

Press Release

Achievement Results for IEA's 2011 Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS)

East Asian Countries Lead Achievement in Mathematics, Science, and Reading

- **TIMSS 2011 Assessed Student Achievement in Mathematics and Science at the Fourth and Eighth Grades, including 63 Countries and 14 States or Regions**
- **PIRLS 2011 Assessed Student Achievement in Reading at the Fourth Grade in 49 Countries and 9 States or Regions**
- **More Countries Show Increases than Decreases in Achievement over Past Decade**
- **Key Factors for Achievement Include Early Childhood Education, Supportive Home and School Environments, Experienced and Satisfied Teachers, and Positive Student Attitudes**

Amsterdam, The Netherlands (11 December 2012)—Students from East Asian countries, in addition to a select group of European countries, outperform students around the world in mathematics, science, and reading, at both the fourth and eighth grades, according to results released today by IEA and the TIMSS & PIRLS International Study Center at Boston College.

In **mathematics at the fourth grade**, Singapore, Korea, and Hong Kong were top performers, followed by Chinese Taipei and Japan. Northern Ireland, the Flemish Community of Belgium, Finland, England, and the Russian Federation also performed very well. In **mathematics at the eighth grade**, Korea, Singapore, and Chinese Taipei led the world in achievement, followed by Hong Kong and Japan. There was a substantial gap in achievement between these five East Asian countries and the next highest performing countries, including the Russian Federation, Israel, Finland, the United States, and England. For example, the gap in average achievement between Korea and England is more than 100 points.

In **science at the fourth grade**, top-performing countries were led by Korea and Singapore, followed by Finland, Japan, and the Russian Federation. Next came Chinese Taipei and the United States. In **science at the eighth grade**, Singapore had the highest achievement, followed by Chinese Taipei, Korea, and Japan. Finland, Slovenia, the Russian Federation, Hong Kong, and England also performed well.

In **reading at the fourth grade**, the four top-performing countries were Hong Kong, the Russian Federation, Finland, and Singapore. Northern Ireland, the United States, Denmark, Croatia, and Chinese Taipei also had higher achievement than the majority of other participants, followed by Ireland and England.

TIMSS and PIRLS 2011 represent a landmark event—the first time the two renowned international assessments have been conducted concurrently. In 2011, TIMSS assessed 600,000 students in 63 countries and 14 benchmarking participants, and PIRLS assessed 300,000 students in 49 countries and 9 benchmarking participants. [Note: A list of participating countries is at the end of this release.]

“TIMSS and PIRLS are designed to measure trends in achievement and to show growth or decline over time,” explains Dr. Hans Wagemaker, Executive Director of the International Association for the Evaluation of Educational Achievement (IEA), which funds TIMSS and PIRLS. “As a result, many countries and benchmarking participants have comparable data from previous assessments that allow them to monitor system-level trends in a global context.”

TIMSS was the first global assessment of mathematics and science to provide data about trends over time, measuring achievement in these subjects every four years at the fourth and eighth grades. TIMSS 2011 was the fifth assessment since 1995. Performance on PIRLS represents the “gold standard” internationally for reading comprehension at the fourth grade. PIRLS has measured trends in reading comprehension at the fourth grade every five years since 2001, with PIRLS 2011 being the third assessment.

In TIMSS at the **fourth grade**, 17 countries have data measuring trends in mathematics and science achievement over the 16-year period from 1995 to 2011. Indeed, since 1995, twelve of these countries have raised their levels of average **mathematics** achievement: Australia, England, Hong Kong, Iran, Japan, Korea, New Zealand, Norway, Portugal, Singapore, Slovenia, and the United States. Only three countries had decreases in mathematics since 1995. Eight countries have raised their levels of **science** achievement since 1995: Hong Kong, Hungary, Iran, Japan, Korea, Portugal, Singapore, and Slovenia. Just one country showed a decrease in science achievement.

