

TRENDS IN INTERNATIONAL MATHEMATICS AND SCIENCE STUDY

# TIMSS



## TIMSS 2007 International Science Report

*Findings from IEA's Trends  
in International Mathematics  
and Science Study at the  
Fourth and Eighth Grades*

Michael O. Martin

Ina V.S. Mullis

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*In collaboration with*

John F. Olson

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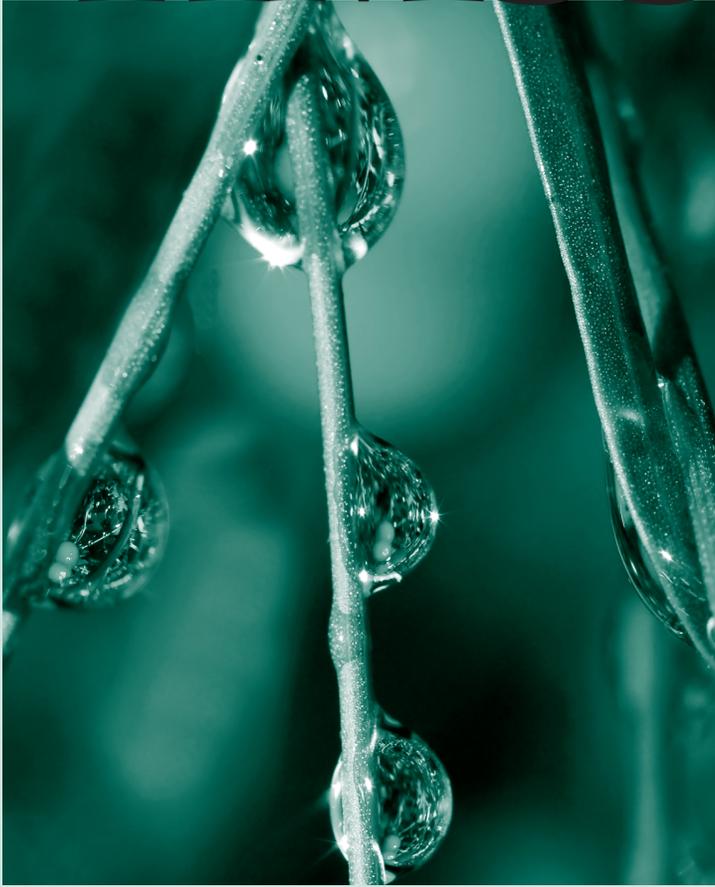


**TIMSS & PIRLS**  
International Study Center  
Lynch School of Education, Boston College



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*Mongolia—Science Achievement*

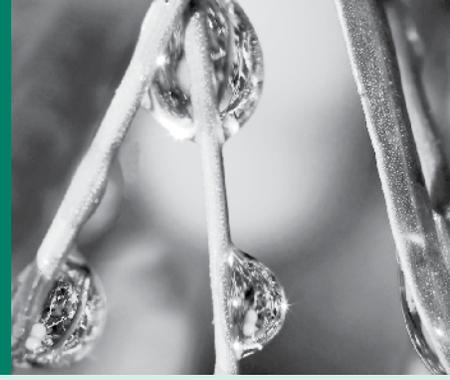
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*Organizations and Individuals Responsible for TIMSS 2007*



# Foreword



There is almost universal recognition that the effectiveness of a country's educational system is a key element in establishing competitive advantage in what is an increasingly global economy. Education is fundamentally implicated not only in a country's economic and social development, but also in the personal development of its citizens. It is considered one of the primary means whereby inequities, social and economic, can be reduced. Attendant on this growing recognition of the importance and centrality of education has been the recognition, worldwide, of the importance of regular monitoring of educational performance and its antecedents.

How and on what basis policymakers, administrators, and teachers make decisions in the educational arena, and how and on what information educational systems are shaped lie at the heart of international comparative studies of education like TIMSS (Trends in International Mathematics and Science Study). As a pioneer in the field, the International Association for the Evaluation of Educational Achievement (IEA) has been conducting comparative studies of educational achievement in a number of curriculum areas, including mathematics and science, for nearly 50 years.

Conducted in 59 countries around the world, TIMSS 2007 represents the fourth cycle of IEA's study of the mathematics and science performance of fourth grade and eighth grade students. This report provides extensive information on the performance of students in mathematics and science as well as sub-domains in these curricular areas. It also provides information about students' competence in managing mathematics and science challenges

which have differing cognitive demands. For policymakers, the TIMSS 2007 report contains a wealth of information about key instructional, curricular, and resource related variables that are fundamental in understanding the teaching and learning process. This extensive information about trends in students' achievement and the contexts for teaching and learning mathematics and science should help ensure that TIMSS continues to be widely recognized as the most influential study of its type. The information should be of great value in guiding educational decision making and practice in the areas of mathematics and science around the world.

TIMSS is an enormous undertaking, well into its second decade of operation and involving activities spanning the globe. Clearly, projects of this magnitude are not possible without the dedication, skills, cooperation, and support of a large number of individuals, institutions, and organizations around the world. The trend data in this report represent years of technically demanding work involving many, many people, far too numerous to name here. IEA, however, is deeply grateful to each and every person who contributed to the possibility and creation of the TIMSS results reported herein.

IEA is particularly indebted to the remarkable group of professionals at the TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College who have been charged with the overall leadership of this project. The contributions from the staff of the IEA Data Processing and Research Center and the IEA Secretariat, as well as from IEA's consortium partners, Statistics Canada and Educational Testing Service, are also central to the success of this project and for their support I am extremely grateful. The TIMSS 2007 project coordinators, assessment designer/developers, psychometricians, sampling statisticians, statistical programmers, and production specialists are among the most expert and experienced in the world. Most important, however, has been the continued leadership and direction of the TIMSS Executive Directors, Drs. Ina Mullis and Michael Martin, whose contributions are central to the success of this project.

Projects of this size are also not possible without considerable financial support. I am particularly grateful for the financial support from IEA's major funding partners, including the U.S. National Center for Education Statistics, the World Bank, the United Nations Development Program, and the many self funding countries without which this project would not have been possible. I also wish to thank Boston College and the National Foundation for Educational Research for their continued support.

As always, critical to the success of this project has been the willingness of participating countries to commit to a common set of protocols. Also, TIMSS would not have been possible without the participation of the many teachers, students, and policymakers around the world who gave freely of their time in the interest of advancing our common understanding of mathematics and science achievement. On behalf of all who benefit from the use of the information provided by TIMSS, we remain thankful for this commitment.

Finally, TIMSS relies on the National Research Coordinators and their colleagues whose responsibility it was to manage and execute the study at the national level. These individuals and their national teams made this project a success and for this they deserve our thanks and appreciation.

Dr. Hans Wagemaker  
Executive Director, IEA



# Executive Summary



TIMSS 2007 is the fourth in a continuing cycle of international mathematics and science assessments conducted every four years. TIMSS assesses achievement in countries around the world and collects a rich array of information about the educational contexts for learning mathematics and science, with TIMSS 2007 involving more than 60 participants. This report contains the science results for 37 countries and 7 benchmarking participants at the fourth grade and for 50 countries and 7 benchmarking participants at the eighth grade. Trend data are provided at the fourth and eighth grades for those countries that also participated in 1995, 1999, and 2003 (please see the Introduction for more information about TIMSS 2007).

## Science Achievement

- ▶ At the fourth grade, Singapore was the top performing country, with higher average science achievement than all of the other countries. Singapore was followed by Chinese Taipei and Hong Kong SAR, that were outperformed only by Singapore. Next came Japan, the Russian Federation, Latvia, England, the United States, Hungary, Italy, and Kazakhstan that also performed very well. Several benchmarking participants also had high average science achievement, including the U.S. state of Massachusetts, that was outperformed by Singapore but had higher average achievement than all other countries, and the state of Minnesota, that was outperformed only by Singapore and Massachusetts. The Canadian provinces of Alberta, British Columbia, and Ontario also performed very well.

- ▶ At the eighth grade, Singapore and Chinese Taipei had the highest average achievement in science. These were followed by Japan and Korea, that had higher average achievement than all countries except Singapore and Chinese Taipei. England, Hungary, the Czech Republic, Slovenia, Hong Kong SAR, and the Russian Federation also performed well. Among the benchmarking participants, average science achievement in Massachusetts was similar to that of the four top Asian countries (Singapore, Chinese Taipei, Japan, and Korea) and higher than all other participants. Minnesota had achievement similar to England, Hungary, the Czech Republic, Slovenia, Hong Kong SAR, and the Russian Federation.
- ▶ Asian countries had the highest percentages of students reaching the Advanced International Benchmark for science, representing fluency on items involving the most complex topics and reasoning skills. At the fourth grade, Singapore and Chinese Taipei had 36 and 19 percent of their students, respectively, achieving at or above the Advanced International Benchmark. At the eighth grade, Singapore and Chinese Taipei had 32 and 25 percent of their students, respectively, achieving at or above the Advanced International Benchmark. The median percentage of students reaching this Benchmark was 7 percent at the fourth grade and 3 percent at the eighth grade.
- ▶ Looking at trends across all of the participating countries, not taking into account whether countries have participated in two, three, or four cycles (eighth grade) of TIMSS, more countries showed improvement in average achievement between their first cycle of participation and TIMSS 2007 than declines at both fourth and eighth grades, although the pattern was less pronounced at eighth grade. At the fourth grade, 11 countries had higher average achievement in 2007 than in their first TIMSS assessment, 5 had lower average achievement, and 7 showed no significant change. At the eighth grade, 11 countries had higher average achievement in 2007 than in their initial assessment, 8 lower average achievement, and 16 showed no significant change.
- ▶ At both fourth and eighth grades, average science achievement for girls was higher than for boys on average across the TIMSS 2007 countries

(by 3 points at fourth grade and 6 points at eighth grade). At the fourth grade, the difference in average achievement was negligible in more than half the countries, whereas girls had higher science achievement than boys in 6 countries and boys had higher achievement than girls in 8 countries. At the eighth grade, girls had higher average science achievement than boys in 14 countries and boys had higher achievement than girls in 11 countries.

### **Factors Associated with Higher Achievement in Science**

- ▶ At both fourth and eighth grades, on average across countries, a large majority of students reported always or almost always speaking the language of the test at home, and these students had higher average science achievement than those who reported speaking it less frequently. Also, students from homes with more books had higher average science achievement than those from homes with fewer books.
- ▶ At the eighth grade, higher levels of parents' education were associated with higher average science achievement in almost all countries.
- ▶ On average across countries at the fourth and eighth grades, students from homes with a computer had higher science achievement than those from homes without a computer, and those from homes with an Internet-connected computer had higher achievement than students from homes without such a facility. Average achievement was highest among those reporting using a computer at home and at school and at home only, perhaps reflecting an economic advantage for those with a computer at home, and lowest among those reporting that they do not use a computer at all or use one only at places other than the home and the school. At both grades, computer use increased in a number of countries between 2003 and 2007.
- ▶ Fourth grade students generally had positive attitudes toward science, and those with more positive attitudes had higher average science achievement than students with less positive attitudes. This also was true at eighth grade for students in countries teaching science as a single, integrated subject. In countries teaching science as separate

subjects, eighth grade students' attitudes to biology were as positive as student attitudes to integrated science in single science countries, but somewhat less positive to earth science and particularly to chemistry and physics.

