Highlights from the

2003 Trends in International Mathematics and Science Study

Note: There are10 pages in this document, including the title page.
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TIMSS 2003 Tables

Table 5. Average mathematics scale scores of eighth-grade students, by country: 2003

Country	Average score
International average[1]	466
Singapore	605
Korea, Republic of	589
Hong Kong SAR[2,3]	586
Chinese Taipei	585
Japan	570
Belgium-Flemish	537
Netherlands[2]	536
Estonia	531
Hungary	529
Malaysia	508
Latvia	508
Russian Federation	508
Slovak Republic	508
Australia	505
(United States)	**504**
Lithuania[4]	502
Sweden	499
Scotland[2]	498
(Israel)	496
New Zealand	494
Slovenia	493
Italy	484
Armenia	478
Serbia[4]	477
Bulgaria	476
Romania	475
Norway	461
Moldova, Republic of	460
Cyprus	459
(Macedonia, Republic of)	435
Lebanon	433
Jordan	424
Iran, Islamic Republic of	411
Indonesia[4]	411
Tunisia	410
Egypt	406
Bahrain	401
Palestinian National Authority	390
Chile	387
(Morocco)	387
Philippines	378
Botswana	366
Saudi Arabia	332
Ghana	276
South Africa	264

■Average is higher than the U.S. average
□Average is not measurably different from the U.S.
□Average is lower than the U.S. average

[1] The international average reported here differs from that reported in Mullis et al. (2004) due to the deletion of England. In Mullis et al.,the reported international average is 467.
[2] Met international guidelines for participation rates in 2003 only after replacement schools were included.
[3] Hong Kong is a Special Administrative Region (SAR) of the People's Republic of China.
[4] National desired population does not cover all of the international desired population.
NOTE: Countries are ordered by 2003 average score. The test for significance between the United States and the international average was adjusted to account for the U.S. contribution to the international average. The tests for significance take into account the standard error for the reported difference. Thus, a small difference between the United States and one country may be significant while a large difference between the United States and another country may not be significant. Parentheses indicate countries that did not meet international sampling or other guidelines in 2003. Countries were required to sample students in the upper of the two grades that contained the largest number of 13-year-olds. In the United States and most countries, this corresponds to grade 8. See table A1 in appendix A for details.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2003.

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TIMSS 2003 Tables

Table 6. Average science scale scores of eighth-grade students, by country: 2003

Country	Average score
International average[1]	473
Singapore	578
Chinese Taipei	571
Korea, Republic of	558
Hong Kong SAR[2,3]	556
Estonia	552
Japan	552
Hungary	543
Netherlands[2]	536
(United States)	**527**
Australia	527
Sweden	524
Slovenia	520
New Zealand	520
Lithuania[4]	519
Slovak Republic	517
Belgium-Flemish	516
Russian Federation	514
Latvia	512
Scotland[2]	512
Malaysia	510
Norway	494
Italy	491
(Israel)	488
Bulgaria	479
Jordan	475
Moldova, Republic of	472
Romania	470
Serbia[4]	468
Armenia	461
Iran, Islamic Republic of	453
(Macedonia, Republic of)	449
Cyprus	441
Bahrain	438
Palestinian National Authority	435
Egypt	421
Indonesia[4]	420
Chile	413
Tunisia	404
Saudi Arabia	398
(Morocco)	396
Lebanon	393
Philippines	377
Botswana	365
Ghana	255
South Africa	244

■Average is higher than the U.S. average
□Average is not measurably different from the U.S.
□Average is lower than the U.S. average

[1] The international average reported here differs from that reported in Martin et al. (2004) due to the deletion of England. In Martin et al., the reported international average is 474.
[2] Met international guidelines for participation rates in 2003 only after replacement schools were included.
[3] Hong Kong is a Special Administrative Region (SAR) of the People's Republic of China.
[4] National desired population does not cover all of the international desired population.
NOTE: Countries are ordered by 2003 average score. The test for significance between the United States and the international average was adjusted to account for the U.S. contribution to the international average. The tests for significance take into account the standard error for the reported difference. Thus, a small difference between the United States and one country may be significant while a large difference between the United States and another country may not be significant. Parentheses indicate countries that did not meet international sampling or other guidelines in 2003. Countries were required to sample students in the upper of the two grades that contained the largest number of 13-year-olds. In the United States and most countries, this corresponds to grade 8. See table A1 in appendix A for details.
SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2003.