Over the 10 years of PIRLS assessments, 21 countries have comparable data measuring trends in **reading** achievement. From 2001 to 2011, ten countries raised their reading achievement: Colombia, the Czech Republic, Hong Kong, Iran, Norway, the Russian Federation, Singapore, the Slovak Republic, Slovenia, and the United States. Only four countries showed declines over the past decade

At the **eighth grade** in TIMSS, 25 countries have trend data spanning from 1995 or 1999 to 2011. Of these 25 countries, nine had increases in **mathematics** achievement: Chile, Chinese Taipei, Hong Kong, Italy, Korea, Lithuania, the Russian Federation, Slovenia and the United States. During this same period, however, eleven countries had decreases in mathematics achievement at the eighth grade. In **science**, eleven countries had increases from 1995 or 1999 to 2011: Chile, Hong Kong, Iran, Japan, Korea, Lithuania, the Russian Federation, Singapore, Slovenia, Tunisia, and the United States. Six countries had decreases in achievement during this period.

“A number of countries have been working hard to improve their educational achievement, for example, by redeveloping curricula, raising standards for teacher certification, or increasing the number of years of schooling,” said Drs. Ina V.S. Mullis and Michael O. Martin, Executive Directors of the TIMSS & PIRLS International Study Center. “It is impressive that so many have been able to improve student performance since 1995.”

As in previous cycles, TIMSS and PIRLS 2011 report achievement at four international benchmarks. These describe what students know and can do in mathematics, science, and reading, and can be used to help interpret achievement scores.

In addition, another unique feature of TIMSS and PIRLS 2011 is the extensive set of contextual information collected by student, teacher, school, curriculum, and parent questionnaires. These provide insights into factors that are positively related to academic success.

Significantly, key findings include the following:

COUNTRIES REACHING THE “ADVANCED” BENCHMARK

- In **mathematics at the fourth grade**, students in the East Asian countries had the largest percentages of students reaching the TIMSS International Benchmarks, with gaps between these countries and all others at the Advanced and High levels. Singapore, for example, had 43 percent of their students reach the Advanced International Benchmark, followed by Korea, Hong Kong, Chinese Taipei, and Japan (with from 39 to 30%). The next highest country was Northern Ireland, with 24 percent reaching the advanced level.
- In **science at the fourth grade**, the two countries with the highest average science achievement—Singapore and Korea—also were the countries with the largest percentages of students reaching the TIMSS Advanced International Benchmark (with 33 and 29%, respectively), followed by Finland with 20 percent, and then the Russian Federation, Chinese Taipei, the United States, and Japan, each with between 16 and 14 percent.

- Among the top-performing countries in **reading at the fourth grade**, Singapore had the largest percentage of students reaching the Advanced Benchmark (24%), followed by the Russian Federation, Northern Ireland, Finland, England, and Hong Kong (with between 18 and 19%).
- In **mathematics at the eighth grade**, the same five East Asian countries had by far the largest percentages of students reaching the Advanced International Benchmark: Chinese Taipei, Singapore, and Korea led with nearly half, followed by Hong Kong with about one-third, and Japan with over one-fourth. The country with the next highest percentage of students achieving this level was the Russian Federation, with 14 percent.
- In **science at the eighth grade**, Singapore by far had the largest percentage of students reaching the Advanced Benchmark, with 40 percent, followed by three other East Asian countries: Chinese Taipei, Korea, and Japan (with between 24 and 18%). The Russian Federation again was the country with the next highest percentage of students achieving this level, with 14 percent.

