

Who'll Fill the Gap?

By Chuck Downing

Stigler, James and Hiebert, James. (1999) The Teaching Gap. THE FREE PRESS. NY.

Some gaps are good. Without the *Cumberland Gap*, who knows how long the early American settlers would have remained married to the east coast. Without the *synapse*, the gap between consecutive neurons, much of our nerve physiology would be dramatically different. And *gaps* between my car and the others around me on the freeways of Southern California are always a satisfying situation.

But not all gaps are good. I've experienced too many gaps between the pieces of wood I carefully measured (twice!) and then cut and the space between the sides my piece was *supposed* to fill. And, while the synapse is a good gap, any gap between consecutive electric wires in a circuit is bad thing. Another bad gap is the one between theory and practice as described by Stigler and Hiebert in The Teaching Gap.

This commentary is based on a book, not the usual "article" that formed the basis for previous commentaries. The Teaching Gap is 179 pages of reporting on, review of, and reflection about the videotaped lessons portion of the TIMSS results. Far from the other TIMSS reports I've seen, this book has minimal statistical reporting. Mostly it presents condensed versions of several lesson tapes, then provides insightful interpretation. While I didn't agree with everything the authors' presented, there was a plethora of compelling evidence to support the bulk of their theories.

At this point, the usual admonition might be: Sit back, relax, and enjoy the read. But that's not what I hope happens to you while you read this. So, find a hard chair, one that you'll be sure not to doze off in and get ready to read something that will change the way you look at your teaching and the teaching profession as a whole.

Before some of you go out and read the book, then complain that it reports only on math teachers and teaching, I know that. I think it's fair to say that most disciplines have disgustingly similar problems as our math colleagues. In fact, Stigler and Hiebert state in the *Preface*,

The points we make go well beyond mathematics, however—and certainly beyond eighth grade. Mathematics teachers might find the book especially interesting, but our intention became to write a book that would be of interest to teachers in all subjects.

To begin, let me make it clear that the authors are not teacher bashers. In fact, every presentation about the TIMSS study is very supportive of teachers.

We have watched many examples of good teachers employing limited methods that, no matter how competently they are executed, could not lead to high levels of student achievement. (p. 10)

Their point is *not* that U.S. teachers “aren’t doing their job.”

To put it simply, we were amazed at how *much* teaching varied *across cultures* and how *little* it varied *within cultures* [emphasis mine]... Although we saw variation in the U.S. videos we collected, comparing them with videos from Germany and Japan allowed us to see something we could not see before: a distinctly American way of teaching, which differs markedly from the German way and from the Japanese way. (p. 11)

They make the point that it appears that “the American way of teaching,” as an entity unto itself, has much, much more to do with achievement than individual teachers. And they don’t blame teachers for not seeing this and changing.

The fact that teaching is a cultural activity explains why teaching has been so resistant to change... [W]hen teachers do change their practice, it is often in only superficial ways. (p. 12)

The primary reason for the lack of change in American teachers is

American teachers, compared with those in Japan... have no means of contributing to the gradual improvement of teaching methods or of improving their own skills. American teachers are left alone... (p. 13)

And how true that is! Once the door to a classroom closes, but even when teachers are outside the classroom and intentionally trying to improve, it’s almost always on our own time, or in some isolated, randomly periodic in-service session. U.S. teachers have little support if they want to change *and* little access to reasons to change.

Hmmm. I’m digressing. Let’s move on and take a look at the video component of the TIMSS. The study attempted to collect 100 lessons each from Germany, Japan, and the United States. That didn’t happen. Only Germany met the goal of 100. Fifty Japanese classes were videotaped and 81 U.S. lessons were documented on cassette.