- ▶ There also was a positive association between level of self-confidence in learning science and science achievement at fourth grade, and at eighth grade among students in both single science and separate science countries. Further, eighth grade science achievement was higher for students in single science countries who reported placing a higher value on science. However, across the various sciences in separate science countries, the relationship was less clear cut.
- ▶ At both grades, on average, there was a positive association between attending schools with fewer students from economically disadvantaged homes and science achievement. Also, achievement was highest among students attending schools with more than 90 percent of students having the language of the test as their native language.
- ▶ Average science achievement was highest among students attending schools with few attendance problems and lowest among students attending schools where there were serious problems with students arriving late, absenteeism, and missing class. Such problems appear to be more serious at the eighth grade.
- ▶ Principals were asked the degree to which shortages or inadequacies in resources affected their schools' general capacity to provide instruction. At both grades, average science achievement was highest among students in schools where principals reported that resource shortages were not a problem. Also, there was an association between higher average achievement and more positive teachers' reports about the adequacy of their working conditions.
- ▶ At both fourth and eighth grades, science achievement was highest, on average, where principals and teachers had a positive view of the school climate. At the eighth grade, teachers had a somewhat less positive outlook on climate than principals. There was a positive association between average science achievement and students' perception of being safe in school at both fourth and eighth grades.

## Science Curriculum and Instruction

- ▶ One of the major differences among the science curricula of the TIMSS 2007 countries is that some countries teach science as a single, general subject through the eighth grade, while others teach the sciences as separate subjects, usually beginning in the fifth, sixth, or seventh grades. By the eighth grade, most of the continental European countries, as well as Algeria, Indonesia, Lebanon, Mongolia, Morocco, and the Syrian Arab Republic, were separately teaching some or all of biology, chemistry, physics, and earth science, although not necessarily at the same time. In some cases, chemistry and physics or biology and earth science were combined. Also, in some countries, earth science topics were taught as part of geography.
- ▶ At the fourth grade, there was some variation, but countries' prescribed curricula averaged 23 hours of total instruction per week, with less than one tenth of the time (9%) being for science instruction. Generally, there was very close agreement between the curriculum and teachers' reports about its implementation. On average internationally, fourth grade teachers reported a total of 24 hours of weekly instruction, with 8 percent being devoted to science. At the eighth grade for countries teaching general/integrated science, the average total instruction time per week was 27 hours with 12 percent being devoted to science instruction. Teachers' reports of 28 hours per week in total and 11 percent devoted to science instruction corresponded with the instructional time guidelines across the countries' curricula. Among separate science countries at the eighth grade, the total instructional time, on average, was similar to general science countries (28 hours vs. 27), but the percentage of instructional time devoted to science instruction was higher—24 percent (6% for each of four science subjects) compared to 12 percent. In general, teacher reports corresponded with curricular guidelines across the four science subjects.
- ▶ At the fourth grade, on average across countries, teachers reported devoting 40 percent of the science instructional time to life science, 25 percent to physical science, 24 percent to earth science, and 10 percent to other areas. At the eighth grade, on average internationally, teachers

reported devoting 28 percent of the science instructional time to biology, 24 percent to chemistry, 27 percent to physics, 16 percent to earth science, and 6 percent to other areas.

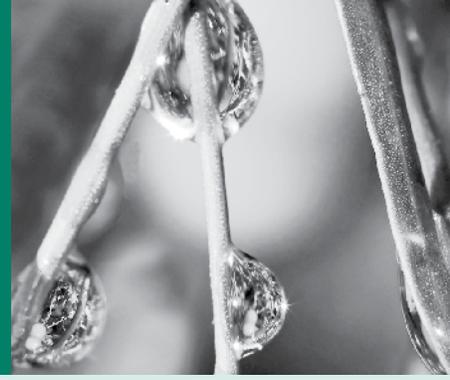
- ▶ For most countries, much of the science content assessed by TIMSS is included in their intended curricula. On average across countries at the fourth grade, the majority of the assessment topics (23 out of 35) were intended for all or almost all students. On average across countries at the eighth grade, most of the science assessment topics (34 out of 46) were intended for all or almost all students.
- ▶ According to their teachers, 61 percent of fourth grade students and 66 percent of eighth grade students, on average across countries, had been taught the science topics assessed.
- ▶ At both the fourth and eighth grades, the majority of students were taught science by teachers in their 30s and 40s. Although about one fourth of the students internationally were taught by teachers 50 or older, relatively few students were taught by younger teachers. On average, internationally, 70 percent of the fourth grade students and 81 percent of the eighth grade students had teachers with a university degree. However, there was some variation at the fourth grade.
- ▶ Most countries have a national or regional science curriculum, and most countries reported that teachers received specific preparation in how to teach the science curriculum as part of pre-service education. At the eighth grade, on average internationally, most students had teachers who had studied science (81%), but fewer students (39%) had teachers whose major area of study was science education. However, the teachers of the fourth grade students in a number of countries reported little specific training or specialized education in science.
- ▶ At the fourth grade, on average internationally, 54 percent of the students were taught by teachers who reported feeling very well prepared to teach the science topics in the TIMSS assessment. Greater percentages of students had teachers feeling well prepared to teach life science (59%) and earth science (56%) than physical science (46%). At the eighth grade, 70 percent of the students had teachers who reported being very well prepared to teach the TIMSS science topics overall, with some variation

across the sciences: chemistry (77%), physics (70%), biology (67%), and earth science (62%).

- ▶ The textbook remains the primary basis of science instruction at both the fourth and eighth grades. On average internationally, 52 percent of the students at fourth grade and 53 percent at eighth grade had teachers who reported using a textbook as the primary basis of their lessons. For another 34 percent of the fourth grade students and 40 percent of the eighth grade students, teachers reported using textbooks as a supplementary resource.
- ▶ According to teachers, internationally on average, most time in eighth grade science classes was spent on having students listen to lecture-style presentations (25%) and working on problems with teacher guidance (17%). Considerable time also was spent having students work on solving problems independently (13%), and listening to the teacher re-teach and clarify content or procedures (13%). Together, these four activities accounted for 68 percent of the class time at the eighth grade.
- ▶ At the fourth grade, science homework was not very prevalent and there was little relationship between teachers' emphasis on homework and student achievement. At the eighth grade, teachers reported placing more emphasis on science homework than at fourth grade, although there was considerable variation across countries. Several countries were assigning less homework in 2007 than in 2003.
- ▶ At the eighth grade, teachers used classroom tests to some extent for nearly all of the students. According to teachers' reports, 76 percent of eighth grade students were given science tests at least monthly, on average internationally. About one third were given a science test or examination every two weeks (or more frequently). On average, 23 percent of the students were taught by teachers who reported testing them with only or mostly constructed-response items, another 62 percent by teachers who reported using about half constructed-response and half multiple-choice items, and only 14 percent by teachers who reported using only or mostly multiple-choice items.



# Introduction



This report contains the results from the TIMSS 2007 science assessment at the fourth and eighth grades, including trends over time in achievement and the educational contexts for science instruction. The mathematics results are contained in a companion volume, the *TIMSS 2007 International Mathematics Report*.<sup>1</sup> Intended as a companion to both the mathematics and science reports, the *TIMSS 2007 Encyclopedia*<sup>2</sup> describes the national contexts for mathematics and science education and the mathematics and science curricula in the participating countries. The *TIMSS 2007 Assessment Frameworks*<sup>3</sup> contains the mathematics and science frameworks underlying the assessments at the fourth and eighth grades, and the contextual framework for the questionnaires. The *TIMSS 2007 Technical Report*<sup>4</sup> provides technical documentation about the development and implementation of the assessment. This report and the four other publications can be found on the TIMSS website ([timssandpirls.bc.edu](http://timssandpirls.bc.edu)).

Also, achievement results for the TIMSS 2007 participants are influenced by a great many factors, and the international report typically is complemented by a national report prepared by each country. In a national report, the countries can explore their data in more detail, make comparisons with smaller sets of countries of interest, or examine aspects of particular contextual factors not examined in the international report.

- 1 Mullis, I.V.S., Martin, M.O., & Foy, P. (with Olson, J.F., Preuschoff, C., Erberber, E., Arora, A., & Galia, J.). (2008). *TIMSS 2007 international mathematics report: Findings from IEA's Trends in International Mathematics and Science Study at the fourth and eighth grades*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.
- 2 Mullis, I.V.S., Martin, M.O., Olson, J.F., Berger, D.R., Milne, D., & Stanco, G.M. (Eds.). (2008). *TIMSS 2007 encyclopedia: A guide to mathematics and science education around the world*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.
- 3 Mullis, I.V.S., Martin, M.O., Ruddock, G.J., O'Sullivan, C.Y., Arora, A., & Erberber, E. (2005). *TIMSS 2007 assessment frameworks*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.
- 4 Olson, J.F., Martin, M.O., & Mullis, I.V.S. (Eds.). (2008). *TIMSS 2007 technical report*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

## What Is TIMSS?

TIMSS 2007, involving approximately 425,000 students from 59 countries around the world, is the most recent in an ambitious series of international assessments. The goal is to provide comparative information about educational achievement across countries to improve teaching and learning in mathematics and science.

TIMSS (Trends in International Mathematics and Science Study) measures trends in mathematics and science achievement at the fourth and eighth grades, as well as monitoring curricular implementation and identifying the most promising instructional practices from around the world. TIMSS is a project of the IEA (International Association for the Evaluation of Educational Achievement), which is an independent international cooperative of national research institutions and government agencies that has been conducting studies of cross-national achievement in a wide range of subjects since 1959.

Conducted on a regular 4-year cycle, TIMSS has assessed mathematics and science in 1995, 1999, 2003, and 2007 with planning underway for 2011. In addition to monitoring trends in achievement at the fourth and eighth grades, TIMSS provides information about relative progress across grades as the cohort of students assessed at the fourth grade in one cycle moves to the eighth grade four years later (i.e., the fourth grade students of 2003 became the eighth grade students of 2007). Also, to provide comparative perspectives on trends in achievement in the context of different educational systems, school organizational approaches, and instructional practices, TIMSS collects a rich array of background information.

### **Which Countries Participated in TIMSS 2007?**

TIMSS 2007 involved widespread participation from around the world. Exhibit 1 shows a map of the world identifying the TIMSS 2007 countries and benchmarking participants (regional entities). In Exhibit 1, the 59 participating countries and 8 benchmarking participants are listed alphabetically and shown by their geographic location. The benchmarking participants are regional entities that follow all of the rigorous quality standards established by TIMSS. Their data are comparable to the countries' data, and they can use the TIMSS results as a benchmark. The decision to participate in any IEA study is coordinated through the IEA Secretariat in Amsterdam and made by each member country according to its own data needs and resources.

For the sake of comparability across countries and across assessments, TIMSS 2007 testing was generally conducted at the end of the school year. The countries on a Southern Hemisphere school schedule tested during October through December of 2006, which was the end of the school year for them. The remaining countries tested towards the end of the 2006-2007 school year, most often in April, May, or June of 2007.