TRENDS IN ACHIEVEMENT

- Since 1995, twelve TIMSS countries have raised their levels of average **fourth grade mathematics** achievement: Australia, England, Hong Kong, Iran, Japan, Korea, New Zealand, Norway, Portugal, Singapore, Slovenia, and the United States. Only three countries had decreases in mathematics since 1995. Remarkably, nine countries have been able to improve at all four International Benchmarks since 1995, including Australia, England, Hong Kong, Iran, Japan, Korea, Portugal, Slovenia, and the United States.
- Since 1995, eight countries have raised their levels of **science achievement at the fourth grade**: Hong Kong, Hungary, Iran, Japan, Korea, Portugal, Singapore, and Slovenia. Just one country showed a decrease in science achievement. Six countries improved at all four International Benchmarks during this same period: Hong Kong, Iran, Korea, Portugal, Singapore, and Slovenia.
- Over the 10 years of PIRLS assessments, from 2001 to 2011, ten countries raised their **reading achievement at the fourth grade**: Colombia, the Czech Republic, Hong Kong, Iran, Norway, the Russian Federation, Singapore, the Slovak Republic, Slovenia, and the United States. Only four countries showed declines over the past decade. In reading, there were also more improvements across the International Benchmarks than declines. Six countries showed increases at all four benchmarks: Hong Kong, Iran, the Russian Federation, Singapore, Slovenia, and the United States.
- Since 1995 or 1999, nine countries had increases in **mathematics achievement at the eighth grade**: Chile, Chinese Taipei, Hong Kong, Italy, Korea, Lithuania, the Russian Federation, Slovenia and the United States. During this same period, however, eleven countries had decreases in mathematics achievement at the eighth grade. In addition, just three

countries improved at all four International Benchmarks: Korea, Lithuania, and the United States.

- In **science at the eighth grade**, eleven countries had increases from 1995 or 1999 to 2011: Chile, Hong Kong, Iran, Japan, Korea, Lithuania, the Russian Federation, Singapore, Slovenia, Tunisia, and the United States. Six countries had decreases in achievement during this period. Similar to mathematics at the eighth grade, just three countries improved at all four International Benchmarks since 1995: Korea, Lithuania, and Slovenia.

HOME ENVIRONMENT AND PREPRIMARY EDUCATION

Internationally, mathematics achievement at the fourth grade was higher if children's parents...

- Engaged them in early numeracy activities (for example, counting rhymes or songs, playing with number toys and games with shapes, and counting different things);
- Similarly, children's reading achievement was higher when parents engaged their children in early literacy activities (such as, reading books, telling stories, singing songs, and playing word games);

In addition...

- Mathematics achievement at the fourth grade was higher when parents reported that children could do early numeracy tasks upon starting primary school (for example, counting by him/herself, recognizing different shapes/written numbers from 1 to 10, and writing numbers from 1 to 10); and
- Likewise, reading achievement was higher when parents reported that children could do early literacy tasks upon starting primary school (such as, recognizing most of the letters of the alphabet, reading some words and sentences, and writing letters of the alphabet and some words).
- Attending preprimary education also is associated with higher mathematics, science, and reading achievement internationally, and the more years of preprimary education, the greater the benefit.
- Lastly, higher achievement in mathematics, science, and reading was associated with having home resources for learning, including parents that are well-educated and in professional occupations, many books and reading materials in the home, and study supports such as their own room for studying and an Internet connection.

FACTORS FOR SUCCESS: SCHOOL ENVIRONMENT

- Students with higher achievement attended schools with more affluent student bodies and that did not suffer from resource shortages—having sufficient buildings, space, and staff. Moreover, achievement was higher

- when teachers reported hardly any problems with overcrowding, or inadequate workspace or supplies to conduct lessons.
- Higher achieving students attend schools that emphasize academic success. That is, these schools establish rigorous curricular goals, and have students that desire to do well, parental support, and teachers that understand and are effective in implementing the curriculum.
 - Higher achieving students also attend schools that are safe and orderly, having hardly any problems with disciplinary safety, and where students are almost never bullied. Unfortunately, bullying does have a negative impact on achievement—as the frequency of bullying behavior increases, student achievement in reading, mathematics, and science decreases.