Once inside the classroom, the videographers collected two main types of data: a videotape of the lesson and a questionnaire response from the teacher. They also collected supplementary materials... Each classroom was videotaped for one complete lesson on a date convenient for the teacher. (p. 18)

To insure that any given teacher wouldn’t select their “best class” for the videotaping,

... the video sample was constructed to be a random subsample of the full TIMSS sample... every eighth-grade math teacher in the country and each of the teacher’s classes had an equal chance of being selected for the study. (p. 19)

The authors acknowledge that what they saw might not be totally typical. However, they report

... students were on their best behavior in front of the camera, so we believe the videotapes do not show the normal frequency with which teachers must discipline their students. On the other hand, it seems unlikely that teachers asked completely different kinds of questions while being videotaped than they did when the camera was not present. (p. 20)

That classrooms tend to exhibit a constancy in questioning strategy over time is a critical point. I remember being very skeptical of a presentation at an NSTA convention when the speaker said he could tell from a one-lesson video whether a teacher was using inquiry on a regular basis. I questioned that. He responded that if a teacher used inquiry-like questions only for the lesson being videotaped, students would not know how to respond. [For more on the concept of teaching techniques to help with open-ended/inquiry concepts, see "Tune Up Your Teaching," also on this website.]

Because of that NSTA conference experience, and others since, I have no trouble believing that the summaries of teaching styles and concept difficulty included in the lessons generated by the TIMSS videotapes are accurate. The summaries of style and content are:

... German teachers are in charge of the mathematics and that the mathematics is quite advanced...A good motto for German teaching would be 'developing advanced procedures.' ...In Japan, teachers take a less active role, allowing their students to invent their own procedures... An appropriate motto for Japanese teaching would be 'structured problem solving.' ...In the United States, content is not totally absent, but the level is less advanced and requires much less mathematical reasoning than the other two countries... the [U.S.] motto is 'learning terms and practicing procedures.' (p. 27)

One scary item uncovered by TIMSS was

... an analysis of the grade level at which the majority of the forty-one TIMSS countries gave the most concentrated attention to each mathematical topic...The topics in the eighth-grade videotaped lessons were matched against this scale. The United States lagged significantly behind Germany and Japan. By international standards, the mathematical content of U.S. lessons was, on average, at a mid-seventh-grade level, whereas German and Japanese lessons were at the high eighth- and beginning ninth-grade levels, respectively. This means that most eighth-graders in the United States study topics that students in many other countries encounter a year earlier. (p. 57)

I'm pretty sure that TIMSS was not the primary driving force behind the move to standards-based teaching in California. In spite of that, the new California mathematics standards do require algebra much earlier in the school curriculum. However, beyond mathematical concepts, the idea of students doing critical thinking during lessons was also investigated.

In mathematics, deductive reasoning is often found in proofs. As it turns out, there were *no* mathematical proofs in U.S. lessons. In contrast, there were proofs in 52 percent of Japanese lessons and 10 percent of German lessons. Whatever students in the United States were doing with the definitions [they had learned], they clearly were not using them to develop proofs of mathematical relationships... We found that one-fifth of the topics in U.S. lessons contained developed concepts, while four-fifths contained only stated concepts... this distribution was nearly reversed in Germany [77% developed:23% stated] and Japan [83%:17%]. (p. 59-60)

Not a flattering place to be as an American math [or science?] teacher is it? Why do you think that American lessons *generally* seem to move in the same low-level morass?

We have learned that students in Germany and the United States learn mathematics by following the teacher's lead... on average, there is a balance in Japan. Mathematical work is shared by the teacher and the students. (p. 71)

“Mathematical work is shared by the teacher and the students.” What a concept. How much work do you do for your students? How much do they do? How equal is the sharing, or do you do *way* more than your share? Stigler and Hiebert don't point fingers, but they do point out that American math [science?] teachers tend to do more than their share of the work during lessons.

When we watched a Japanese lesson, we noticed that the teacher presents a problem to the students without first demonstrating how to solve the problem. We realized that U.S. teacher almost never do this, and we saw a feature... that is perhaps one of the most important features of U.S. lessons-that the teacher almost always demonstrates a procedure for solving problems before assigning them to students. (p. 77)

Here are summaries of the generalized patterns found in lessons from each of the three countries included in the video study.

The German Pattern

German lessons usually unfold through a sequence of four activities.

1. Reviewing previous material. [Can take many forms.]
2. Presenting the topic and problem for the day.
3. Developing the procedures to solve the problem. [Teacher-directed, but student-involved by offering suggestions and actually working at the board.]
4. Practicing. [Usually seatwork/homework of similar problems to that solved in class.]

