

# Executive Summary

TIMSS is an international assessment of mathematics and science at the fourth and eighth grades that has been conducted every four years since 1995. In 2011, nationally representative samples of students in 63 countries and 14 benchmarking entities (regional jurisdictions of countries, such as states) participated in TIMSS. Countries and benchmarking participants could elect to participate in the fourth grade assessment, the eighth grade assessment, or both: fifty-two countries and seven benchmarking entities participated in the fourth grade assessment, and 45 countries and 14 benchmarking entities participated in the eighth grade assessment. Several of the countries, where fourth and eighth grade students were expected to find the TIMSS assessments too difficult, administered the fourth and eighth grade assessments to their sixth and ninth grade students.

In total, more than 600,000 students participated in TIMSS 2011. TIMSS 2011 continues the series of international assessments in mathematics and science conducted by the International Association for the Evaluation of Educational Achievement (IEA).

IEA pioneered international comparative assessments of educational achievement in the 1960s to gain a deeper understanding of the effects of policies and practices across countries' different systems of education. TIMSS is directed by IEA's TIMSS & PIRLS International Study Center at Boston College.

The TIMSS science assessment is based on a comprehensive framework developed collaboratively with the participating countries that is organized around two dimensions:

- ◆ A content dimension specifying the domains or subject matter to be assessed within science; and
- ◆ A cognitive dimension specifying the domains or thinking processes expected of students as they engage with the science content.

The content domains and topic areas within them are different for the fourth and eighth grades, but the cognitive domains are the same for both grades, encompassing a range of cognitive processes involved in solving problems throughout the primary and middle school years.

Fourth Grade Content Domains	Eighth Grade Content Domains
45% Life Science	35% Biology
35% Physical Science	20% Chemistry
20% Earth Science	25% Physics
	20% Earth Science
Fourth Grade Cognitive Domains	Eighth Grade Cognitive Domains
40% Knowing	35% Knowing
40% Applying	35% Applying
20% Reasoning	30% Reasoning

Given the frameworks' broad coverage goals, the science assessment item pools were necessarily large—172 and 217 assessment items at the fourth and eighth grades, respectively—with about half being multiple choice and half being constructed response items where students write their answers. The achievement results are reported on

the TIMSS achievement scales for the fourth and eighth grades, each with a range of 0–1,000 (although student performance typically ranges between 300 and 700). TIMSS uses the centerpoint of the scale (500) as a point of reference that remains constant from assessment to assessment.

## East Asian Countries Among the Top-performers in TIMSS 2011

Korea and Singapore were the top-performing countries in science in TIMSS 2011 at the fourth grade, followed by Finland, Japan, the Russian Federation, and Chinese Taipei. At the eighth grade, Singapore had the highest average achievement. The next highest-performing countries—Korea, Chinese

Taipei, and Japan—had higher achievement than all other countries except Singapore. Finland was the next highest-performing country.

**Top-performing Countries in TIMSS 2011**

Fourth Grade	Eighth Grade
Korea	Singapore
Singapore	Chinese Taipei
Finland	Korea
Japan	Japan
Russian Federation	Finland
Chinese Taipei	

In addition to the six top-performers at the fourth grade, the United States was the next highest performing country, followed by the Czech Republic, Hong Kong SAR, Hungary, Sweden, the Slovak Republic, Austria, and the Netherlands, which had similar levels of achievement. The US states of Florida and North Carolina and the Canadian province

of Alberta had performance similar to these countries. At the eighth grade, Slovenia, the Russian Federation, Hong Kong SAR, and England also were included in the top nine high-achieving countries. The US state of Massachusetts was outperformed only by Singapore, and the states of Minnesota, Colorado, Indiana, Connecticut, North Carolina, and Florida as well as the Canadian province of Alberta also had high achievement, comparable to the top nine countries.

While there were small differences from country to country, there was a substantial range in performance from the top-performing to the lower-performing countries. Twenty-seven countries at the fourth grade had average achievement above the TIMSS scale centerpoint of 500, as did five benchmarking participants. At the eighth grade, 16 countries and ten benchmarking participants had average achievement above 500.

**More Increases Than Decreases, Particularly at the Fourth Grade**

At the fourth grade, 17 countries and three benchmarking participants have comparable data from 1995 and 2011, providing trends over the past 16 years. Since 1995, eight of these countries raised their levels of science achievement and only one had a decrease. Among the benchmarking participants, the Canadian province of Ontario increased achievement and the province of Québec decreased achievement between 1995 and 2011.