Exhibit 1 **Countries Participating in TIMSS 2007**

**TIMSS2007** 4<sup>th</sup> & 8<sup>th</sup>  
**Mathematics & Science** Grades

- |                        |                         |
|------------------------|-------------------------|
| Algeria                | Mongolia                |
| Armenia                | Morocco                 |
| Australia              | Netherlands             |
| Austria                | New Zealand             |
| Bahrain                | Norway                  |
| Bosnia and Herzegovina | Oman                    |
| Botswana               | Palestinian Nat'l Auth. |
| Bulgaria               | Qatar                   |
| Chinese Taipei         | Romania                 |
| Colombia               | Russian Federation      |
| Cyprus                 | Saudi Arabia            |
| Czech Republic         | Scotland                |
| Denmark                | Serbia                  |
| Egypt                  | Singapore               |
| El Salvador            | Slovak Republic         |
| England                | Slovenia                |
| Georgia                | Sweden                  |
| Germany                | Syrian Arab Republic    |
| Ghana                  | Thailand                |
| Hong Kong SAR          | Tunisia                 |
| Hungary                | Turkey                  |
| Indonesia              | Ukraine                 |
| Iran, Islamic Rep. of  | United States           |
| Israel                 | Yemen                   |
| Italy                  |                         |
| Japan                  |                         |
| Jordan                 |                         |
| Kazakhstan             |                         |
| Korea, Rep. of         |                         |
| Kuwait                 |                         |
| Latvia                 |                         |
| Lebanon                |                         |
| Lithuania              |                         |
| Malaysia               |                         |
| Malta                  |                         |

**Benchmarking Participants**

- Alberta, Canada
- Basque Country, Spain
- British Columbia, Canada
- Dubai, UAE
- Massachusetts, US
- Minnesota, US
- Ontario, Canada
- Quebec, Canada

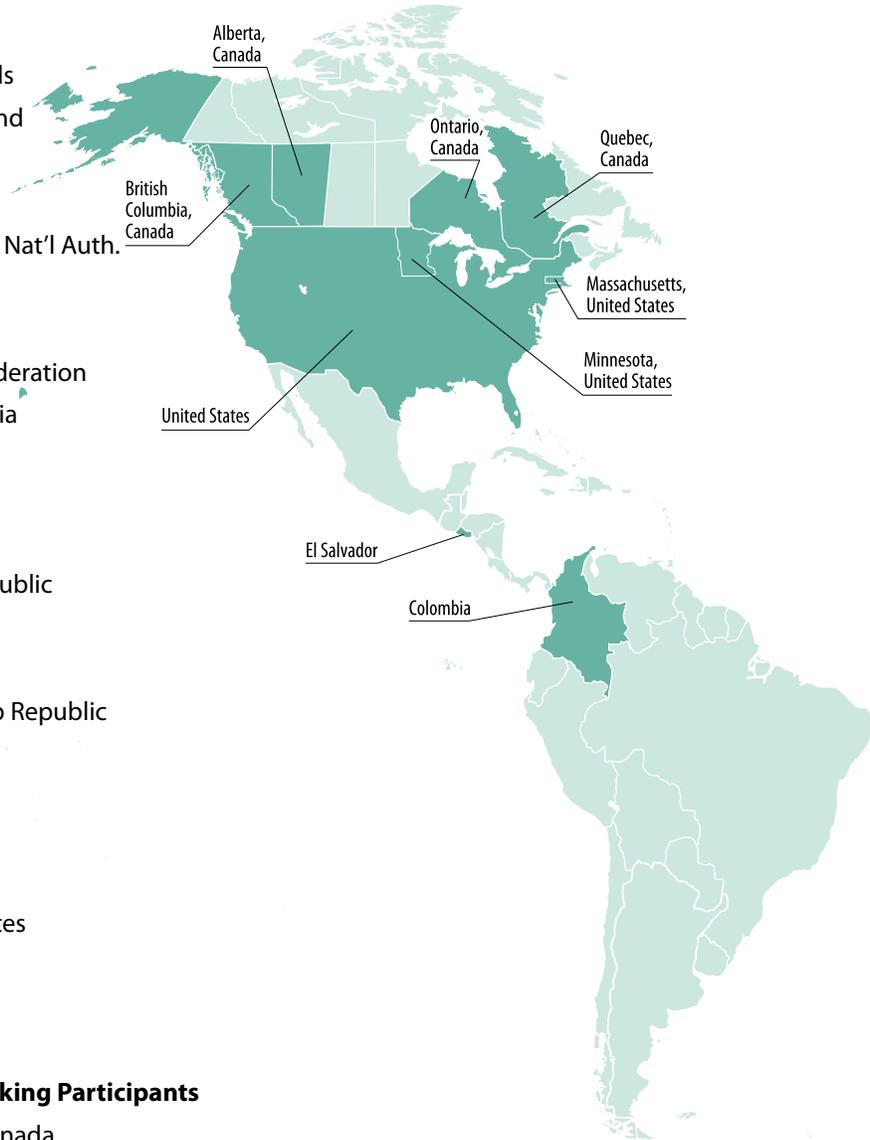


Exhibit 1 Countries Participating in TIMSS 2007 (Continued)

TIMSS2007  
Mathematics & Science  
4<sup>th</sup> & 8<sup>th</sup>  
Grades

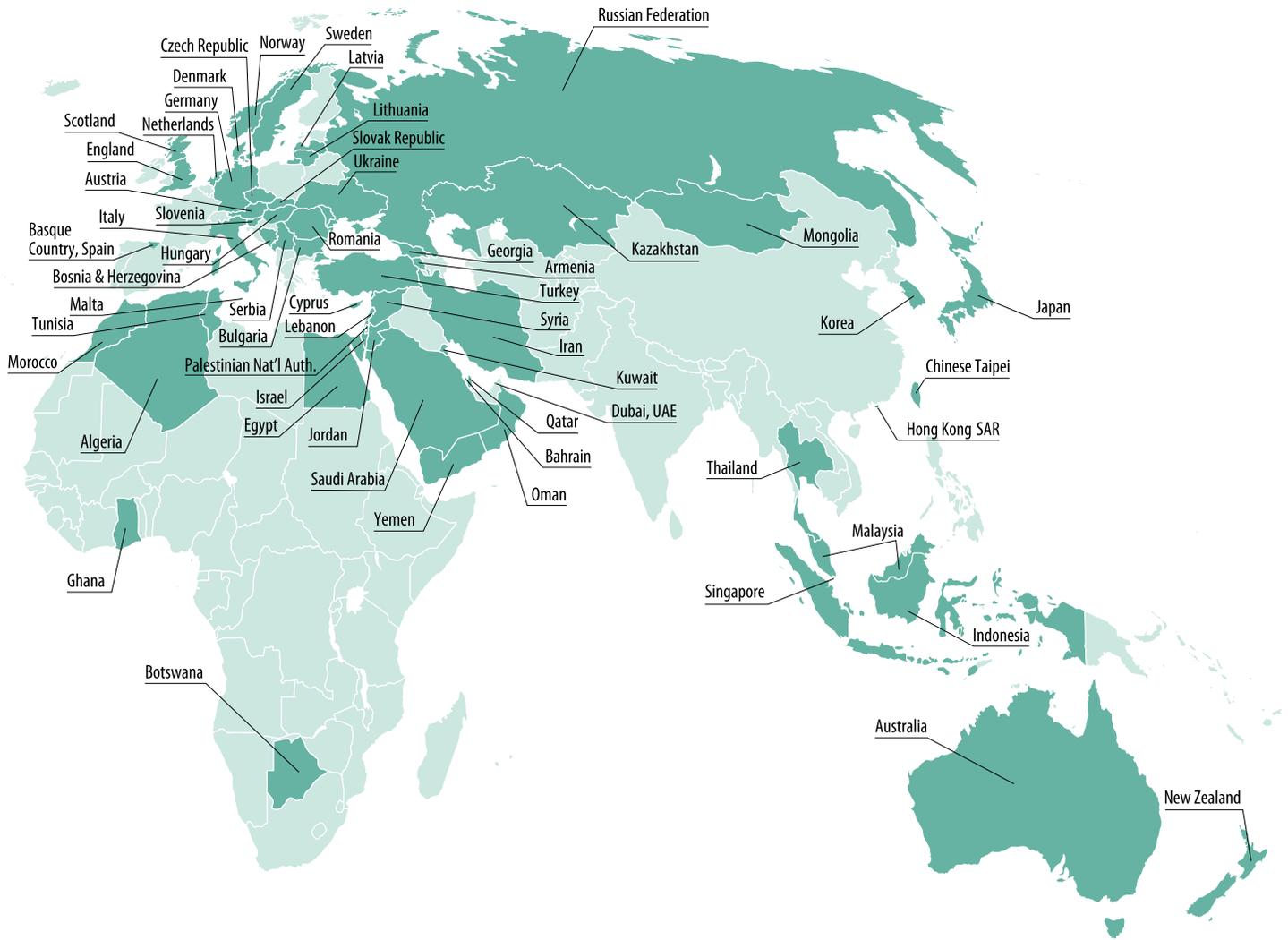


Exhibit 2 lists the TIMSS 2007 participants, and indicates the grade(s) at which they participated and the previous cycles they participated in at that grade. It can be seen that many of the TIMSS 2007 participants have data for both the fourth and eighth grades. At the fourth grade, this report contains TIMSS 2007 data for 37 countries and 7 benchmarking participants, including 12 countries and 3 benchmarking entities that participated at the fourth grade for the first time. In all, 183,150 students participated at the fourth grade. At the eighth grade, the report contains data for 50 countries and 7 benchmarking participants, including 9 countries and 1 benchmarking entity participating at the eighth grade for the first time. In all, 241,613 students participated at the eighth grade. Because the quality of the Mongolian data is not well documented, the achievement results for Mongolia are presented in Appendix E.

Exhibit 2 also shows that most TIMSS 2007 participants have trend data and, for each participant, whether it is for two, three, or four points in time: 1995, 1999, 2003, and 2007. In several cases, countries participated in previous TIMSS assessments but some procedures were improved or changed for TIMSS 2007 and the earlier data are not comparable. The trend tables in this report include 23 countries and 4 benchmarking participants at the fourth grade and 35 countries and 6 benchmarking participants at the eighth grade.

Exhibit 3 presents selected information about the demographic and economic characteristics of the TIMSS 2007 countries, because such factors can influence educational policies and decision-making. As can be seen, the TIMSS 2007 countries vary widely in population size and geographic area, as well as in population density. The countries also vary widely on indicators of health, such as life expectancy and infant mortality rate. The majority of countries had life expectancies of 70 to 79 years, and infant mortality rates of between 3 and 20 out of 1,000 births. However, at one end of the continuum, 11 of the countries had a life expectancy of 80 years or more and a low infant mortality rate (5 or fewer infant deaths per 1,000 live births), while Ghana and Yemen had life expectancies of about 60 years and Botswana of 50 years,

and these three had the highest infant mortality rates (approximately 75 and 90 infant deaths per 1,000 live births, respectively).

The economic indicators in Exhibit 3, such as the data for gross national income per capita, reveal great disparity in the economic resources available, and also that different policies exist about the percentage of funds spent on education. Economically, the TIMSS 2007 countries ranged from Kuwait, Norway, Singapore, and the United States with relatively high gross national incomes per capita (in U.S. dollars adjusted for purchasing power parity) to Egypt, Georgia, Ghana, Indonesia, Jordan, Mongolia, Morocco, and Syria with relatively low gross national incomes per capita. Although a number of countries had 95 percent or more of their primary and secondary students enrolled in school, there were differences in enrollments rates, especially at the secondary level. It should be noted that enrollment data are for primary and secondary schools, not for the fourth and eighth grades *per se*.

