LEARNING TASKS

What kind of work should students do in school? It is a question that lies at the heart of education and debates about education. The Third International Mathematics and Science Study (TIMSS) addressed this question by videotaping classroom activity in the United States, Germany, and Japan. The results revealed great differences between American classroom practice and most especially Japan's, where student achievement in math and science is consistently higher.

Overall, Japanese teachers use methods that, according to current research, are proven to be effective. By contrast, U.S. teachers use more outdated practices and techniques.

- Research confirms that learning is enhanced when students do most of the mathematics work during a lesson rather than watching the teacher do the work for them.[1] In Japan, students are asked to perform 40 percent of their math work in class. U.S. students are asked to do only about 9 percent of the work in class.[2]
- Reviews of research show that two obvious factors influence how much and how well students learn in school:[3]
    1. *Quantity of instruction*—the amount of time students spend actively learning
    2. *Metacognition*—how children monitor their own learning, intentionally planning to become more effective learners and continuously testing, revising, and evaluating learning strategies
- Quality teams, collaborative research teams, and project groups are common ways of organizing to get work done in the world outside school. Small-group learning also has a long history in education. However, while businesses give such groups considerable autonomy, teachers rarely give student groups similar independence. Consider the following:
    - TIMSS revealed that 11 percent of all U.S. fourth-grade math teachers report having students work in small groups without direct teacher assistance most or all of the time. For eighth grade, the figure is 12 percent.
    - In Ohio, 10 percent of third- and fourth-grade math teachers report having students work in small groups without direct teacher assistance most or all of the time.
    - In Ohio, 9 percent of seventh- and eighth-grade math teachers have students work in small groups most or all of the time.
    - In Ohio, 10 percent of math instruction in 12th grade occurs mostly in independent small groups.[4]

- Teachers in lower grades, who spend more time per week with the same group of students than teachers in higher grades, are more likely to use small-group instruction and to conduct classroom discussions about classwork.[5]
- At least once a week, about two-thirds of U.S. teachers ask students to explain how what they have learned in class relates to the world outside class. Teachers in lower grades ask this question more frequently than teachers in higher grades.[6]

Learning tasks chosen by Ohio's teachers are not unlike those in the rest of the nation's classrooms. However, there are alternatives. In suburban Chicago, the First in the World Consortium has achieved much different results. For this group, 23 percent of fourth-grade math classes and 16 percent of eighth-grade math classes work in independent groups most of the time.[7] These students outperformed all countries participating in TIMSS, except Singapore. Science classes followed a similar pattern.

It is clear that using small-group learning, teaching real-world applications, and asking students to do work in class are not new teaching concepts or techniques. They are all basic elements of any teacher's repertoire. Essentially, Japanese teachers and American teachers use many of the same techniques. But they use them differently to deliver different content.

Though teachers may be familiar with the basic principles of pedagogy, they also must be aware of ways to structure classroom tasks that maximize learning in the subject they are teaching. As the research shows, effective math teachers not only know *math*, and know how to teach, they also know how to *teach math*.

Endnotes

1. W. Doyle, "Work in Mathematics Classes: The Context of Students' Thinking During Instruction," *Educational Psychologist, 23,* 1988, pp. 167-80.
2. J. W. Stigler and J. Hiebert, *The Teaching Gap: Best Ideas from the World's Teachers for Improving Education in the Classroom,* The Free Press, New York, NY, 1999, p. 68.
3. M. C. Wang, G. D. Haertel, and H. J. Walberg, "What Influences Learning? A Content Analysis of Review Literature," *Journal of Educational Research, 84*(1), Sept/Oct 1990.
4. North Central Regional Educational Laboratory analysis of OMSC-sponsored Teacher Survey, 1999.
5. R. R. Henke, X. Chen, and G. Goldman, *What Happens in Classrooms? Instructional Practices in Elementary and Secondary Schools, 1994-95,* National Center for Education Statistics, U.S. Department of Education, Washington, DC, 1999.
6. Ibid.
7. P. Kimmelman, D. Kroeze, W. Schmidt, A. van der Ploeg, M. McNeely, and A. Tan, *A First Look at What We Can Learn from High-Performing School Districts: An Analysis of TIMSS Data from the First in the World Consortium,* National Institute on Student Achievement, Curriculum, and Assessment, U.S. Department of Education, Washington, DC, 1999.

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