**Trends Between 1995 and 2011, Fourth Grade**

Countries Improving	Countries Declining
Hong Kong SAR	Norway
Hungary	
Iran	
Japan	
Korea	
Portugal	
Singapore	
Slovenia	

At the eighth grade, there was more balance between science achievement growth and decline among countries, although more countries had increases than at the fourth grade. Of the 25 countries and eight benchmarking participants with comparable data spanning from 1995 or 1999 to 2011, eleven countries had increased achievement and six countries had decreased achievement. In addition, three benchmarking participants had increased achievement—the Canadian province of Ontario and the US

**Trends Between 1995 or 1999\* and 2011, Eighth Grade**

Countries Improving	Countries Declining
Chile	Hungary
Hong Kong SAR	Macedonia
Iran	Malaysia
Japan	Norway
Korea	Sweden
Lithuania	Thailand
Russian Federation	
Singapore	
Slovenia	
Tunisia	
United States	

\*The 1999 assessment only was given at the eighth grade, and a number of countries joined at that time.

states of Massachusetts and North Carolina—while the Canadian province of Québec had decreased achievement.

**Overview of TIMSS 2011 International Benchmarks, Fourth Grade**

Advanced
• Apply understanding of scientific processes and show knowledge of scientific inquiry.
High
• Apply knowledge and understanding to explain phenomena in everyday and abstract contexts.
Intermediate
• Have basic knowledge and understanding of practical situations in the sciences.
Low
• Show some elementary knowledge of life, physical, and earth sciences.

**Overview of TIMSS 2011 International Benchmarks, Eighth Grade**

Advanced
• Communicate an understanding of complex and abstract concepts in biology, chemistry, physics, and earth science.
High
• Demonstrate understanding of concepts related to science cycles, systems, and principles.
Intermediate
• Apply understanding of basic scientific knowledge in various contexts.
Low
• Recognize some basic facts from the life and physical sciences.

This report contains a number of items illustrating performance at the TIMSS International Benchmarks at the fourth and eighth grades.

**Trends at TIMSS International Benchmarks**

TIMSS reports achievement at four points along the scale as international benchmarks: Advanced International Benchmark (625), High International Benchmark (550), Intermediate International Benchmark (475), and Low International Benchmark (400). At the fourth grade, reflecting the upward trends in average achievement, there were more improvements across the International Benchmarks in 2011 than there were declines. Six countries showed improvement at all four benchmarks between 1995 and 2011, raising the level of performance across the entire distribution of student achievement.

Reflecting less improvement across countries at the eighth grade, three countries declined since 1995 at all four benchmarks (Hungary, Sweden, and Norway), and only three countries improved at all four benchmarks.

### High Percentages of East Asian Students Reach TIMSS International Benchmarks

At the fourth grade, Singapore and Korea, the two countries with the highest average science achievement, also were the countries with the largest percentages of students reaching the Advanced International Benchmark. One-third of the Singaporean students reached this advanced level of performance, as did 29 percent of students in Korea. Twenty percent of the students in Finland reached this level, followed by the Russian Federation (16%), Chinese Taipei (15%), the United States (15%), and Japan (14%). Although relatively few students reached the Advanced International Benchmark in most countries (median percentage across countries: 5%), the high median percentage reaching the Low International Benchmark (92%) indicates that many countries have been successful in educating almost all of their fourth grade students to a basic level of science achievement.

At the eighth grade, four East Asian countries had the largest percentages of students reaching the Advanced International Benchmark: Singapore had the highest percentage (40%), followed by Chinese Taipei (24%), Korea (20%), and Japan (18%). Next, the Russian Federation and England had 14 percent of their students reaching the Advanced Benchmark; Slovenia and Finland had 13 percent reaching this level. Several of the US states had similarly high percentages of students reaching the Advanced Benchmark, including Massachusetts (24%), Minnesota (16%), Colorado (14%), Connecticut (14%), and Florida (13%). In comparison to the fourth grade, the percentage of eighth grade students reaching each of the International Benchmarks was lower. For example, the median percentage of students reaching the Low International Benchmark was 79 percent (compared to 92% at the fourth grade), indicating that more eighth grade students were being “left behind” their classmates.

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#### Countries with Increases at All Four TIMSS International Benchmarks between 1995 and 2011, Fourth Grade

Singapore	Portugal
Korea	Slovenia
Hong Kong SAR	Iran

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#### Countries with Increases at All Four TIMSS International Benchmarks between 1995 and 2011, Eighth Grade