## Exhibit 2 Countries Participating in TIMSS 1995 Through 2007

TIMSS2007  
Mathematics & Science  
4<sup>th</sup> & 8<sup>th</sup>  
Grades

Country	Grade 4			Grade 8			
	2007	2003	1995	2007	2003	1999	1995
Algeria	●			●			
Armenia	●	●		●	●		
Australia	●	●	●	●	●	●	●
Austria	●		●				●
Bahrain				●	●		
Bosnia and Herzegovina				●			
Botswana				●	●		
Bulgaria				●	●	●	●
Chinese Taipei	●	●		●	●	●	
Colombia	●			●			●
Cyprus		●	●	●	●	●	●
Czech Republic	●		●	●		●	●
Denmark	●						●
Egypt				●	●		
El Salvador	●			●			
England	●	●	●	●	●	●	●
Georgia	●			●			
Germany	●						●
Ghana				●	●		
Hong Kong SAR	●	●	●	●	●	●	●
Hungary	●	●	●	●	●	●	●
Indonesia				●	●	●	●
Iran, Islamic Rep. of	●	●	●	●	●	●	●
Israel			●	●	●	●	●
Italy	●	●	●	●	●	●	●
Japan	●	●	●	●	●	●	●
Jordan				●	●	●	
Kazakhstan	●						
Korea, Rep. of			●	●	●	●	●
Kuwait	●		●	●			●
Latvia	●	●	●		●	●	●
Lebanon				●	●		
Lithuania	●	●		●	●	●	●
Malaysia				●	●	●	
Malta				●			
Mongolia	●			●			
Morocco	●	●		●	●	●	
Netherlands	●	●	●		●	●	●
New Zealand	●	●	●		●	●	●
Norway	●	●	●	●	●		●
Oman				●			
Palestinian Nat'l Auth.				●	●		
Qatar	●			●			
Romania				●	●	●	●
Russian Federation	●	●		●	●	●	●
Saudi Arabia				●	●		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Exhibit 2 Countries Participating in TIMSS 1995 Through 2007 (Continued)** **TIMSS2007**  
Mathematics & Science **4<sup>th</sup> & 8<sup>th</sup> Grades**

Country	Grade 4			Grade 8			
	2007	2003	1995	2007	2003	1999	1995
Scotland	●	●	●	●	●		●
Serbia				●	●		
Singapore	●	●	●	●	●	●	●
Slovak Republic	●				●	●	●
Slovenia	●	●	●	●	●	●	●
Sweden	●			●	●		●
Syrian Arab Republic				●	●		
Thailand			●	●		●	●
Tunisia	●	●		●	●	●	
Turkey				●		●	
Ukraine	●			●			
United States	●	●	●	●	●	●	●
Yemen	●	●					
<b>Benchmarking Participants</b>							
Alberta, Canada	●		●			●	●
Basque Country, Spain				●	●		
British Columbia, Canada	●			●		●	
Dubai, UAE	●			●			
Massachusetts, US	●			●		●	
Minnesota, US	●		●	●			●
Ontario, Canada	●	●	●	●	●	●	●
Quebec, Canada	●	●	●	●	●	●	●

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Exhibit 3 Selected Characteristics of TIMSS 2007 Countries

TIMSS2007  
Mathematics & Science 4<sup>th</sup> & 8<sup>th</sup> Grades

Country	Population Size (in Millions) <sup>1</sup>	Area of Country (Square Kilometers) <sup>2</sup>	Population Density (People per Square Kilometer) <sup>3</sup>	Urban Population (% of Total) <sup>4</sup>	Life Expectancy at Birth (Years) <sup>5</sup>	Infant Mortality Rate (per 1,000 Live Births) <sup>6</sup>	Gross National Income per Capita (in US Dollars) <sup>7</sup>	GNI per Capita (Purchasing Power Parity) <sup>8</sup>
Algeria	33.4	2381700	14	64	72	33	3030	5940
Armenia	3.0	28200	107	64	72	21	1920	4950
Australia	20.7	7682300	3	88	81	5	35860	33940
Austria	8.3	82500	100	66	80	4	39750	36040
Bahrain	0.7	700	1041	97	76	9	19350	34310
Bosnia and Herzegovina	3.9	51200	77	46	75	13	3230	6780
Botswana	1.9	566700	3	58	50	90	5570	11730
Bulgaria	7.7	108600	71	70	73	12	3990	10270
Chinese Taipei	23.0	36000	634	70	78	5	17294	–
Colombia	45.6	1109500	41	73	73	17	3120	6130
Cyprus	0.8	9300	84	70	79	3	23270	25060
Czech Republic	10.3	77300	133	74	77	3	12790	20920
Denmark	5.4	42400	128	86	78	4	52110	36190
Egypt	74.2	995500	75	43	71	29	1360	4940
El Salvador	6.8	20720	326	60	72	22	2680	5610
England	50.4	130000	390	90	79	5	40560	33650
Georgia	4.4	69500	64	52	71	28	1580	3880
Germany	82.4	348800	236	75	79	4	36810	32680
Ghana	23.0	227500	101	49	60	76	510	1240
Hong Kong SAR	6.9	1000	6581	100	82	–	29040	39200
Hungary	10.1	89600	112	67	73	6	10870	16970
Indonesia	223.0	1811600	123	49	68	26	1420	3310
Iran, Islamic Rep. of	70.1	1628600	43	67	71	30	2930	9800
Israel	7.1	21600	326	92	80	4	20170	23840
Italy	58.8	294100	200	68	81	4	31990	28970
Japan	127.8	364500	351	66	82	3	38630	32840
Jordan	5.5	88200	63	83	72	21	2650	4820
Kazakhstan	15.3	2699700	6	58	66	26	3870	8700
Korea, Rep. of	48.4	98700	490	81	79	5	17690	22990
Kuwait	2.6	17800	146	98	78	10	30630	48310
Latvia	2.3	62400	37	68	71	8	8100	14840
Lebanon	4.1	10200	396	87	72	26	5580	9600
Lithuania	3.4	62700	54	67	71	7	7930	14550
Malaysia	26.1	328600	80	68	74	10	5620	12160
Malta	0.4	300	1269	96	79	5	15310	20990
Mongolia	2.6	1566500	2	57	67	34	1000	2810
Morocco	30.5	446300	68	59	71	34	2160	3860
Netherlands	16.3	33900	482	81	80	4	43050	37940
New Zealand	4.2	267700	16	86	80	5	26750	25750
Norway	4.7	304300	15	78	80	3	68440	50070
Oman	2.5	309500	8	72	76	10	11120	19740
Palestinian Nat'l Auth.	3.9	6000	648	57	72	29	1374	–
Qatar	0.8	11000	75	96	76	18	–	–
Romania	21.6	230000	94	54	72	16	4830	10150
Russian Federation	142.5	16381400	9	73	66	14	5770	12740
Saudi Arabia	23.7	2000000	12	81	73	21	13980	22300
Scotland	5.1	78000	66	82	77	5	40560	33650
Serbia	7.4	102000	84	52	73	7	4030	9320
Singapore	4.5	700	6508	100	80	2	28730	43300
Slovak Republic	5.4	48100	112	56	74	7	9610	17060
Slovenia	2.0	20100	100	51	78	3	18660	23970
Sweden	9.1	410300	22	84	81	3	43530	34310
Syrian Arab Republic	19.4	183800	106	51	74	12	1560	4110
Thailand	63.4	510900	124	33	70	7	3050	7440
Tunisia	10.1	155400	65	66	74	19	2970	6490
Turkey	73.0	769600	95	68	72	24	5400	8410
Ukraine	46.8	579400	81	68	68	20	1940	6110
United States	299.4	9161900	33	81	78	7	44710	44070
Yemen	21.7	527900	41	28	62	75	760	2090

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



**Exhibit 3 Selected Characteristics of TIMSS 2007 Countries (Continued)**

**TIMSS2007**  
**Mathematics & Science** **4<sup>th</sup> & 8<sup>th</sup> Grades**

Public Expenditure on Education (% of GDP) <sup>9</sup>	Net Enrollment Ratio in Education (% of Relevant Group) <sup>10</sup>		Primary Pupil-Teacher Ratio <sup>11</sup>	Country
	Primary	Secondary		
–	95	66	25	Algeria
–	82	86	21	Armenia
5	96	86	–	Australia
5	97	–	12	Austria
–	96	90	–	Bahrain
–	–	–	–	Bosnia and Herzegovina
9	86	61	25	Botswana
3	93	89	16	Bulgaria
4	99	95	17	<sup>12</sup> Chinese Taipei
5	88	65	28	Colombia
6	100	94	18	Cyprus
4	93	–	16	Czech Republic
8	96	91	–	Denmark
–	94	83	26	Egypt
3	94	54	40	El Salvador
5	99	95	22	England
3	89	79	15	Georgia
5	–	–	14	Germany
5	66	38	32	Ghana
4	93	78	18	Hong Kong SAR
5	89	90	10	Hungary
1	95	57	20	Indonesia
5	94	77	19	Iran, Islamic Rep. of
7	97	89	13	Israel
5	99	92	10	Italy
4	100	100	19	Japan
–	91	79	20	Jordan
3	90	86	17	Kazakhstan
5	98	94	28	Korea, Rep. of
4	83	–	10	Kuwait
5	90	–	12	Latvia
3	82	73	14	Lebanon
5	88	94	14	Lithuania
6	99	72	17	Malaysia
–	86	84	11	Malta
5	91	82	33	Mongolia
7	88	35	27	Morocco
5	98	87	10	Netherlands
7	99	–	16	New Zealand
8	98	96	11	Norway
5	74	77	14	Oman
11	80	95	25	Palestinian Nat'l Auth.
2	96	90	11	Qatar
3	91	81	17	Romania
4	92	–	17	Russian Federation
7	93	60	15	Saudi Arabia
5	100	100	16	Scotland
–	96	–	–	Serbia
–	–	–	24	Singapore
4	92	–	18	Slovak Republic
6	96	91	15	Slovenia
7	97	99	10	Sweden
–	92	63	–	Syrian Arab Republic
4	94	71	18	Thailand
7	97	–	20	Tunisia
4	90	66	–	Turkey
6	90	84	17	Ukraine
6	92	88	14	United States
–	75	37	–	Yemen

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

All data taken from the 2008 World Development Indicators (World Bank, 2008) unless otherwise noted.

