For Your Information

TIMSS Repeat Study Released

In early December 2000 the National Center for Education Statistics (NCES) released a report containing initial findings from the Third International Mathematics and Science Study—Repeat (TIMSS-R). Entitled Pursuing Excellence: Comparisons of International Eighth-Grade Mathematics and Science Achievement from a U.S. Perspective, 1995 and 1999, the report builds on data collected during the first round of TIMSS, which was held in 1995. The U.S. has participated in such international studies for around forty years, but TIMSS-R is the only one designed specifically to allow comparison with a prior study.

Unlike TIMSS, which collected data on mathematics and science achievement at the fourth-, eighth-, and twelfth-grade levels, TIMSS-R focused primarily on eighth-grade achievement. Forty-one countries participated in the original TIMSS, and thirty-eight participated in TIMSS-R. The latter group included twenty-six nations that had participated in TIMSS in 1995, plus twelve others that were participating for the first time. Among those countries that decided against participating in the repeat study are Austria, France, Germany, and Switzerland. In the U.S. the TIMSS-R sample consisted of about 9,000 eighth-graders in 220 schools.

The report separates the participating nations into three groups whose scores were similar. The U.S. was in the middle group, where scores were above the international average, along with the Czech Republic, Malaysia, Bulgaria, Latvia, England, and Switzerland. The top group included twenty-six nations that had participated in TIMSS in 1995, plus twelve others that were participating for the first time. Among those countries that decided against participating in the repeat study are Austria, France, Germany, and Switzerland. In the U.S. the TIMSS-R sample consisted of about 9,000 eighth-graders in 220 schools.

The report discusses achievement in five mathematics content areas: fractions and number sense; measurement; geometry; algebra; and data representation, analysis, and probability. U.S. students scored below average in measurement and geometry and above average in the other areas. In none of the areas did the U.S. place among the high-scoring nations.

The TIMSS-R test included multiple-choice questions as well as “free-response” questions in which students had to present their reasoning. For example, one free-response mathematics question stated that in a club of 86 members there were 14 more girls than boys and asked students to calculate the number of boys and girls in the club. Twenty-nine percent of U.S. students got this problem right, compared to 33 percent of students internationally. The free-response sample problems in mathematics boiled down to a single numerical answer, but one of the science problems was open to multiple interpretations. The problem presented a “food web”, which is a diagram showing relationships among dependencies on food sources for a small group of animals, and asked students to use the diagram to figure out what would happen to the robin population if the corn crop failed. The report states that, provided logical explanations were given, three possible answers were acceptable for full credit: the robin population decreases, the robin population increases, and the robin population stays the same. Nevertheless, only 35 percent of U.S. students got this problem right, and the international average was 26 percent.

The report includes comparative data about the performance of different U.S. student populations. For example, the report states that there was no difference between U.S. boys’ and girls’ performance on the mathematics part of TIMSS-R. White students outperformed black and Hispanic students by a considerable margin. Students whose parents completed college had higher scores than those whose parents did not.

Part of the report is devoted to comparing data from TIMSS and TIMSS-R. No difference was found between the 1995 achievement of eighth-graders on TIMSS and the 1999 performance of eighth-graders on TIMSS-R. Most nations that participated in both studies also found little change. The only ones registering a significant rise in average scores were Latvia, Canada, and Cyprus, and the only one with a
significant drop in average score was the Czech Republic. The study found that U.S. black eighth-graders performed significantly better in 1999 than in 1995.

A group of seventeen nations participated in the fourth-grade TIMSS testing and in the eighth-grade TIMSS-R testing. Comparing data from the two rounds of testing can provide some insight into how students fare as they move through the educational system. Thus one can compare where U.S. fourth-graders placed in this group in 1995 to where U.S. eighth-graders placed in this group in 1999. Such a comparison indicates that the performance of U.S. students deteriorates between the fourth and the eighth grade, going from around average to below average in this group. By contrast, Canadian fourth-graders performed well below average in 1995, but Canadian eighth-graders performed slightly above average in 1999. The period 1995–99 coincides with a period of reform of mathematics teaching in many U.S. school districts. However, the report cautions: “Findings from comparisons between the results of TIMSS and TIMSS-R cannot be interpreted to indicate the success or failure of mathematics and science reform efforts in the United States.”

One part of TIMSS-R collected information about teachers’ background and preparation. Forty-one percent of U.S. eighth-grade mathematics teachers held degrees in mathematics, compared to 71 percent internationally. Still, U.S. teachers, more frequently than their international counterparts, reported feeling very well prepared to teach mathematics. On average, 90 percent of U.S. students are being taught by teachers who reported feeling very well prepared to teach mathematics; this percentage was exceeded only in Macedonia. By contrast, in Japan, where TIMSS-R scores were quite high, just 23 percent of students are taught by teachers who reported feeling very well prepared to teach mathematics. The report also notes that, according to information collected from U.S. mathematics teachers, professional development programs tend to emphasize topics like curriculum, teaching methods, and the use of technology and tend not to emphasize strengthening teachers’ knowledge of mathematics.

The report Pursuing Excellence may be downloaded from the Web site http://www.nces.ed.gov/timss/timss-r/. At the time of this writing the report was available only electronically, but a print version was forthcoming.

—Allyn Jackson

**Correction:** The Notices has recently undergone a change in the manner in which the publication is submitted to the printer. As a result of this transition, an erroneous font substitution occurred in the mathematical equation in the cover graphic for the February issue. The mathematics should have appeared as:

\[ V(2,1,0) \oplus V(2,1,0) = V(4,2,0) \oplus V(3,2,1) \oplus V(4,1,1) \oplus V(3,3,0) \oplus V(2,2,2) \]

The Notices regrets this error.