Korea
Lithuania
Slovenia

## More Countries Demonstrate Relative Strength in Knowing Science Than in Applying Scientific Knowledge or Reasoning

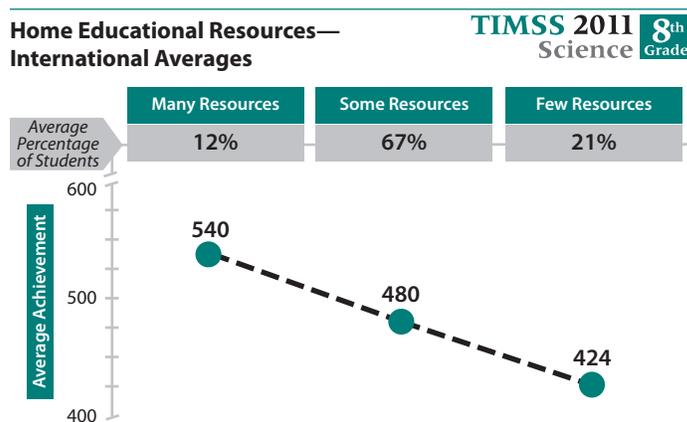
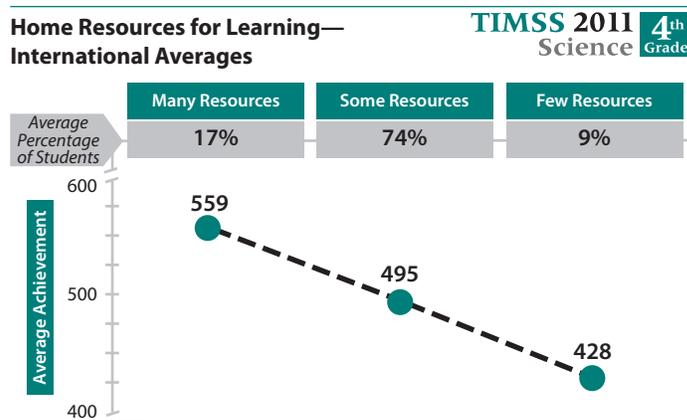
Generally, TIMSS 2011 participants with the highest achievement overall also had the highest achievement in the science content domains (e.g., biology and physics). Internationally, more countries demonstrated relative strengths in knowing science (i.e., recalling/recognizing, defining, and describing) than in applying scientific knowledge and reasoning.

## Home Resources Strongly Related to Science Achievement

Research consistently shows a strong positive relationship between achievement and indicators of socioeconomic status, such as parents' or caregivers' level of education. At the fourth and sixth grades, TIMSS used the parents' reports on the availability of key home resources to create the Home Resources for Learning scale, including parents' education, parents' occupation, books in the home, and

study supports. Internationally, on average, almost three-quarters of the fourth grade students (74%) had **Some Resources**, and the 17 percent of students with **Many Resources** had substantially higher science achievement than the nine percent with **Few Resources**—a 131-point difference.

At the eighth and ninth grades, TIMSS asked the students themselves about their parents' education, books in the home, and study supports, with similar results. Internationally, the twelve percent of eighth grade students with **Many Resources** had the highest average achievement, the two-thirds with **Some Resources** had the next highest achievement, and the one-fifth with **Few Resources** had the lowest average achievement.



## Successful Schools Tend to Be Well-resourced

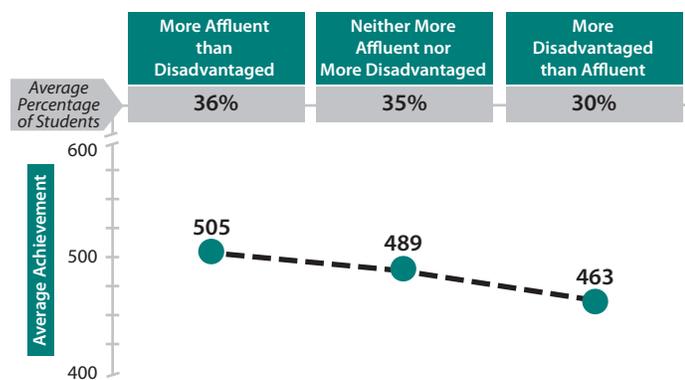
Ever since the Coleman report in 1966, researchers have recognized that the compositional characteristics of a school's student body can affect student achievement. To provide information on this topic, TIMSS routinely asks school principals to report on their students' economic home backgrounds and home language. While there was variation across countries, higher average science achievement was associated with students attending schools where a greater percentage of students had the following characteristics:

- ◆ Were from relatively affluent socioeconomic backgrounds; and
- ◆ Spoke the language of the TIMSS assessment as their first language.

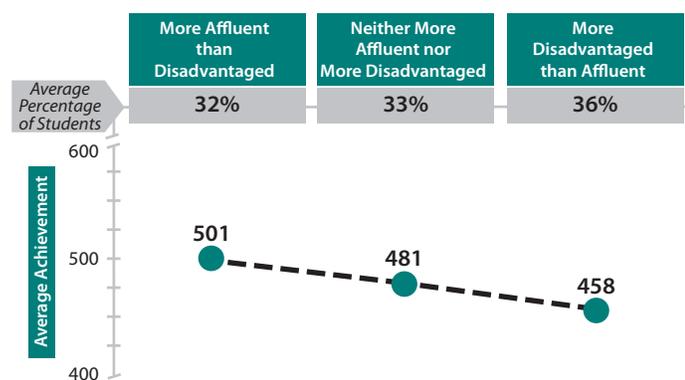
For example, students were distributed relatively equally across three types of schools categorized by the affluence of their home backgrounds. At the fourth grade, 36 percent attended schools with relatively more students from affluent than from economically disadvantaged homes, and these students had the highest average achievement. At the other end of the range, 30 percent of students attended schools with relatively more students from economically disadvantaged homes, and these students had the lowest average achievement.