- <sup>1</sup> Includes all residents regardless of legal status or citizenship except refugees not permanently settled in the country of asylum as they are generally considered to be part of their country of origin (pp. 40–43). Data for Palestinian National Authority, England, and Scotland provided by the National Research Coordinator (NRC).
  - <sup>2</sup> Area is the total surface area in square kilometers, excluding the area under inland water bodies and national claims to the continental shelf and exclusive economic zones (pp. 130–133). Data for Palestinian National Authority, England, and Scotland provided by the NRC.
  - <sup>3</sup> Mid-year population is divided by land area in square kilometers (pp. 14–17). Data for Palestinian National Authority, England, and Scotland provided by the NRC.
  - <sup>4</sup> Urban population is the mid-year population of areas defined as urban in each country and reported to the United Nations. It is measured here as the percentage of the total population (pp. 170–173). Data for Palestinian National Authority, England, and Scotland provided by the NRC.
  - <sup>5</sup> Number of years a newborn infant would live if prevailing patterns of mortality at its birth were to stay the same throughout its life (pp. 118–121). Data for Palestinian National Authority, England, and Scotland provided by the NRC.
  - <sup>6</sup> Infant mortality rate is the number of deaths of infants under 1 year of age, per 1,000 live births in the same year (118–121). Data for Palestinian National Authority, England, and Scotland provided by the NRC.
  - <sup>7</sup> GNI per capita in U.S. dollars is converted using the World Bank Atlas method (pp. 14–17). Data for Palestinian National Authority provided by the NRC. Figures for England and Scotland are for the whole region of the United Kingdom.
  - <sup>8</sup> An international dollar has the same purchasing power over GNI as a U.S. dollar in the United States (pp. 14–17). Figures for England and Scotland are for the whole region of the United Kingdom.
  - <sup>9</sup> Current and capital public expenditure on primary, secondary, and tertiary education expressed as a percentage of GDP (pp. 76–79). Data for Palestinian National Authority provided by the NRC. Figures for England and Scotland are for the whole region of the United Kingdom.
  - <sup>10</sup> Ratio of the children of official school age who are enrolled in school to the population of the corresponding official school age, based on the International Standard Classification of Education 1997 (pp. 80–83). Data also provided by the Global Education Digest 2007, UNESCO Institute for Statistics (pp. 81–89, 101–109). Figures for England are for the whole region of the United Kingdom. Figures for Scotland provided by the NRC.
  - <sup>11</sup> Primary pupil-teacher ratio is the number of pupils enrolled in primary school divided by the number of primary school teachers (regardless of their assignment (pp. 76–79)). Data for England and Scotland provided by the NRC.
  - <sup>12</sup> Data for Chinese Taipei provided by the NRC.
- A dash (–) indicates comparable data are not available.

## What Was the Nature of the TIMSS 2007 Science Test?

Chapters 1 through 3 of this report contain data about students' achievement on the science assessment. At both fourth and eighth grades, the TIMSS 2007 science assessment is organized around two dimensions, a content dimension specifying the subject matter domains to be assessed within science and a cognitive dimension specifying the thinking processes or domains to be assessed.

The publication entitled *TIMSS 2007 Assessment Frameworks*<sup>5</sup> contains the science framework for the fourth and eighth grades. The content domains differ for the fourth and eighth grades, reflecting the nature and difficulty of the science widely taught at each grade.<sup>6</sup> At the fourth grade, the three content domains are life science, physical sciences, and earth science. At the eighth grade, the four content domains are biology, chemistry, physics, and earth science. At each grade, the science framework describes each content domain in terms of the specific topic areas covered and the objectives within each topic.

The cognitive domains are the same for both grades—knowing, applying, and reasoning. Each cognitive domain is described according to the sets of processing behaviors expected of students as they engage with the science content. The emphasis across the cognitive domains is such that the majority of the items assess the applying or reasoning domains.

TIMSS 2007 included a very extensive test development effort to support the science assessment framework. At the fourth grade, the test includes 174 items totaling 194 score points and at the eighth grade the test includes 214 items totaling 240 score points. At both grades, approximately half the items are constructed-response and half are multiple-choice. Chapter 2 contains more information about the content of the science assessment, including example items. Appendix A contains further information about the numbers of items by type in each domain.

Developing the TIMSS tests for 2007 was a cooperative venture involving representatives from the participating countries throughout the entire process. The TIMSS & PIRLS International Study Center began the process

5 Mullis, I.V.S., Martin, M.O., Ruddock, G.J., O'Sullivan, C.Y., Arora, A., & Erberber, E. (2005). *TIMSS 2007 assessment frameworks*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

6 With each cycle, TIMSS updates the assessment frameworks. For example, in 2003 the frameworks were expanded to provide specific objectives for assessing students at the fourth and eighth grades, and in 2007 the content domains were presented separately for the two grades. Also, there was an effort to consolidate the major content areas and, particularly at the fourth grade, to adjust the topic areas and objectives to make them better reflect fourth-grade curricula.

with an item-writing workshop for the National Research Coordinators from the participating countries and their colleagues. Through a series of efforts, countries then submitted items that were reviewed by science subject-matter specialists. Participating countries field-tested the items with representative samples of students, and all of the potential new items were reviewed by the TIMSS 2007 Science and Mathematics Item Review Committee of subject area experts. The National Research Coordinators had several opportunities to review the items and scoring criteria to ensure the items were measuring objectives in the frameworks, and were appropriate for students in the countries.

### **How Was Information Collected About the Contexts for Learning Science?**

TIMSS uses the curriculum, broadly defined, as the major organizing concept in considering how educational opportunities are provided to students, and the factors that influence how students use these opportunities. IEA's curriculum model has three aspects, the intended curriculum specified by countries, the implemented curriculum actually taught, and the achieved curriculum—what students have learned. While Chapters 1 through 3 of this report present the data about students' science learning, Chapters 4 through 8, together with the *TIMSS 2007 Encyclopedia* provide comprehensive information about the national contexts for science education including information about the intended curriculum and the implemented curriculum.

To collect information about the intended curriculum, the TIMSS 2007 participants each completed a chapter for the *TIMSS 2007 Encyclopedia* published as a companion to the TIMSS 2007 international reports. For each TIMSS 2007 participant, the encyclopedia summarizes the major components of the curriculum in mathematics and science and describes what supports there are for curriculum implementation—for example, the types of teacher education required, and any formal testing programs and/or assessments. Also, countries completed questionnaires about their national situations for

education and aspects of their intended curricula, including identifying the TIMSS topics included (see Chapter 5).

Data about the instructional methods used to implement the curriculum were collected via questionnaires completed by the teachers and principals of the assessed students and by the students themselves. Corresponding to the information about the intended curriculum, teachers provided information about each of the TIMSS topics taught to the students (also in Chapter 5). The students that were assessed provided information about their home and classroom experiences, and their teachers and school principals provided information about instructional practices, school resources, and the school climate for learning.

To guide questionnaire development, the *TIMSS 2007 Assessment Frameworks* document includes a framework describing the contextual factors associated with students' learning in mathematics and science. Advice throughout the development process was provided by the TIMSS 2007 Questionnaire Item Review Committee.

### Who Conducts TIMSS?

TIMSS is a major undertaking of IEA, and together with PIRLS, comprises the core of IEA's regular cycle of studies. PIRLS (Progress in International Reading Literacy Study) has been assessing reading comprehension at the fourth grade since 2001 on a regular 5-year cycle. Forty countries participated in PIRLS 2006<sup>7</sup> and PIRLS 2011 is underway. IEA has delegated responsibility for the overall direction and management of these two projects to the TIMSS & PIRLS International Study Center at Boston College. Headed by Michael O. Martin and Ina V.S. Mullis, the study center is located in the Lynch School of Education.

In carrying out the projects, the TIMSS & PIRLS International Study Center works closely with the IEA Secretariat in Amsterdam, the IEA Data Processing and Research Center in Hamburg, Statistics Canada in Ottawa, and Educational Testing Service in Princeton, New Jersey. TIMSS expends enormous energy to ensure the reliability, validity, and comparability of the data through careful planning and documentation, cooperation among

7 Kennedy, A.M., Mullis, I.V.S., Martin, M.O., & Trong, K.L. (Eds.). (2007). *PIRLS 2006 encyclopedia: A guide to reading education in the forty PIRLS 2006 countries*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., Kennedy, A.M., & Foy, P. (2007). *PIRLS 2006 international report: IEA's Progress in International Reading Literacy Study in primary schools in 40 countries*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

participating countries, standardized procedures, and rigorous attention to quality control throughout. The data are collected according to rigorous scientific standards detailed in manuals, and countries receive training every step of the way.

TIMSS 2007 was conducted in many different languages, involving a substantial effort in translating all of the assessment instruments. The translations underwent a complex verification procedure coordinated by the IEA Secretariat, while the test booklet layouts were verified by the TIMSS & PIRLS International Study Center.

The student sampling for TIMSS 2007 was conducted with careful attention to quality and comparability. The sampling was designed to ensure that the data provided accurate and economical estimates of the student population. To maintain high quality standards, a uniform approach was specified and staff from Statistics Canada worked with the participants on all phases of the sampling activities. If procedures did not satisfy the TIMSS standards, the data are annotated in the report (or not reported at all). Appendix A contains further information on target populations, sample implementation, and participation rates.

Adherence to the test administration procedures was monitored through the use of international quality control observers arranged by the IEA Secretariat, and within-country quality control procedures. The TIMSS & PIRLS International Study Center conducted several training sessions to ensure that the constructed-response scoring was done correctly. Reliability data were collected for within-country scoring and across assessment cycles using special procedures developed by the IEA Data Processing and Research Center (see Appendix A). The IEA Data Processing and Research Center checked each country's data files for internal consistency and accuracy, and interacted with countries to resolve data issues.

The TIMSS & PIRLS International Study Center reviewed achievement item statistics for every country and consulted with Educational Testing Service on the methods and results of the scaling process. The primary approach to reporting the TIMSS 2007 achievement data was based on

item response theory (IRT) scaling methods. In order to measure trends in mathematics achievement across assessments, the TIMSS achievement scales for mathematics were designed to provide reliable measures on a common metric established originally with the 1995 assessment, and now spanning the 1995, 1999, 2003, and 2007 assessments. More information about the TIMSS 2007 procedures for scaling and data analysis can be found in Appendix A.

To coordinate the TIMSS project nationally and to work with the international team, each participating country designated an individual (or two) to be its National Research Coordinator (NRC). The NRCs had the crucial and complex task of implementing the TIMSS study in their countries in accordance with the TIMSS guidelines and procedures. The quality of the assessments depends on the work of the NRCs and their colleagues in carrying out the very detailed sampling, data collection, and scoring tasks involved. The TIMSS NRCs performed their many tasks with great dedication, competence, and energy, and are to be commended for their commitment to the project and high quality of their work.

Appendix F lists the names of many of those responsible for the management, coordination, and conduct of TIMSS 2007, including the NRCs from every country and benchmarking participant.





# Chapter 1



## *International Student Achievement in Science*

Chapter 1 contains the TIMSS 2007 achievement results for fourth and eighth grade students in science for each of the participating countries and benchmarking entities. It also presents trends in science achievement over time for participants in previous TIMSS assessments in 1995, 1999, and 2003. Achievement differences by gender at both grades are also described.

### **How Do Countries Differ in Science Achievement?**

Exhibit 1.1 shows the distribution of student achievement for the participants in TIMSS 2007, including the average (mean) scale score with its 95 percent confidence interval and the ranges in performance for the middle half of the students (25th to 75th percentiles) as well as the extremes (5th and 95th percentiles). The first page of Exhibit 1.1 presents the distribution for the achievement for the 36 countries and 7 benchmarking participants at the fourth grade and the second page presents the distribution of student achievement for the 49 countries and 7 benchmarking participants at the eighth grade.<sup>1</sup> For each grade in Exhibit 1.1, countries are shown in decreasing order of average (mean) scale score (with the exception of Morocco at the eighth grade<sup>2</sup>) followed by the benchmarking participants also ordered from highest to lowest average achievement. The benchmarking participants followed the same procedures and met the same standards as the countries, the difference being that they are regional entities (in some cases parts of

<sup>1</sup> Because characteristics of their samples and data are not completely known, achievement results for Mongolia at the fourth and eighth grades are presented in Appendix E.