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The Release of U.S. Report on Grade 12 Results From the Third International Mathematics and Science Study (TIMSS)
February 24, 1998

Statement of Pascal D. Forgione, Jr., Ph.D.,
U.S. Commissioner of Education Statistics
National Center for Education Statistics (NCES)

Today feels like graduation day for all of us who have spent the last few years working on the TIMSS study. The results of schooling in America are now in. Our most significant finding is that U.S. 12th grade students do not do well. When our graduating seniors are compared to the students graduating secondary school in other countries, our students rank near the bottom. This holds true in both science and math, and for both our typical and our top-level students.

How do we know this? Our 12th graders along with students in their last year of school in more than 20 countries were tested in 1995 as part of the Third International Mathematics and Science Study, better known as TIMSS. The results are included in this report, Pursuing Excellence: A Study of U.S. Twelfth-Grade Mathematics and Science Achievement in International Context. This is the third report from the study. Previous reports covered international comparisons of 4th graders and 8th graders.

In sheer quantitative terms, TIMSS is the world's largest, most comprehensive, and most rigorous international education comparison ever. In 1995, researchers tested the mathematics and science knowledge of more than half a million students in 41 countries at three grade levels-primary, middle, and end of secondary. This is far more than any previous study. TIMSS ensured that the participating students in each country were representative of its population -- this study is a fair evaluation.

Today we are here to present the results of TIMSS covering the end of secondary school. We actually gave four different tests to these students. In 21 countries, students were tested for general knowledge in mathematics and science. In addition, in 16 countries, advanced students were tested in physics and advanced mathematics. This study included largely the developed European countries, plus the U.S., Canada, Australia, and New Zealand. Asian countries chose not to participate.

TIMSS is not an assessment of other country's best students against our average students, but of the entire range of students in each country. While the percentage of young adults who complete secondary school in the U.S. once was significantly larger than the percentage in other countries, this is no longer the case.

Results of the Advanced Students Assessments

U.S. student performance on the assessments in Advanced Mathematics and Physics was among the lowest of participating countries and, in both cases, below the international average. On the Advanced Mathematics assessment, the U.S. was outperformed by 11 countries, was similar to four countries, and did not outperform any country. On the Physics assessment, the U.S. was outperformed by 14 countries, was the same as one country, and did not outperform any country. On all five content areas that make up Physics and all three content areas comprising Advanced Mathematics, the U.S. was below the international average and was outperformed by a majority of the other countries.

Who took the advanced TIMSS assessments? A random sample of the approximately 10-20 percent of students in the last year of school in each country took these tests. In the U.S. the students who took the Advanced Mathematics TIMSS had already taken or were currently enrolled in precalculus, calculus, or Advanced Placement Calculus. They represented 14 percent of young people their age in the U.S. compared with the 19 percent average for the 16 countries as a whole. In the U.S. the students who took the Physics assessment had previously taken or were currently enrolled in Physics. They represented 14 percent of young people their age which was the same as the international average for all participating countries. Therefore, the U.S. performance was not the result of any differences in the selectivity of students taking the assessments.

When we compare these international students to our most advanced students, we come closer to the international average. In the U.S., many of our advanced students do not take calculus, but a quarter of the items on TIMSS Advanced Mathematics assessment are Calculus questions. When we looked at U.S. students who had taken calculus, we found that their performance were close to the international advanced student average. Six countries outperformed this U.S. Calculus population, seven were similar, and the U.S. outperformed two countries. If we compare only those U.S. students with Advanced Placement Calculus to the international advanced mathematics group, only France outscored the U.S. Advanced Placement students. The U.S.

Today, similar proportions of young people are enrolled at the end of secondary schooling in most of these countries. Since some nations group their students into different types of schools with different graduation requirements, TIMSS assessed students in their last year in all types of schools and programs in all countries. This last grade ranged from the ninth grade in some vocational programs through the 14th grade in other programs.