Similarly, at the eighth grade, 32 percent attended schools with relatively more students from affluent than disadvantaged homes, and these students had the highest average achievement. Conversely, 36 percent of students attended schools with relatively more students from economically disadvantaged homes, and these students had the lowest average achievement.

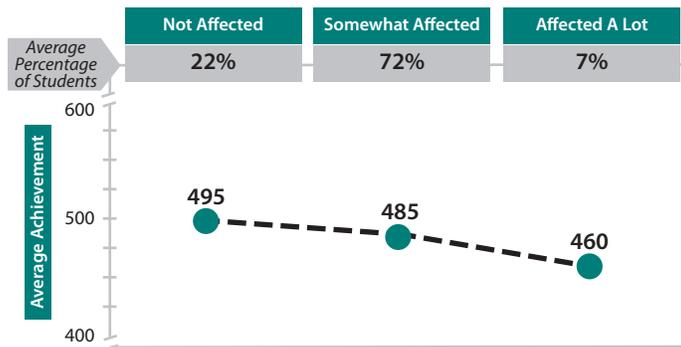
**School Composition by Student Home Economic Background—International Averages** TIMSS 2011 4<sup>th</sup> Grade Science



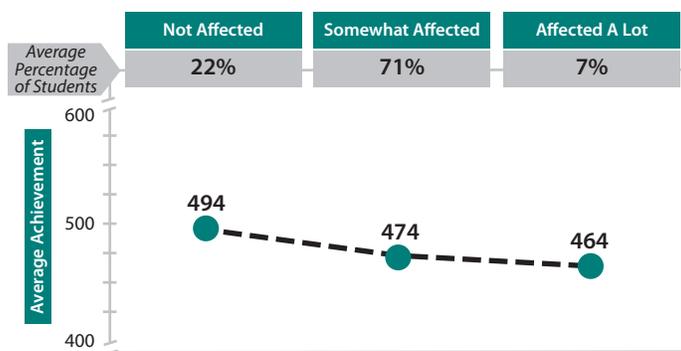
**School Composition by Student Home Economic Background—International Averages** TIMSS 2011 8<sup>th</sup> Grade Science



**Instruction Affected by Science Resource Shortages—International Averages** **TIMSS 2011** **4<sup>th</sup> Grade** **Science**



**Instruction Affected by Science Resource Shortages—International Averages** **TIMSS 2011** **8<sup>th</sup> Grade** **Science**



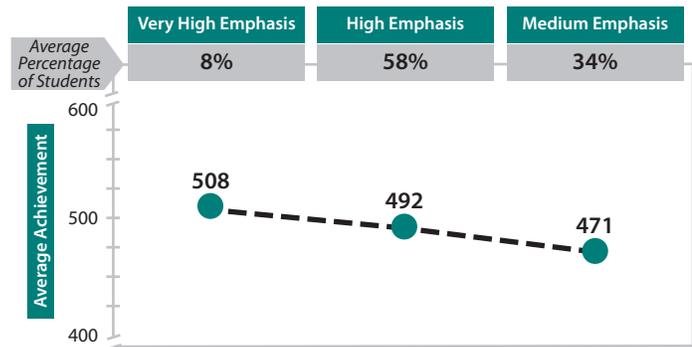
Successful schools also are likely to have better working conditions and facilities as well as more instructional materials, such as books, computers, technological support, and supplies. TIMSS 2011 created the Science Resource Shortages scale based on principals' responses concerning inadequacies in general school resources in general school resources (materials, supplies, heating/cooling/lighting, buildings, space, and staff) as well as resources specifically targeted to support science instruction (specialized teachers, computers, computer software, calculators, library materials, and audio-visual resources). Many countries were fortunate to have very few,

if any, students in schools where instruction was **Affected A Lot** by resource shortages. However, this was a crucial problem in some countries. At both the fourth and eighth grades, the one-quarter of students in schools **Not Affected** by resource shortages had higher average science achievement than their counterparts in less well-resourced schools. For students at the sixth and ninth grades, there was more impact from lack of resources, with greater percentages of students in schools **Affected A Lot** by resource shortages.

