

President's Message

TIMSS—What Can We Learn?

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The recent release of the 12th-grade achievement data from the Third International Mathematics and Science Study (TIMSS) completes the picture painted by the fourth- and eighth-grade data, and clearly, the results are not what we would like to see. But it is important to remember two things: we *are* making progress, and TIMSS gives us more than international rankings. TIMSS provides an abundance of information about curriculum, classrooms, students, and teachers that can be used as a starting point to reflect on our own practices and priorities. TIMSS raises questions whose answers can help us learn.

How challenging is our curriculum? The TIMSS curriculum analysis reveals that the U.S. curriculum contains more topics broken into smaller objectives than those of most other countries. Think about a 750-page algebra book with 120 lessons. Are your lessons focused on students' learning—or on “covering the material”? Do you pick and choose which lessons to include? And on what do you base your decision?

I recently asked an audience of mathematics teachers from grades 7 to 12 how many of them taught students to solve linear equations. Nearly every teacher in every course did. Compare this situation with that in other countries where students are expected to learn a topic and move on. Who makes decisions in your school or district about who should teach what concepts and when? It is time to talk to your colleagues about what they do and how it interfaces with what you do. The NCTM *Standards* provide guidelines for your mathematics curriculum, but each school must use those guidelines to connect the development of mathematical topics from grade to grade and course to course in a meaningful way.

What is basic? All TIMSS countries focus on computation in the early elementary grades, but as students move through the grades, most shift the notion of what is basic to other topics, particularly algebra and geometry. And the vast majority of countries do not divide students according to ability until after eighth grade. The typical U.S. middle school mathematics program has three levels, from remedial to accelerated. The division occurs to an even greater degree in urban and impoverished communities. For too many students, algebra, geometry, and statistics never even become part of their curriculum. What is basic in your school? Who gets to learn what mathematics and when?

What is happening in our classrooms? TIMSS conducted a video study of eighth-grade mathematics lessons in Germany, Japan, and the United States. According to the expert analysis of the content, no U.S. classrooms in the study focused on high-quality mathematical thinking and reasoning. Instead, as TIMSS data reveal, the goals of U.S. teachers were directed

toward showing students how to do something—61 percent of the reported goals were skills oriented. In contrast, 75 percent of the goals of Japanese teachers in the study were focused on helping students understand a mathematical concept. Six percent of U.S. teachers' goals were spent preparing for tests; neither Germany nor Japan have lesson goals involving test preparation. In the United States and Germany, 40 percent of the lessons made links with previous lessons or other mathematical ideas, in contrast to 96 percent in Japan. The data suggest that U.S. teachers state concepts rather than develop them. Think about your own teaching goals. Do you develop concepts? How do you help students think, reason, and make connections in the mathematics they are learning?

What about our teachers? According to TIMSS, U.S. teachers have more university training than teachers in all but a few of the 41 participating countries. Yet a recent report from the National Commission on Teaching & America's Future shows that nearly 30 percent of secondary school mathematics teachers do not have even a college minor in mathematics. That percent increases in “low track” classes and high-poverty schools. TIMSS data suggest that teachers in other countries have different entry levels into the profession. Many have to pass a qualifying exam and are given support as novice teachers. U.S. teachers spend more than 30 hours a week in the classroom teaching, whereas those in Germany teach just more than 20. Teachers in Japan spend more time talking with one another about what and how to teach. How much time do you spend discussing lessons with your colleagues? What professional development might help you better understand the mathematics you are teaching and how to teach it?

Much of the TIMSS data were gathered before many *Standards*-based curriculum projects were in place, before students had the opportunity to experience a complete program rich in problem solving and critical thinking. Clearly, there are places in the United States and Canada where excellent teaching and quality learning are taking place (see the NCTM Web site, www.nctm.org, for specific case studies). But TIMSS findings can give us all cause to reflect on what is taking place in our classrooms.

We should not view TIMSS as a means to emulate the educational practices of another country, nor even as a way to “catch up.” We must think instead about how to use the information from TIMSS, along with what we are learning from research, to find ways to give all students the mathematics education they will need for their future. Ω