. Almost any teaching routine can be corrupted if it gets divorced from the goals it was intended to achieve. It is sometimes easy for teachers (and others) to forget that performing a teaching routine is not, in itself, the goal of the enterprise. For routines to be effective at creating learning opportunities for students, we must maintain a constant focus on the details of implementation. Routines
must be constantly adjusted to maximize their effects on student learning. Knowing what data to collect from students, and knowing how to use this information, is a kind of knowledge that can only be developed by teachers and researchers working together. Each kind of expertise is essential for improving the quality of teaching within each culture.

The concept of learning opportunities will not be popular because it takes what educators wish was simple and makes it more complex. Many current models of teacher assessment assume a direct and linear connection between what teachers do and how much students learn. These models produce assessment instruments that look for particular teaching behaviors rather than particular learning opportunities. Teachers can game these assessments by displaying the preferred teaching behaviors when they are assessed so they receive high scores. But this takes the focus off the students and the kind of learning in which they are engaged. Teaching methods are a means to an end (better learning opportunities), but many assessments are making them ends in themselves. The profession must keep its eye on what may be the most important part of teaching: the judgment to decide which of all the routines and methods our culture provides can be crafted together, in a particular context with particular students, to support learning.

NOTES

1. The “Third” was later changed to “Trends,” when the series of studies of which TIMSS was a part was extended for a fourth time.

2. We certainly aren’t the first to make this point: it was made more eloquently by Philip W. Jackson in his 1968 classic, Life in Classrooms.

3. Some readers may wonder about the connection between these learning opportunities and the Practice Standards of the US Common Core State Standards for Mathematics (National Governors Association Center for Best Practices and Council for Chief State School Officers, 2010). The Practice Standards describe “varieties of expertise that mathematics educators at all levels should seek to develop in their students”—in essence, some additional learning outcomes for students. The learning opportunities we propose, in contrast, describe the contexts educators can create to facilitate students’ development of mathematical proficiency, including outcomes such as those in the Practice Standards. On the face of it, it does seem that the opportunities we propose would lead to the kinds of outcomes described in the Practice Standards, as well as deeper understanding of core mathematical content. This hypothesis will need to be confirmed through empirical study.

REFERENCES