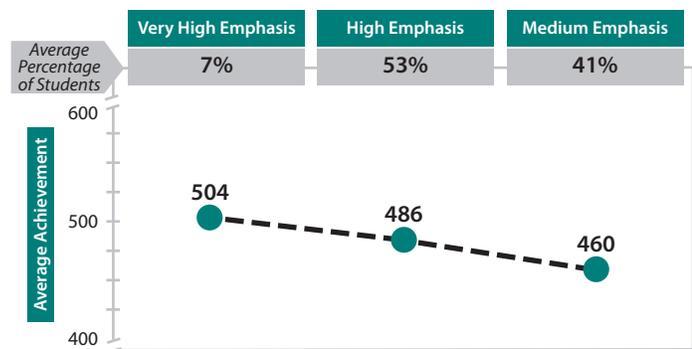
## Successful Schools Emphasize Academic Success and Have Safe and Orderly Environments

Students with the highest science achievement typically attend schools that emphasize academic success, as indicated by rigorous curricular goals, effective teachers, students that desire to do well, and parental support. Both principals and teachers answered the questions comprising the School Emphasis on Academic Success scale, and both were extremely positive and remarkably similar in their responses. At both the fourth and eighth grades, there was a direct correspondence between average science achievement and principals' reports, with higher emphasis on academic success related to higher average science achievement.

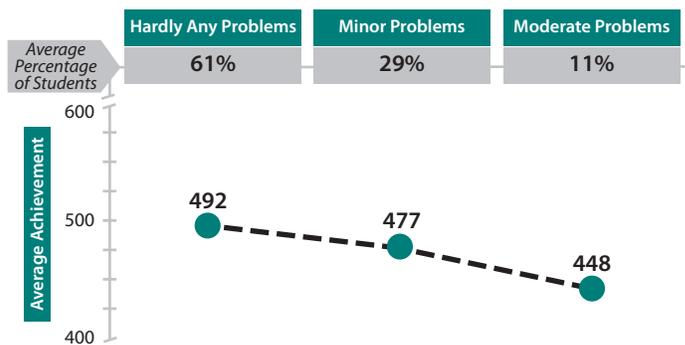
**Principals' School Emphasis on Academic Success—International Averages** **TIMSS 2011** **4<sup>th</sup> Grade** **Science**



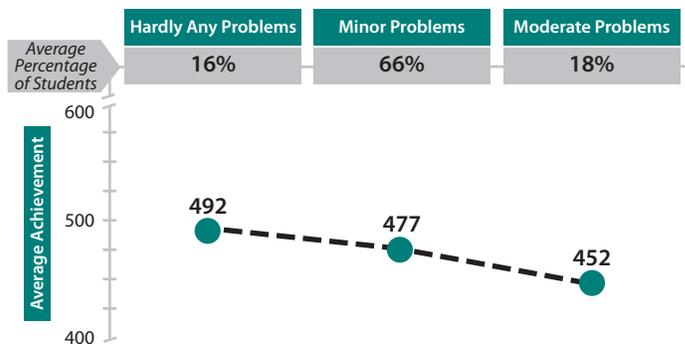
**Principals' School Emphasis on Academic Success—International Averages** **TIMSS 2011** **8<sup>th</sup> Grade** **Science**



**Principals' Problems with School Discipline and Safety—International Averages** **TIMSS 2011** **4<sup>th</sup> Grade** **Science**



**Principals' Problems with School Discipline and Safety—International Averages** **TIMSS 2011** **8<sup>th</sup> Grade** **Science**



In contrast, schools with discipline and safety problems are not conducive to high achievement. The sense of security that comes from attending a school with few behavior problems and having little or no concern about student or teacher safety promotes a stable learning environment. To create the School Discipline and Safety scale, principals provided their perceptions about the degree to which a series of ten discipline, disorderly, and bullying behaviors were problems in their schools.

At both the fourth and eighth grades, students who attended schools with disorderly environments and who reported more frequent bullying had much lower achievement than their counterparts in safe and orderly schools. Interestingly, across the fourth grade countries, 61 percent

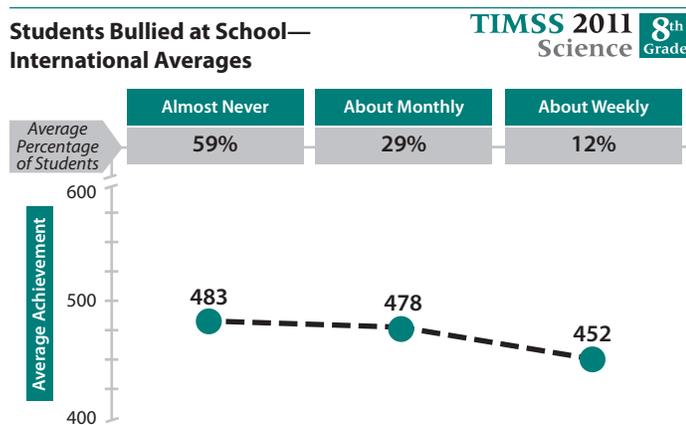
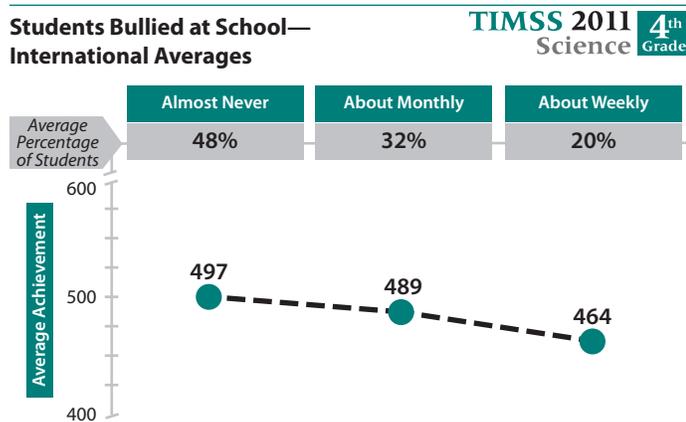
of students, on average, attended schools with **Hardly Any Problems** with discipline or safety, 29 percent were in schools with **Minor Problems**, and 11 percent attended schools with **Moderate Problems**.