<sup>2</sup> Morocco did not meet the school participation rates as specified in the TIMSS guidelines due to a procedural difficulty with some schools, and consequently, its results are shown below a line.

countries shown above). Because there often are relatively small differences between participants in average achievement, Exhibit 1.2 shows whether or not the differences in average achievement are statistically significant.

TIMSS used item response theory (IRT) methods to summarize the achievement for each grade on a scale with a mean of 500 and a standard deviation of 100.<sup>3</sup> The TIMSS science scales for the fourth and eighth grades were established based on the 1995 assessments and the methodology enables comparable trend measures from assessment to assessment within each grade. It should be noted that the results for the fourth and eighth grades are not directly comparable. While the scales for the two grades are expressed in the same numerical units, they are not directly comparable in terms of being able to say how much achievement or learning at one grade equals how much achievement or learning at the other grade. That is, achievement on the TIMSS scales cannot be described in absolute terms (like all such scales developed using IRT technology). Comparisons can only be made in terms of relative performance (higher or lower), for example, among countries and population groups as well as between assessments.

In Exhibit 1.1, there is a symbol by a participant's average scale score indicating if the average achievement is significantly higher (up arrow) or lower (down arrow) than the scale average of 500. It should be noted that the scale average referenced in Exhibit 1.1 is different from the international average referenced in previous TIMSS reports. The TIMSS scale metric for the fourth grade and for the eighth grade was established in 1995 by setting the average of the mean scores of the countries that participated in TIMSS 1995 to 500 and the standard deviation to 100. To enable comparisons across TIMSS assessments, with each subsequent assessment the data from 1999, 2003, and 2007 also were placed on this metric so that scores are equivalent from assessment to assessment. Thus, the scale average has remained at 500 with each cycle of TIMSS and provides a fixed point of comparison through time. That is, a score of 500 in eighth or fourth grade science in 2007 is equivalent to a score of 500 in eighth or fourth grade science, respectively, in 2003, in 1999 (eighth grade only), and in 1995.

3 Given the matrix-sampling approach, the scaling process averages students' responses in a way that accounts for differences in the difficulty of different subsets of items. It allows students' performance to be summarized on a common metric even though individual students responded to different items in the science test. For further information, see the "IRT Scaling and Data Analysis" section of Appendix A.

In contrast, the international average, obtained by averaging across the mean scores for each of the participating countries, needs to be recomputed for each new cycle based on the set of participating countries and has changed from cycle to cycle, becoming lower with each assessment, particularly at the eighth grade, depending on the set of countries taking part.<sup>4</sup> Using a point of reference that can change substantially from cycle to cycle depending on which countries participate creates the possibility for misinterpretations, particularly if countries gauge their progress in terms of how far they are above or below this point. For example, in 2003 using the international average may have given the erroneous impression that some countries at the eighth grade had improved, when actually it was only that the international average had become lower. Thus, to avoid misinterpretations based on movement of the international average between cycles, TIMSS 2007 adopted the fixed average approach by using the scale average as the point of reference, and this approach will be used for all future cycles of TIMSS (i.e., in 2011, 2016, and so on). It can be noted that the same approach is used in PIRLS. In PIRLS 2001, the average of the mean scale scores of the countries was set to 500 (the scale average) and the standard deviation to 100, and the fixed reference point approach (scale average instead of international average) was adopted for use from then on.

Similar to earlier TIMSS assessments, Asian countries top Exhibit 1.1 at both the fourth and eighth grades. Singapore was the top performing country at the fourth grade, with an average score 87 points above the 500 scale average. Using Exhibit 1.2 to help interpret the typically small differences in achievement among countries, it can be seen that Singapore had higher achievement than all of the other countries. Singapore was followed by Chinese Taipei and Hong Kong SAR, that were outperformed only by Singapore. Next came Japan and the Russian Federation, that were outperformed only by Singapore and Chinese Taipei, and then Latvia and England, that were outperformed only by Singapore, Chinese Taipei, and Hong Kong SAR. The United States, Hungary, Italy, and Kazakhstan also performed very well, and were outperformed only by the top four Asian

4 In 1995, the scale average for science and the international average were both 500 at the fourth grade and at the eighth grade. In 1999, the scale average remained at 500; however, because different countries participated in 1999 than 1995, the international average at the eighth grade for TIMSS 1999 changed to 488, somewhat lower than the scale average. With yet a larger and different set of countries participating in TIMSS 2003, including some with low average achievement, the international average at grade 8 dropped to 474. At the fourth grade in 2003, the international average was 489 in science.

Exhibit 1.1 TIMSS 2007 Distribution of Science Achievement

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Science Achievement Distribution	Average Scale Score	Years of Formal Schooling*	Average Age at Time of Testing	Human Development Index**
Singapore		587 (4.1)	4	10.4	0.922
Chinese Taipei		557 (2.0)	4	10.2	0.932
Hong Kong SAR		554 (3.5)	4	10.2	0.937
Japan		548 (2.1)	4	10.5	0.953
Russian Federation		546 (4.8)	4	10.8	0.813
<sup>1</sup> Latvia		542 (2.3)	4	11.0	0.855
England		542 (2.9)	5	10.2	0.946
<sup>2</sup> † United States		539 (2.7)	4	10.3	0.951
Hungary		536 (3.3)	4	10.7	0.874
Italy		535 (3.2)	4	9.8	0.941
<sup>1</sup> Kazakhstan		533 (5.6)	4	10.6	0.794
Germany		528 (2.4)	4	10.4	0.935
Australia		527 (3.3)	4	9.9	0.962
Slovak Republic		526 (4.8)	4	10.4	0.863
Austria		526 (2.5)	4	10.3	0.948
Sweden		525 (2.9)	4	10.8	0.956
‡ Netherlands		523 (2.6)	4	10.2	0.953
Slovenia		518 (1.9)	4	9.8	0.917
† Denmark		517 (2.9)	4	11.0	0.949
Czech Republic		515 (3.1)	4	10.3	0.891
<sup>1</sup> Lithuania		514 (2.4)	4	10.8	0.862
New Zealand		504 (2.6)	4.5 – 5.5	10.0	0.943
† Scotland		500 (2.3)	5	9.8	0.946
<b>TIMSS Scale Avg.</b>		<b>500</b>			
Armenia		484 (5.7)	4	10.6	0.775
Norway		477 (3.5)	4	9.8	0.968
Ukraine		474 (3.1)	4	10.3	0.788
Iran, Islamic Rep. of		436 (4.3)	4	10.2	0.759
<sup>1</sup> Georgia		418 (4.6)	4	10.1	0.754
Colombia		400 (5.4)	4	10.4	0.791
El Salvador		390 (3.4)	4	11.0	0.735
Algeria		354 (6.0)	4	10.2	0.733
♣ Kuwait		348 (4.4)	4	10.2	0.891
Tunisia		318 (5.9)	4	10.2	0.766
Morocco		297 (5.9)	4	10.6	0.646
Qatar		294 (2.6)	4	9.7	0.875
Yemen		197 (7.2)	4	11.2	0.508
<b>Benchmarking Participants</b>					
<sup>2</sup> Massachusetts, US		571 (4.3)	4	10.3	–
<sup>2</sup> † Minnesota, US		551 (6.1)	4	10.3	–
<sup>2</sup> Alberta, Canada		543 (3.8)	4	9.8	–
<sup>2</sup> British Columbia, Canada		537 (2.7)	4	9.8	–
<sup>2</sup> Ontario, Canada		536 (3.7)	4	9.8	–
<sup>2</sup> Quebec, Canada		517 (2.7)	4	10.1	–
♣ † Dubai, UAE		460 (2.8)	4	10.0	–

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



⬆ Country average significantly higher than TIMSS scale average  
 ⬇ Country average significantly lower than TIMSS scale average

\* Represents years of schooling counting from the first year of ISCED Level 1.  
 \*\* Taken from United Nations Development Programme's *Human Development Report 2007/2008*, p.229–232, except for Chinese Taipei taken from Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C. *Statistical Yearbook 2007*. Data for England and Scotland are for the United Kingdom.  
 † Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

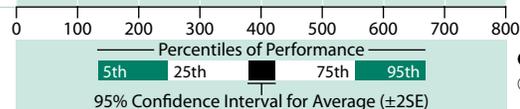
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
 ♣ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (–) indicates comparable data are not available.  
 Note: See Exhibit D.1 for percentiles of achievement in science.

Exhibit 1.1 TIMSS 2007 Distribution of Science Achievement (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Science Achievement Distribution	Average Scale Score	Years of Formal Schooling*	Average Age at Time of Testing	Human Development Index**
Singapore		567 (4.4)	8	14.4	0.922
Chinese Taipei		561 (3.7)	8	14.2	0.932
Japan		554 (1.9)	8	14.5	0.953
Korea, Rep. of		553 (2.0)	8	14.3	0.921
<sup>†</sup> England		542 (4.5)	9	14.2	0.946
Hungary		539 (2.9)	8	14.6	0.874
Czech Republic		539 (1.9)	8	14.4	0.891
Slovenia		538 (2.2)	7 or 8	13.8	0.917
<sup>†</sup> Hong Kong SAR		530 (4.9)	8	14.4	0.937
Russian Federation		530 (3.9)	7 or 8	14.6	0.802
<sup>2 †</sup> United States		520 (2.9)	8	14.3	0.951
<sup>1</sup> Lithuania		519 (2.5)	8	14.9	0.862
Australia		515 (3.6)	8	13.9	0.962
Sweden		511 (2.6)	8	14.8	0.956
<b>TIMSS Scale Avg.</b>		<b>500</b>			
<sup>†</sup> Scotland		496 (3.4)	9	13.7	0.946
Italy		495 (2.8)	8	13.9	0.941
Armenia		488 (5.8)	8	14.9	0.775
Norway		487 (2.2)	8	13.8	0.968
Ukraine		485 (3.5)	8	14.2	0.788
Jordan		482 (4.0)	8	14.0	0.773
Malaysia		471 (6.0)	8	14.3	0.811
Thailand		471 (4.3)	8	14.3	0.781
<sup>1 2</sup> Serbia		470 (3.2)	8	14.9	0.810
<sup>3</sup> Bulgaria		470 (5.9)	8	14.9	0.824
<sup>3</sup> Israel		468 (4.3)	8	14.0	0.932
Bahrain		467 (1.7)	8	14.1	0.866
Bosnia and Herzegovina		466 (2.8)	8 or 9	14.7	0.803
Romania		462 (3.9)	8	15.0	0.813
Iran, Islamic Rep. of		459 (3.6)	8	14.2	0.759
Malta		457 (1.4)	9	14.0	0.878
Turkey		454 (3.7)	8	14.0	0.775
Syrian Arab Republic		452 (2.9)	8	13.9	0.724
Cyprus		452 (2.0)	8	13.8	0.903
Tunisia		445 (2.1)	8	14.5	0.766
Indonesia		427 (3.4)	8	14.3	0.728
Oman		423 (3.0)	8	14.3	0.814
<sup>1</sup> Georgia		421 (4.8)	8	14.2	0.754
<sup>♦♦</sup> Kuwait		418 (2.8)	8	14.4	0.891
Colombia		417 (3.5)	8	14.5	0.791
Lebanon		414 (5.9)	8	14.4	0.772
Egypt		408 (3.6)	8	14.1	0.708
Algeria		408 (1.7)	8	14.5	0.733
Palestinian Nat'l Auth.		404 (3.5)	8	14.0	0.731
Saudi Arabia		403 (2.4)	8	14.4	0.812
El Salvador		387 (2.9)	8	15.0	0.735
Botswana		355 (3.1)	8	14.9	0.654
Qatar		319 (1.7)	8	13.9	0.875
Ghana		303 (5.4)	8	15.8	0.553
<sup>‡</sup> Morocco		402 (2.9)	8	14.8	0.646
<b>Benchmarking Participants</b>					
<sup>2</sup> Massachusetts, US		556 (4.6)	8	14.2	–
<sup>2 †</sup> Minnesota, US		539 (4.8)	8	14.3	–
<sup>2</sup> Ontario, Canada		526 (3.6)	8	13.8	–
<sup>2</sup> British Columbia, Canada		526 (2.7)	8	13.9	–
<sup>3</sup> Quebec, Canada		507 (3.1)	8	14.2	–
Basque Country, Spain		498 (3.0)	8	14.1	–
<sup>♦†</sup> Dubai, UAE		489 (2.8)	8	14.2	–