The Japanese Pattern

Japanese lessons often follow a sequence of five activities.

1. Reviewing the previous lesson. [Each lesson builds on the previous lesson.]
2. Presenting the problem for the day. [Usually one key problem.]
3. Students working individually or in groups. [Rarely groups before an individual solution is developed.]
4. Discussing solution methods. [Solutions discussed are those generated by the students. Teacher *may* elaborate on some solution schemes.]
5. Highlighting and summarizing the major points. [Brief, lecture-like, summary of the lesson content.]

The U.S. Pattern

1. Reviewing previous material. [Typically a warm-up while homework is checked.]
2. Demonstrating how to solve problems for the day. [Teacher shows step-by-step how to solve the new problems.]
3. Practicing. [Seatwork solving problems similar to that demonstrated by teacher. Can be small groups.]
4. Correcting seatwork and assigning homework. [More practice problems assigned. Homework usually begun in class.]

From my years of experience as a high school teacher and now as a supervisor of student teachers, I think the American description is accurate. The authors contend

[Common activities in each lesson pattern] play different roles. For example, presenting a problem in Germany sets the stage for a rather long development of a solution procedure... In Japan, presenting a problem sets the stage for students to work... on developing solution procedures. In the United States, presenting a problem is the context for demonstrating a procedure and sets the stage for students practicing the procedure. (p. 81)

After viewing all the videos and their analyses, Stigler and Hiebert contend that teaching patterns evolve over time and are very consistent *throughout entire nations*.

But where does this shared knowledge come from? One possibility is that it is imparted to teachers in teacher-training programs. Another possibility is that the knowledge is cultural, passed on from generation to generation through human interactions. We contend, as do other educational researchers, that although teachers learn some things about teaching from their formal training, mostly they learn from simple cultural participation. After all, teacher spend at least thirteen years in classrooms, as students, before they even enter a teacher-preparation program. (p. 83)

The authors break teaching as a cultural activity into several components and compare only Japan and the U.S. First is the **Nature of Mathematics**.

Sixty-one percent of U.S. teachers described *skills* they wanted their students to learn. They wanted students to be able to perform a procedure,

solve a particular kind of problem, and so on... 73 percent of Japanese teachers said the main thing they wanted their students to learn from the lesson was to think about things in a new way, such as to see new relationships between mathematical ideas. (p. 89-90)

The next cultural component is the **Nature of Learning**. Amazingly, in this section, American individualism is more “stereotypically Japanese” than “stereotypically American.”

[In the U.S.], it would seem to be understandable that mathematics is best learned by mastering the material incrementally, piece by piece... Confusion and frustration, in this traditional American view, should be minimized; they are signs that earlier material was not mastered... One can infer that Japanese teachers believe students learn best by first struggling to solve mathematics problems... Frustration and confusion are taken to be a natural part of the process, because each person must struggle with a situation or problem first in order to make sense of the information he or she hears later. (p. 91)

The **Role of the Teacher** is the next cultural component. Look for “yourself” as you read this description.

[American] teachers act as if confusion and frustration are signs that they have not done their job. When they notice confusion, *they quickly assist students by providing whatever information it takes* [emphasis mine] to get the student back on track... [Japanese teachers] often choose a challenging problem to begin the lesson, and they help students understand and represent the *problem* [emphasis mine] so they can begin working on a solution... Rarely would teachers show students how to solve the problem midway through the lesson. (p. 93)

The cultural component of **Individual Differences** provides some very keen insight into our profession. To me, the Japanese ideas sound like past American educational rhetoric. Rhetoric we now put aside as not politically correct.