Across the eighth grade countries, however, discipline appeared to be more of an issue; principals reported that only 16 percent of students were in schools with **Hardly Any Problems**, 66 percent were in schools with **Minor Problems**, and 18 percent attended schools with **Moderate Problems**.

There is growing evidence that bullying in schools is on the rise, especially with the emergence of cyber-bullying, and that bullying does have a negative impact on students' educational achievement. The Students Bullied at School scale was based on how often students experienced six bullying behaviors, such as "Someone spread lies about me" and "I was made to do things I didn't want to do by other students."

At both the fourth and eighth grades, an increase in the frequency of bullying was related to a decrease in average science achievement. Unsettlingly, across countries, although nearly half of the fourth grade students reported **Almost Never** being bullied (48%), the majority were bullied either **About Monthly** (32%) or **About Weekly** (20%).

In contrast to principals' reports of more school discipline and safety problems at the eighth grade than fourth grade, the eighth grade students reported experiencing somewhat less bullying behavior than the fourth grade students.



## Teacher Preparation and Career Satisfaction Related to Higher Science Achievement

In view of the importance of a well-prepared teaching force to an effective education, TIMSS 2011 collected a variety of information about teacher education. Internationally, most students were taught by the following:

- ◆ Teachers with bachelor's or postgraduate university degrees (80% at the fourth grade, and 90% at the eighth grade);
- ◆ Teachers with at least 10 years of experience (70% at the fourth grade, and 62% at the eighth grade);
- ◆ Teachers who reported being **Very Well** prepared to teach the TIMSS science topics (62% at the fourth grade, and 72% at the eighth grade); and
- ◆ Teachers **Very Confident** in teaching science (59% at the fourth grade, 73% at the eighth grade).

At both the fourth and eighth grades, students with more experienced and more confident teachers had higher science achievement.

The TIMSS 2011 Teacher Career Satisfaction scale categorized students based on their teachers' degree of agreement with six statements, such as "I do important work as a teacher" and "I plan to continue as a teacher for as long as I can." At both the fourth and eighth grades, teacher satisfaction was positively related to average science achievement, and very few students had teachers that expressed any dissatisfaction except in a small number of countries.

Internationally, the fourth grade students with **Satisfied** science teachers (54%) had higher achievement than those with teachers that were only **Somewhat Satisfied** (41%) or **Less Than Satisfied** (5%). The eighth grade science teachers reported somewhat lower levels of career satisfaction, with the 47 percent of students taught by **Satisfied** science teachers having higher science achievement than those taught by only **Somewhat Satisfied** (45%) or **Less Than Satisfied** (8%) teachers.

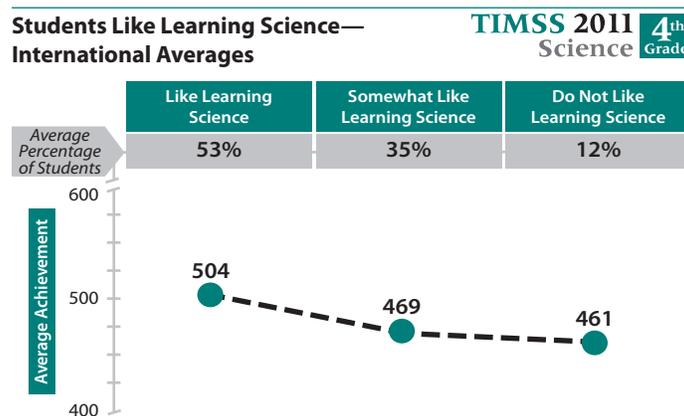
## Students with Positive Attitudes Toward Science Have Higher Achievement, but Attitudes Less Positive at the Eighth Grade

Each successive TIMSS assessment has shown a strong positive relationship within countries between student attitudes toward science and their science achievement. The relationship is bidirectional, with attitudes and achievement mutually influencing each other.