FACTORS FOR SUCCESS: TEACHERS

- TIMSS and PIRLS 2011 found that, across countries, students who had teachers with at least ten years of experience had higher achievement in reading at the 4th grade, and in mathematics and science at the 4th and 8th grades.
- Students with teachers who had greater career satisfaction had higher achievement across these subjects.
- Teachers' instructional skills also play a role in affecting student achievement. Good teaching practice—specifically, instruction that engages students—can bring the student and the subject matter together in a way that sparks interest and stimulates learning. Internationally, students who reported being “engaged” in their lessons had higher mathematics, science, and reading achievement. That is, higher achieving students knew what their teacher expected, had a teacher who is easy to understand, were interested in what the teacher said, and were given interesting things to do.

FACTORS FOR SUCCESS: STUDENT ATTITUDES

TIMSS and PIRLS 2011 found that the following attitudes were related to higher achievement:

- Liking mathematics, science and reading;
- Feeling motivated to read;
- Feeling confident in mathematics, science, and reading; and
- At the eighth grade, valuing mathematics and science.

TIMSS and PIRLS are projects of the International Association for the Evaluation of Educational Achievement (IEA) and are directed by the TIMSS & PIRLS International Study Center at Boston College.

TIMSS and PIRLS 2011 Participants

TIMSS 2011 participants included Armenia, Australia, Austria, Azerbaijan, Bahrain, Belgium (Flemish Community), Botswana, Chile, Chinese Taipei, Croatia, the Czech

Republic, Denmark, England, Finland, Georgia, Germany, Ghana, Honduras, Hong Kong SAR, Hungary, Indonesia, the Islamic Republic of Iran, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, the Republic of Korea, Kuwait, Lebanon, Lithuania, Macedonia, Malaysia, Malta, Morocco, the Netherlands, New Zealand, Northern Ireland, Norway, Oman, the Palestinian National Authority, Poland, Portugal, Qatar, Romania, the Russian Federation, Saudi Arabia, Serbia, Singapore, the Slovak Republic, Slovenia, South Africa, Spain, Sweden, the Syrian Arab Republic, Thailand, Tunisia, Turkey, Ukraine, United Arab Emirates, the United States, and Yemen. Benchmarking entities included the Canadian provinces of Alberta, Ontario, and Quebec, Canada; the Emirates of Abu Dhabi and Dubai, United Arab Emirates; and the states of Alabama, California, Colorado, Connecticut, Florida, Indiana, Massachusetts, Minnesota, and North Carolina, the United States.

PIRLS 2011 participants included Australia, Austria, Azerbaijan, Belgium (French Community), Botswana, Bulgaria, Canada, Chinese Taipei, Colombia, Croatia, the Czech Republic, Denmark, England, Finland, France, Georgia, Germany, Honduras, Hong Kong SAR, Hungary, Indonesia, Islamic Republic of Iran, Ireland, Israel, Italy, Kuwait, Lithuania, Malta, Morocco, the Netherlands, New Zealand, Northern Ireland, Norway, Oman, Poland, Portugal, Qatar, Romania, the Russian Federation, Saudi Arabia, Singapore, the Slovak Republic, Slovenia, Spain, Sweden, Trinidad and Tobago, United Arab Emirates, and the United States. Benchmarking entities included the Canadian provinces of Alberta, Ontario, and Quebec, Canada; Malta (Maltese); South Africa (English and Afrikaans); the Autonomous Community of Andalusia, Spain; the Emirates of Abu Dhabi and Dubai, United Arab Emirates; and the state of Florida, the United States. prePIRLS participants included Botswana, Colombia, and South Africa.

Media Note

As of 11 December 2012, the full TIMSS and PIRLS 2011 reports will be available online at the TIMSS & PIRLS International Study Center's web site at <http://timssandpirls.bc.edu/data-release-2011/> or by calling +1 617 552 1600.

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Follow the TIMSS & PIRLS International Study Center at Boston College on Twitter at twitter.com/TIMSSandPIRLS