U.S. teachers believe that individual differences are an obstacle to effective teaching. Meeting each student’s needs means, ideally, diagnosing each student’s level of performance and providing different instruction for different levels... Japanese teachers view individual differences as a natural characteristic of a *group*... Tailoring instruction to specific students is seen as unfairly limiting and prejudging what students are capable of learning; all students should have the same opportunity to learn the same material. (p. 94)

The final cultural component discussed is the **Sanctity of the Lesson**. In Japan, lessons are so essential to learning that

... a great deal of attention is given to their development. They are planned as complete experiences—as stories with a beginning, a middle, and an end. Their meaning is found in the connections between the parts... And they must flow along, free from interruptions and unrelated activities. It is clear why *Japanese lessons we videotaped were never interrupted from the outside, not by P.A. announcements, not by lunch-count monitors, not by anyone* [all emphases mine]... In the United States, lessons are treated differently... The activities within a lesson are more modular, with fewer connections between them... It might not be surprising, then, that we found *almost one-third of the U.S. lessons were interrupted in some way*. (p. 95-96)

Sound familiar? While probably not the time nor place for a detailed discussion, I know I'd like to experience days on end of lessons without external interruptions. How about you?

The remainder of the book is a blueprint for changing the American system to make it more learning-oriented. Unfortunately, I am not optimistic that the proposed solution, although a wonderful one, will ever come close to being implemented. The reason for my pessimism is the time required for implementation of the author's plan.

Here in the good old US of A, we are quick-fixers. "Well, we didn't see test scores improve this year after we implemented that new [fill in subject area here] program in September, so we'll have to find a way that does work," seems to be the prevailing philosophy of most school boards.

Does that mean I don't think improvement is possible? No. What I do believe is that each teacher has the power to influence her/his students in a dramatic way during the year(s) they spend together. While I encourage all of us to support some form of long-term change, like that proposed by Stigler and Hiebert, I also admonish each of us to *do what we can now in our own classrooms*.

In how many of the cultural components did you see yourself in the American mode but wishing you could be more "Japanese" in your teaching? Before reading this book, my perception of Japanese teaching was media-derived—I really felt they ran little "factories" of identical students turning out identical products. I'm not ashamed to admit that I now believe the U.S. system is much *less* prone to develop independent, creative thinkers than the Japanese system is.

Differentiation of instruction is currently in vogue—I encourage it in my teacher preparation classes. But, I can't help but wonder what would happen if we actually accepted the research available about learning, didn't cave in to pressure from special interest groups demanding preferential treatment for "their" students, and moved to a more "Japanese-like" culture in our classrooms. Oh, I know the obstacles of "selling" such a radical idea to administrator, fellow teachers, and, most of all, parents.

But, imagine what your classroom could be like if students knew it was okay not to “get it” the first time they thought about it. And, what if we allowed all students to share equally in solving the “problem of the day,” and we valued each response as part of the whole solution?

Goodness! I must have been dreaming. But you know what’s really depressing? Until the early part of the 20th century, American education was not like it is today. Research and teaching were considered *co-equal* and *necessary* by and to all educators. But, when John Dewey left the University of Chicago, a distinction was made between educators and researchers. “Researchers would discover the best methods and teachers would implement them in their classrooms.” (p. 173) As a result of this, most educational reform is seen as top-down; not enough in-service on new techniques and strategies is provided; not enough practitioners are actively involved in research.

When research and practice are isolated, as they are in America today, you get a gap—a ***teaching gap***. What America has tried to do is recognize good teachers in a variety of ways, hoping that some of their “goodness” will trickle down to others. But, change doesn’t happen that way.

Celebrating individual innovations is fine, but individual innovations will never improve teaching in the average classroom. They cannot do so because they do not change *standard* practice. And, if we hope to improve the practice of the profession, it is the standard, common practice that must improve. (p. 178)

I do realize that any changes you make in your teaching won’t change the standard practice. But we all need to strive to be “star teachers.” As Stigler and Hiebert sum up in the final paragraph of the book

The star teachers of the twenty-first century will be those who work together to infuse the best ideas into standard practice... The star teachers of the twenty-first century will be teachers [like you!] who work every day to improve teaching—not only their own but that of the whole profession. (p. 179)

If any of this has struck a chord with you, I encourage you to get and read the whole book. I get no “finder’s fee,” but you will get a challenge. Let’s all help fill the teaching gap that exists now in the lives of our students. And, let’s commit to becoming part of the process that changes “standard practice” in the lives of those generations of students yet to come.