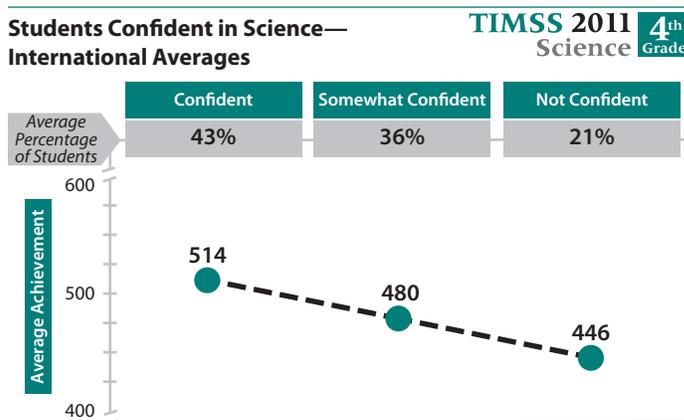
The Students Like Learning Science scale was based on students' degree of agreement with six statements, such as "I enjoy learning science" and "I learn many interesting things in science." Internationally, more than half of the fourth grade students **Like Learning Science**, and they had higher average achievement than those that **Somewhat Like Learning Science** (35%) or those that **Do Not Like Learning Science** (12%).

At the eighth grade, 16 of the TIMSS countries teach science subjects separately (i.e., biology, chemistry, physics, and earth science) rather than as a general or integrated subject. TIMSS asked students in these countries about their liking of the individual subjects and the results were scaled separately for each subject. Compared to the fourth grade, substantially fewer eighth grade students reported positive attitudes toward learning science. Among countries teaching general or integrated science, only about one-third (35%) of students **Like Learning Science**, compared to 53 percent at the fourth grade. Accompanying this decrease is a widening achievement gap between students who like learning the subject (515, on average) and those who do not (450).

Among separate science subject countries, the average percentage of students liking learning biology (36%) and earth science (33%) was similar to the percentage liking learning science in general or integrated science countries, but fewer students like learning chemistry (25%) or physics (26%). In all four science subjects, the students who liked learning the subject had higher average achievement than those who only somewhat liked or did not like learning it.



The Students Confident in Science scale includes six statements (nine at the eighth grade), such as "Science is harder for me than for many of my classmates"(reverse coded) and "My teachers tells me I am good at science." Internationally, just 43 percent of the fourth grade students expressed confidence in their science ability, but their science achievement was higher than for the students who felt **Somewhat Confident**. The students lacking confidence (21%) had the lowest achievement.



At the eighth grade, only 20 percent of the students in general or integrated science countries, on average internationally, felt **Confident** in their science ability, with most students either **Somewhat Confident** (49%) or **Not Confident** (31%). The achievement gap was 86 points between the **Confident** and **Not Confident** students.

The eighth grade students in separate science countries were similar to students in general or integrated countries in their confidence in biology and earth science (21% and 19% **Confident**, respectively) but less confident in chemistry and physics (14% **Confident** for each). In all four science subjects, there was a strong positive relationship between student confidence and average science achievement.

The Students Value Science scale asked the eighth grade students about six different aspects of valuing science, including “I think learning science will help me in my daily life” and “I need to do well in science to get the job I want.” Internationally, the eighth grade students in general or integrated science countries placed a high value on science, with 41 percent who **Value** science and another 33 percent who **Somewhat Value** the subject. However, about one-fourth (26%) **Do Not Value** science. Students who said they value science had higher average achievement than students who only valued it somewhat, and those students, in turn, had higher achievement than students who did not value science.

Students in separate science subject countries do not seem to value the individual science subjects in the same way as students in general science countries. Across the four science subjects, only about one-fourth (25–29%) of the students reported that they value the subjects and about two-fifths (36–42%) reported that they did not value them.

## More Time for Science Instruction in Countries Teaching Science as Separate Subjects

On average at the fourth grade, countries reported devoting 85 hours per year to science instruction, although the amount of instructional time varied widely. Instructional time for science was much greater at the eighth grade, 158 hours per year on average, mainly because of the greater attention given to science instruction in the separate science countries. These countries devote 54 to 59 hours per year, on average, to each science subject, for an overall average of 225 hours of science instruction per year.