Results of the General Knowledge Assessments

When we look at the results, we see that the U.S. was among the lowest performing countries on both the mathematics and science general knowledge assessments. U.S. performance was below the international average in both mathematics and science. In mathematics we were outperformed by 14 out of 20 countries, were similar to four countries, and outperformed two countries. In science we were outperformed by 11 countries, were similar to seven, and outperformed the same two countries. This relatively low U.S. performance is not a change from patterns of previous international assessments at this grade level. It also continues the pattern of slightly better performance in science than in mathematics.

Please note that in talking about the U.S. performance relative to other countries, we should not try to rank them in strict numerical order. Because the data are based on samples of students each score has a statistical margin of error and really represents a range of possible scores. For this reason, we refer to bands of performance for countries that perform better than, similar to, or poorer than the U.S. It would be statistically wrong to say that one country was better than the U.S. if it is in the same group, even if its average score looks different than ours.

Contrary to myths about U.S. education, our poor performance is not because our student body is more diverse or because we have a lot of low scores pulling down the overall U.S. average. Most countries have students from diverse language and cultural groups. It is also true that the other countries in this study have a similar range of performance as the U.S., covering 300 points from the 5th to 95th percentile. However, the entire distribution of U.S. scores both starts and ends lower than in most other nations. This means that the average level of general knowledge in mathematics among students in a majority of these countries matched that of the top quarter of U.S. students. Similarly, a student scoring at the 50th percentile in mathematics in the U.S. would be at about the 25th percentile (or below) in 12 nations. Therefore, we cannot blame our overall low performance on our bottom students; the problem is across the board.

When we compare these 12th grade TIMSS results to the previously released fourth and eighth grade results, we see a loss of competitive advantage. This means that, when comparing the same groups of countries across grades, the relative standing of U.S. eighth graders is lower than that of our fourth graders; and the standing of U.S. fourth graders is higher than that of our eighth graders. In mathematics, fourth graders outperformed five countries and seven were similar to the U.S. In Physics, when the U.S. Advanced Placement Physics students were compared with the Physics students in other countries, the U.S. students were outperformed by four countries, were similar to ten countries, and outperformed one country.

Factors Related to Performance

Our analysis of TIMSS data do not suggest any single cause of this level of U.S. performance. For example:

- Television: Students in other countries watch just as much television as our students;
- Part-time jobs: More U.S. students work in part-time jobs and work more hours than students in countries that scored higher and lower than us; and
- Homework: Students in some countries that outperform us do less homework and studying than we do, while students in other countries that we outperform do more.

One factor that we did find related to performance was the amount of instructional time on advanced mathematics. The U.S. had a significantly lower proportion than the international average of advanced students receiving 5 or more hours of mathematics instruction per week. Countries that had a higher proportion of their advanced mathematics students receiving five or more hours of instruction were more likely to outperform our students than those countries with a similar or smaller proportion of students receiving that much instruction.

Conclusion

TIMSS provides good information to help educators, policymakers, and the public make well-informed decisions. Sound data support sound policies. And TIMSS reports are just a starting point. The TIMSS resource kit, which includes materials on curriculum, teaching, and achievement, helps educators to evaluate their own schools.

The National Center for Education Statistics (NCES) is committed to learning more from TIMSS. We will continue to make this rich data base widely available and to sponsor further research on the relationship between student achievement and educational structures, processes, and student experiences around the world.

We will be conducting a second round of TIMSS. I am pleased to announce that in the Spring of 1999, my Center will collaborate with the National Science Foundation and our international partners on an international assessment to determine whether the fourth graders of 1995 who performed so well on TIMSS are able to maintain their high comparative standing four years later as eighth graders. This will provide valuable insight on the effects of the education reforms of the 1990s.

In the United States, we call graduation commencement. It is not just an ending to one's school

of our 12th graders is lower than that of our eighth graders.

career, but also a beginning of the next phase in one's life. I see today's unveiling of the TIMSS results in the same way. It is not an ending, a final calculation of our students' achievement. It is really the beginning of our efforts to use this valuable information to improve our education system and to raise the performance of our students.

For more information on TIMSS, visit the Website at: http://nces.ed.gov/timss/

Link To:
A Study of U.S. Twelfth-Grade Mathematics and Science Achievement in International Context (Report)
Riley Urges Students to Take Tougher Courses: Challenges Schools and States to Raise Academic, Testing and Teaching Standards in Math and Science (Press Release)