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



\* Represents years of schooling counting from the first year of ISCED Level 1.  
 \*\* Taken from United Nations Development Programme's *Human Development Report 2007/2008*, p.229–232, except for Chinese Taipei taken from Directorate-General of Budget, Accounting and Statistics, Executive Yuan, *R.O.C. Statistical Yearbook 2007* and for Serbia taken from *Human Development Analyses of Serbia 2007*. Data for England and Scotland are for the United Kingdom.  
 † Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).  
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (–) indicates comparable data are not available.  
 Note: See Exhibit D.1 for percentiles of achievement in science.

Exhibit 1.2 TIMSS 2007 Multiple Comparisons of Average Science Achievement

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Singapore	Chinese Taipei	Hong Kong SAR	Japan	Russian Federation	Latvia	England	United States	Hungary	Italy	Kazakhstan	Germany	Australia	Slovak Republic	Austria	Sweden	Netherlands	Slovenia	Denmark	Czech Republic	Lithuania	New Zealand	Scotland	Armenia	Norway	Ukraine	Iran, Islamic Rep. of	Georgia	Colombia	El Salvador		
Singapore	587 (4.1)																																
Chinese Taipei	557 (2.0)	▼																															
Hong Kong SAR	554 (3.5)	▼																															
Japan	548 (2.1)	▼	▼																														
Russian Federation	546 (4.8)	▼	▼																														
Latvia	542 (2.3)	▼	▼	▼																													
England	542 (2.9)	▼	▼	▼																													
United States	539 (2.7)	▼	▼	▼	▼																												
Hungary	536 (3.3)	▼	▼	▼	▼																												
Italy	535 (3.2)	▼	▼	▼	▼																												
Kazakhstan	533 (5.6)	▼	▼	▼	▼																												
Germany	528 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼																							
Australia	527 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼																							
Slovak Republic	526 (4.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼																							
Austria	526 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																						
Sweden	525 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																						
Netherlands	523 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																						
Slovenia	518 (1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																					
Denmark	517 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Czech Republic	515 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Lithuania	514 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
New Zealand	504 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Scotland	500 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Armenia	484 (5.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Norway	477 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Ukraine	474 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Iran, Islamic Rep. of	436 (4.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Georgia	418 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Colombia	400 (5.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
El Salvador	390 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Algeria	354 (6.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Kuwait	348 (4.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Tunisia	318 (5.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Morocco	297 (5.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Qatar	294 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Yemen	197 (7.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				
<b>Benchmarking Participants</b>																																	
Massachusetts, US	571 (4.3)	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Minnesota, US	551 (6.1)	▼																															
Alberta, Canada	543 (3.8)	▼	▼	▼																													
British Columbia, Canada	537 (2.7)	▼	▼	▼	▼																												
Ontario, Canada	536 (3.7)	▼	▼	▼	▼																												
Quebec, Canada	517 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Dubai, UAE	460 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

Exhibit 1.2 TIMSS 2007 Multiple Comparisons of Average Science Achievement (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Algeria	Kuwait	Tunisia	Morocco	Qatar	Yemen	Benchmarking Participants	Average Scale Score	Country
▲	▲	▲	▲	▲	▲	Massachusetts, US	587 (4.1)	Singapore
▼	▼	▼	▼	▼	▼	Minnesota, US	557 (2.0)	Chinese Taipei
▼	▼	▼	▼	▼	▼	Alberta, Canada	554 (3.5)	Hong Kong SAR
▼	▼	▼	▼	▼	▼	British Columbia, Canada	548 (2.1)	Japan
▼	▼	▼	▼	▼	▼	Ontario, Canada	546 (4.8)	Russian Federation
▼	▼	▼	▼	▼	▼	Quebec, Canada	542 (2.3)	Latvia
▼	▼	▼	▼	▼	▼	Dubai, UAE	542 (2.9)	England
▼	▼	▼	▼	▼	▼		539 (2.7)	United States
▼	▼	▼	▼	▼	▼		536 (3.3)	Hungary
▼	▼	▼	▼	▼	▼		535 (3.2)	Italy
▼	▼	▼	▼	▼	▼		533 (5.6)	Kazakhstan
▼	▼	▼	▼	▼	▼		528 (2.4)	Germany
▼	▼	▼	▼	▼	▼		527 (3.3)	Australia
▼	▼	▼	▼	▼	▼		526 (4.8)	Slovak Republic
▼	▼	▼	▼	▼	▼		526 (2.5)	Austria
▼	▼	▼	▼	▼	▼		525 (2.9)	Sweden
▼	▼	▼	▼	▼	▼		523 (2.6)	Netherlands
▼	▼	▼	▼	▼	▼		518 (1.9)	Slovenia
▼	▼	▼	▼	▼	▼		517 (2.9)	Denmark
▼	▼	▼	▼	▼	▼		515 (3.1)	Czech Republic
▼	▼	▼	▼	▼	▼		514 (2.4)	Lithuania
▼	▼	▼	▼	▼	▼		504 (2.6)	New Zealand
▼	▼	▼	▼	▼	▼		500 (2.3)	Scotland
▼	▼	▼	▼	▼	▼		484 (5.7)	Armenia
▼	▼	▼	▼	▼	▼		477 (3.5)	Norway
▼	▼	▼	▼	▼	▼		474 (3.1)	Ukraine
▼	▼	▼	▼	▼	▼		436 (4.3)	Iran, Islamic Rep. of
▼	▼	▼	▼	▼	▼		418 (4.6)	Georgia
▼	▼	▼	▼	▼	▼		400 (5.4)	Colombia
▼	▼	▼	▼	▼	▼		390 (3.4)	El Salvador
▼	▼	▼	▼	▼	▼		354 (6.0)	Algeria
▼	▼	▼	▼	▼	▼		348 (4.4)	Kuwait
▼	▼	▼	▼	▼	▼		318 (5.9)	Tunisia
▼	▼	▼	▼	▼	▼		297 (5.9)	Morocco
▼	▼	▼	▼	▼	▼		294 (2.6)	Qatar
▼	▼	▼	▼	▼	▼		197 (7.2)	Yemen
▲	▲	▲	▲	▲	▲	Massachusetts, US	571 (4.3)	Massachusetts, US
▼	▼	▼	▼	▼	▼	Minnesota, US	551 (6.1)	Minnesota, US
▼	▼	▼	▼	▼	▼	Alberta, Canada	543 (3.8)	Alberta, Canada
▼	▼	▼	▼	▼	▼	British Columbia, Canada	537 (2.7)	British Columbia, Canada
▼	▼	▼	▼	▼	▼	Ontario, Canada	536 (3.7)	Ontario, Canada
▼	▼	▼	▼	▼	▼	Quebec, Canada	517 (2.7)	Quebec, Canada
▼	▼	▼	▼	▼	▼	Dubai, UAE	460 (2.8)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country



Exhibit 1.2 TIMSS 2007 Multiple Comparisons of Average Science Achievement (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

	Turkey	Syrian Arab Republic	Cyprus	Tunisia	Indonesia	Oman	Georgia	Kuwait	Colombia	Lebanon	Egypt	Algeria	Palestinian Nat'l Auth.	Saudi Arabia	Morocco	El Salvador	Botswana	Qatar	Ghana	Benchmarking Participants	Average Scale Score	Country		
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	567 (4.4)	Singapore	
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	561 (3.7)	Chinese Taipei
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	554 (1.9)	Japan
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	553 (2.0)	Korea, Rep. of
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	542 (4.5)	England
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	539 (2.9)	Hungary
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	539 (1.9)	Czech Republic
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	538 (2.2)	Slovenia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	530 (4.9)	Hong Kong SAR
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	530 (3.9)	Russian Federation
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	520 (2.9)	United States
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	519 (2.5)	Lithuania
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	515 (3.6)	Australia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	511 (2.6)	Sweden
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	496 (3.4)	Scotland
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	495 (2.8)	Italy
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	488 (5.8)	Armenia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	487 (2.2)	Norway
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	485 (3.5)	Ukraine
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	482 (4.0)	Jordan
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	471 (6.0)	Malaysia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	471 (4.3)	Thailand
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	470 (3.2)	Serbia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	470 (5.9)	Bulgaria
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	468 (4.3)	Israel
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	467 (1.7)	Bahrain
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	466 (2.8)	Bosnia and Herzegovina
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	462 (3.9)	Romania
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	459 (3.6)	Iran, Islamic Rep. of
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	457 (1.4)	Malta
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	454 (3.7)	Turkey
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	452 (2.9)	Syrian Arab Republic
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	452 (2.0)	Cyprus
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	445 (2.1)	Tunisia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	427 (3.4)	Indonesia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	423 (3.0)	Oman
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	421 (4.8)	Georgia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	418 (2.8)	Kuwait
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	417 (3.5)	Colombia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	414 (5.9)	Lebanon
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	408 (3.6)	Egypt
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	408 (1.7)	Algeria
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	404 (3.5)	Palestinian Nat'l Auth.
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	403 (2.4)	Saudi Arabia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	402 (2.9)	Morocco
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	387 (2.9)	El Salvador
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	355 (3.1)	Botswana
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	319 (1.7)	Qatar
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	303 (5.4)	Ghana
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	556 (4.6)	Massachusetts, US
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	539 (4.8)	Minnesota, US
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	526 (3.6)	Ontario, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	526 (2.7)	British Columbia, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	507 (3.1)	Quebec, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	498 (3.0)	Basque Country, Spain
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	489 (2.8)	Dubai, UAE

▶ Average achievement significantly higher than comparison country

◀ Average achievement significantly lower than comparison country

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

countries. Among the benchmarking participants, the state of Massachusetts in the United States was outperformed by Singapore but had higher average achievement than all other countries. The state of Minnesota was outperformed only by Singapore and Massachusetts; was not significantly different from Chinese Taipei, Hong Kong SAR, Japan, the Russian Federation, Latvia, England, the United States, and the benchmarking participant Alberta, Canada; and performed better than all other countries. The Canadian provinces of Alberta, British Columbia, and Ontario also performed very well in comparison to the other countries.