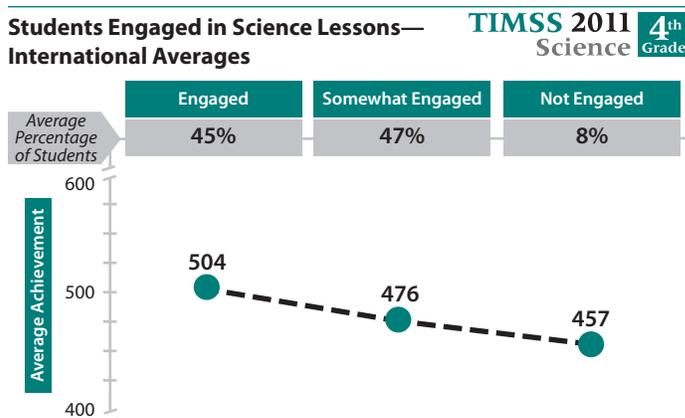
## Engaging Instruction Related to Higher Science Achievement

Historically, educational studies, including TIMSS, have struggled to link student achievement to instructional activities. Typically, teachers are asked to report how frequently they use various instructional activities and strategies, and such information can be very useful. However, in light of the growing body of evidence about the complexities of teaching and learning, researchers are beginning to understand that these lists of activities cannot be used as proxies for the characteristics of good teaching.

To help build a better bridge between curriculum and instruction, TIMSS 2011 collected information about the concept of student engagement in learning, which focuses on the cognitive interaction between the student and the instructional content. To measure aspects of student engagement, TIMSS 2011 developed both a teacher scale, called the Engaging Students in Learning scale, and a student scale, called the Engaged in Science Lessons scale.

For the Engaging Students in Learning scale, students were categorized according to how often their teachers reported using six instructional practices (four at the eighth grade) intended to interest students and reinforce learning (e.g., summarizing the lesson's learning goals, questioning to elicit reasons and explanations, and bringing interesting things to class). Many fourth grade students internationally (71%) had science teachers that made efforts to use these practices to engage them during **Most Lessons**, and the rest had teachers that used such practices in **About Half the Lessons** (with a few exceptions). Internationally, at the eighth grade, 80 percent of students had teachers that reported using the instructional practices to engage students during **Most Lessons**.

From the students' perspective, the Engaged in Science Lessons scale asked how much students agreed with five statements, such as "I know what my teacher expects me to do" and "I am interested in what my teacher says." Internationally, the fourth grade students **Engaged** in their science lessons (45%) had the highest achievement, followed by those **Somewhat Engaged** (47%) and the few students **Not Engaged** (8%). At the eighth grade, internationally, smaller percentages of students reported being **Engaged**. In countries teaching



general or integrated science, only 29 percent of students, on average, reported being **Engaged** during their science lessons, although these students had the highest average achievement. Among the separate science subject countries, students reported somewhat more engagement in biology and earth science lessons (33% and 31% **Engaged**, respectively) than in chemistry and physics lessons

(26% and 27% **Engaged**, respectively). In each of the science subjects, students reporting being engaged in their lessons had higher science achievement than those who were only somewhat or not engaged.

### Science Teachers Emphasizing Science Investigations

As noted in the TIMSS 2011 Science Assessment Framework, one of the ways in which students have been encouraged to build upon their knowledge and understanding of science is through the process of scientific inquiry, and the contemporary science curricula of many countries place considerable emphasis on engaging students in this process. The Emphasize Science Investigation scale was based on teacher reports of how often, in teaching science, they ask students to engage in six activities (seven at the eighth grade), such as "Observe natural phenomena such as the weather or a plant growing and describe what they see" and "Design or plan experiments or investigations."

On average across the fourth grade countries, 40 percent of students were taught by teachers emphasizing science investigation in **About Half the Lessons or More**, although teachers of science at the fourth grade vary widely across countries in their use of inquiry activities, with the percentage of students taught by teachers emphasizing science investigation ranging from 4 to 86 percent.

There was greater use of investigation in science instruction at the eighth grade, with almost half of the students (48%) taught by teachers emphasizing investigation in **About Half the Lessons or More**. Also, science achievement was slightly higher among students whose teachers more frequently emphasize inquiry activities (479 vs. 474).

## Instruction Affected By Students Lacking in Basic Nutrition and Sleep

Finally, the characteristics of the students themselves can be very important to the classroom atmosphere. Unfortunately, some children in many countries around the world suffer from hunger, and a growing body of research, mostly in developing countries, is providing evidence that malnutrition has a negative impact on educational achievement. Similarly, a number of studies in a variety of countries have shown sleep duration and quality to be related to academic functioning at school.

On average, internationally, most fourth grade (71%) and eighth grade students (64%) were in classrooms where instruction was “not at all” limited because students were lacking in basic nutrition. These students had higher average science achievement than their peers in classrooms where instruction was limited “some or a lot” because students suffered from lack of basic nutrition. The percentage lacking in basic nutrition was much higher in some countries, including some of those that participated at the sixth and ninth grades.

Internationally, students suffering from some amount of sleep deprivation did have lower average science achievement. Teachers reported that only a scant majority of fourth grade students (54%) and not even half of the eighth grade students (42%), across countries, were in classrooms where instruction was “not at all” limited by students suffering from not enough sleep. Further, while there was considerable variation across countries, in a number of TIMSS 2011 countries and benchmarking participants at least two-thirds of students reportedly were at least somewhat sleep deprived.

