

Images of Teaching: The TIMSS Video Taping Project¹

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Scores from the Third International Mathematics and Science Study (TIMSS) of the International Association for the Evaluation of Educational Achievement (IEA) show that U.S. eighth grade students lag significantly behind their German and Japanese counterparts in mathematics. In an effort to better understand the overall different pedagogical methods used in these countries and their impact on student achievement, a video study collected videotaped records of actual lessons from representative samples of students belonging to these three countries. The study shows that U.S. teachers tend to deliver more fragmented, disjointed lessons and students spend less time performing practical activities in which learned concepts are applied.

Many readers may be aware of the Third International Mathematics and Science Study (TIMSS) of the International Association for the Evaluation of Educational Achievement (IEA). This study showed that, especially in eighth and twelfth grades, US students were far behind their competitors in Europe and the Far East in mathematics and science achievement. The few developing countries that participated in the program, such as Colombia and South Africa, scored at the bottom. But readers may not be aware that, in an effort to understand what was happening in the classroom, the TIMSS researchers undertook to video-tape actual eighth grade mathematics lessons in the US, Germany, and Japan. One hundred randomly selected classrooms in Germany, 50 in Japan, and 81 in the United States were videotaped. Subsequently, questionnaires were distributed to the teachers who were videotaped. A complex coding system was adopted to identify what teachers were actually doing in their classrooms; to ensure objectivity, coders were also provided with written transcripts and descriptions of each lesson, without identifying the country. This was the first time videotaping had been used to compare cultural differences in teaching. The results are fascinating, but perhaps dismaying, for those hoping for educational reform in the United States.

Us versus Japanese Classrooms

In the first place it was found that the mathematical content of the US eighth grade lessons lagged by at least a year compared to Germany and Japan; that is, the US eighth grade teachers were teaching concepts which had already been taught in seventh grade in Germany and Japan. But the problem was worse than that, since it was found that teachers in the United States were providing fragmented, disjointed lessons, especially compared to the Japanese, whose lessons were far more coherent. The typical US lesson presented a problem, demonstrated a procedure, and then set the stage for students practicing the procedure. The Japanese approach worked at a much deeper level. The problem set the stage for students to work, individually or in groups, on developing solution procedures. In quantitative terms, in the United States, 96 percent of seatwork time was spent in practicing routine procedures. In contrast in Japan, 41 percent of the time was spent in practice, 15 percent in applying concepts, and 44 percent in inventing or analyzing situations in new ways.

The US teachers described *skills* that they wanted their students to learn. They seemed to believe that mathematics was mostly a set of procedures and the goal was to help students become proficient executors of the procedures. They regularly intervened whenever students exhibited confusion or frustration. Individual differences among students were considered an obstacle to effective teaching. The activities in each lesson were modular, with few connections among them. Almost one third of US lessons were interrupted in some way.

¹ Based on *The Teaching Gap*, by James W. Stigler and James Hiebert, 1999, The Free Press, New York; and *The TIMSS Videotape Classroom Study: Methods and findings from an exploratory research project on eight grade mathematics instruction in Germany, Japan and the United States*, Washington D.C., National Center for Education Statistics, and Kluwer Academic Publishers, Netherlands, 1999.

Many US teachers seemed to believe that learning mathematical terms and practicing skills was not very exciting and acted as if student interest would be generated only by diversions outside of mathematics. They often tried to jazz up the lesson by being entertaining or even talking about other subjects.

Japanese teachers acted as if mathematics was a set of relationships between concepts, facts and procedures. These relationships were revealed by developing a variety of solution methods to problems, studying and refining the methods, and talking explicitly about these relationships. In the course of a lesson, students were allowed to make mistakes and then examine the consequences, and rarely would a teacher show students how to solve a problem midway through the lesson. Japanese teachers believed that individual differences were a resource because they provided a range of ideas and solution methods for student discussions and reflection. The Japanese treated each lesson much as one would treat a lecture in a university course or a sermon. Lessons were planned as complete experiences, as stories with a beginning a middle, and an end. Their meaning was in the connections between parts. They were never interrupted from the outside.

Professional Development in Japan

Nearly all Japanese schools are engaged in *kounaikenshuu*—a continuous process of school based professional development, usually three-hour weekly meetings. One of their most important endeavors is “lesson study,” in which teachers develop and implement lesson plans which are critiqued by other teachers. Lesson study is based on long-term continuous improvement, with a constant focus on student learning. Through *kounaikenshuu*, teachers feel that they are contributing to knowledge about teaching rather than simply their own professional development.

Lessons for Educational Reform

Based on the videotaping, subsequent interviews, and the experience of professional development in Japan, the lessons for educational reform are as follows:

1. expect and seek continuous but incremental improvement;
2. focus on student learning goals;
3. focus on teaching, not teachers (e.g., providing teachers with masters or even doctorates may not change how they operate in the classroom);
4. make improvement the continuous work of teachers; and
5. build a system that can learn from its own experience.

To ensure that these changes can happen, the school must be restructured as a place where teachers can learn. In particular the concept of “lesson study” undertaken by the Japanese should be introduced into in-service training.

Videotaping and Educational Change

The TIMSS videotaping study revealed profound differences in pedagogy, which deeply affect how and how much students learn. Based on the methodology, which is in the public domain, any country, state, or district can, through videotaping of a small random sample of classrooms, objectively identify the common classroom practices of its educational system. For the first time, a base line for starting the critical process of real classroom change is available.

A separate article, “Video Technology for Teacher Training: Micro-Teaching and other Adventures,” in the online Journal *TechKnowLogia*, November/December 2000, shows how micro-teaching, a decades old method of improving teaching through videotaping, has been a powerful but inadequately used tool for improving teaching. As part of the process of making the school the center where teachers learn, videotaping can also be used within schools, as a means of enabling teachers to critique their colleagues’ work and, in the process, develop more effective teaching methods.