At the fourth grade, in addition to the 11 highest achieving countries mentioned above, ten more countries had average achievement higher than the scale average of 500, including Germany, Australia, the Slovak Republic, Austria, Sweden, the Netherlands, Slovenia, Denmark, the Czech Republic, and Lithuania. In addition to the benchmarking states of Massachusetts and Minnesota, the four Canadian provinces also performed above the scale average—Alberta, British Columbia, Ontario, and Quebec.

At the eighth grade, Exhibit 1.1 shows Singapore and Chinese Taipei with the highest average achievement in science. Using the information in Exhibit 1.2, it can be seen that these two countries performed similarly, with averages more than 60 points above the TIMSS scale average. Singapore had higher achievement than all of the other countries except Chinese Taipei, which, in turn, outperformed all countries except Singapore, Japan, and Korea. Japan and Korea had higher average achievement than all countries except Singapore and Chinese Taipei. England, Hungary, the Czech Republic, Slovenia, Hong Kong SAR, and the Russian Federation also performed well. At the eighth grade, among the benchmarking participants, the two U.S. states, Massachusetts and Minnesota, and the three Canadian provinces, Ontario, British Columbia, and Quebec, performed above the scale average. Average science achievement in Massachusetts was similar to that of the four top Asian countries (Singapore, Chinese Taipei, Japan, and Korea) and higher than all other countries and benchmarking participants. Minnesota was outperformed by the four Asian countries, had achievement similar to

England, Hungary, the Czech Republic, Slovenia, Hong Kong SAR, and the Russian Federation, and performed better than all other countries.

At the fourth grade, looking at the other end of the achievement continuum in Exhibit 1.2, Colombia (400) and El Salvador (390) performed similarly and had higher achievement than Algeria (354) and Kuwait (348), which performed similarly to each other and had higher achievement than Tunisia (318). Tunisia performed better than Morocco (297) and Qatar (294), and these two in turn had higher achievement than Yemen (197). At the eighth grade, Egypt, Algeria, the Palestinian National Authority, Saudi Arabia, and Morocco performed similarly and had higher achievement than El Salvador (387). El Salvador outperformed Botswana (355), which in turn outperformed Qatar (319), which had higher achievement than Ghana (303).

At both grades, TIMSS 2007 involved countries from around the world and from a wide variety of circumstances. It might then be anticipated that the results would reveal substantial differences in science achievement between the highest- and lowest-performing countries, and this proved to be the case (587 in Singapore compared with 197 in Yemen at fourth grade and 567 in Singapore compared with 303 in Ghana at eighth grade). The percentiles shown in Exhibit 1.1 also show, however, the wide range of achievement within countries. The difference between the 95th and 5th percentiles within countries is often approximately 300 scale points, which is similar to the difference across countries.

TIMSS devoted considerable energy to maximizing comparability across the grades and ages tested, but this is difficult considering the variation internationally in many educational policies, primarily school entry ages and policies concerning retention and promotion from grade to grade. For the most part, TIMSS participants are to assess students in the fourth year of schooling and the eighth year of schooling. However, to avoid testing very young children, the guidelines specify that the average age of the students tested should not be below 9.5 years old for fourth grade or 13.5 years old for eighth grade. Thus, countries where students start school at a very young age assess students at the next higher grade in accordance with the TIMSS guidelines.

Exhibit 1.1 includes the years of formal schooling and average age at time of testing of the students in each country. Every country tested the correct year of schooling in accordance with the TIMSS guidelines, which was the fourth grade and the eighth grade in most countries and why, for the matter of convenience in this report, the students will be referred to as fourth grade students or eighth grade students. It should be noted that five countries (England, Scotland, New Zealand, Malta, and Bosnia and Herzegovina) tested students in their fifth and/or ninth year of schooling in accordance with TIMSS guidelines, because their students start school at a very early age and otherwise would have been very young. Also, both the Russian Federation and Slovenia have been undergoing structural reforms requiring students to start school at a younger age so that students at the fourth and eighth grades would be the same age as students previously were in the third and seventh grades, but having had an additional year of schooling. To monitor this change, these two countries assessed students in the third and seventh years of schooling in previous assessments. The transition has been completed at the fourth grade, but not at the eighth grade where some of the students assessed in these two countries were in the seventh year of schooling.

Given that students typically are in their fourth or eighth year of schooling and the majority begins school at age 6 (see Appendix A), they are expected to be approximately 10 or 14 years old, on average, respectively. This was the case in most countries including the five countries testing students in their fifth and/or ninth years of schooling. In some countries, however, students do not start school until age 7 and, consequently, are expected to be approximately 11 or 15 years old, on average, respectively. Considering the cultural and economic diversity of the TIMSS countries as well as variation in age of entry to school and retention policies, students with the same amount of schooling are of different ages.<sup>5</sup> The interaction among these various factors and achievement is complicated, differing country by country. For example, the TIMSS data show the countries performing above the scale average ranging in students' average age from 9.8 to 11.0 years old at the fourth grade and from 13.8 to 14.9 years at the eighth grade. Students in

5 Martin, M.O., Mullis, I.V.S., & Foy. (2008). Interrelationships among reading achievement, grade level, and age in PIRLS 2006. In C. Papanastasiou (Ed.), *Proceedings of the IEA International Research Conference (IRC): PIRLS volume*. Nicosia, Cyprus: Cyprus University Press.

countries performing below the scale average also range in average age, from 9.7 to 11.2 years at the fourth grade and from 13.8 to 15.8 years at the eighth grade.

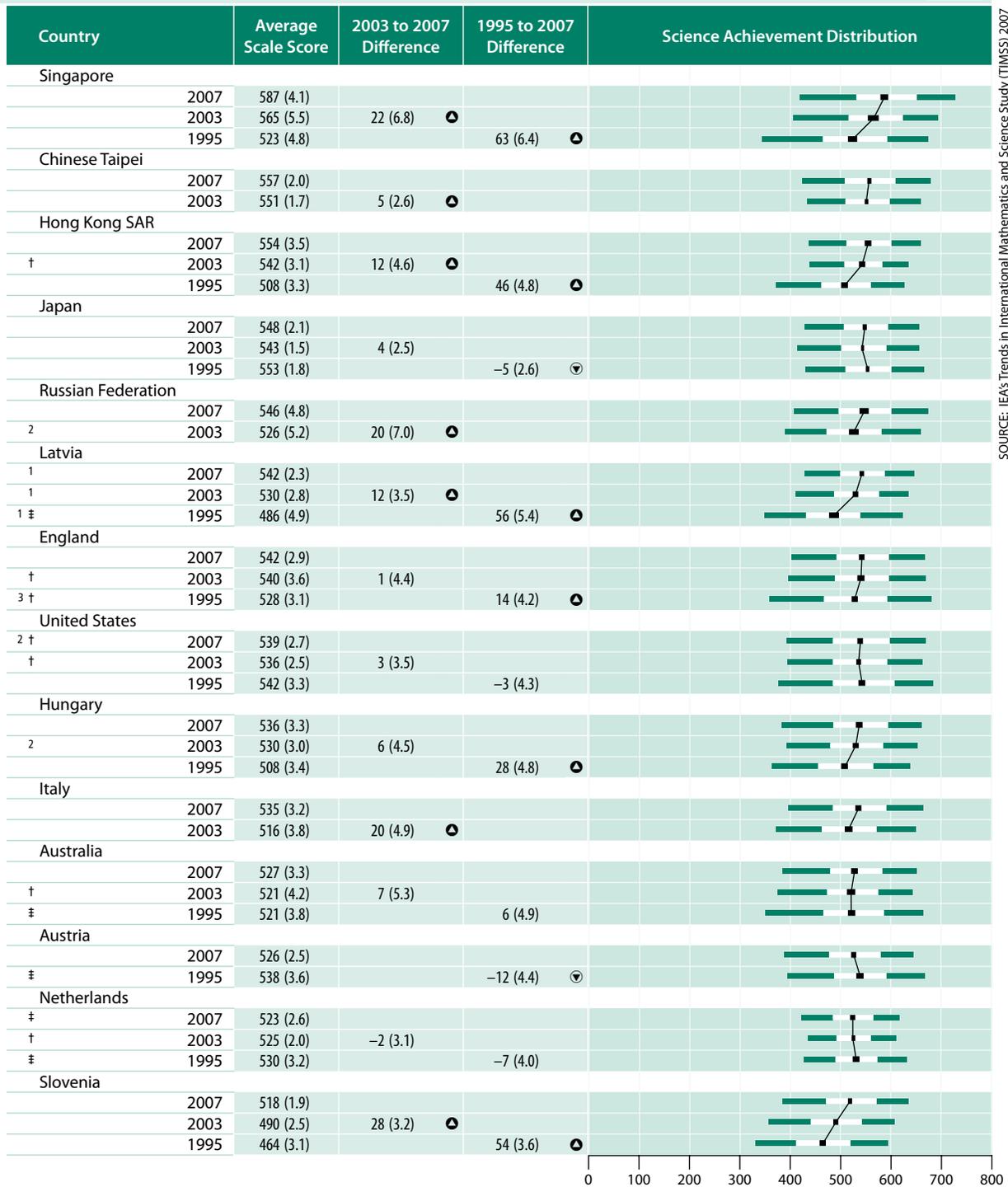
To provide some context about the economic and educational development of the TIMSS participants, Exhibit 1.1 also includes each one's value on the Human Development Index provided by the United Nations Development Programme. The index has a minimum value of 0.0 and a maximum of 1.0. Countries with high values on the index have a long life expectancy, high levels of school enrollment and adult literacy, and a good standard of living, as measured by per capita Gross Domestic Product. Nearly all the TIMSS participants had index values in the 0.7 to 0.9 range, except Botswana and Morocco (0.6) and Ghana and Yemen (0.5). At both grades, the countries performing above the 500 scale average had index values in the 0.8 to 0.9 range (the lowest is Kazakhstan (0.794) at the fourth grade) and those countries with values below 0.8 typically had average achievement below 500. However, not all countries with average achievement below the scale average had low index values. The countries with average achievement significantly below 500 included 3 with index values 0.8 or higher at the fourth grade and 14 at the eighth grade.

### **How Has Science Achievement Changed Since 1995, 1999, and 2003?**

Exhibit 1.3 displays changes in average science achievement for the countries and benchmarking participants that have comparable data from previous TIMSS assessments at the fourth and eighth grades. The participants are shown in descending order of their average TIMSS 2007 achievement. At the fourth grade, 23 countries and 4 benchmarking participants have data from 1995 and 2003 or from either 1995 or 2003 that can be compared to 2007. There was no fourth grade assessment in TIMSS 1999. Thus, participants at the fourth grade have data from two or three points in time. At the eighth grade, 35 countries and 6 benchmarking participants have data from at least one previous assessment that can be compared with 2007, with 25 countries and 2 benchmarking participants having comparable data from three or all four TIMSS assessments—1995, 1999, 2003, and 2007.

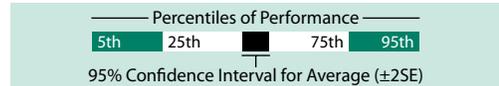
Exhibit 1.3 Trends in Science Achievement – 1995 Through 2007

TIMSS2007  
Science 4<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 average significantly higher  
▼ 2007 average significantly lower

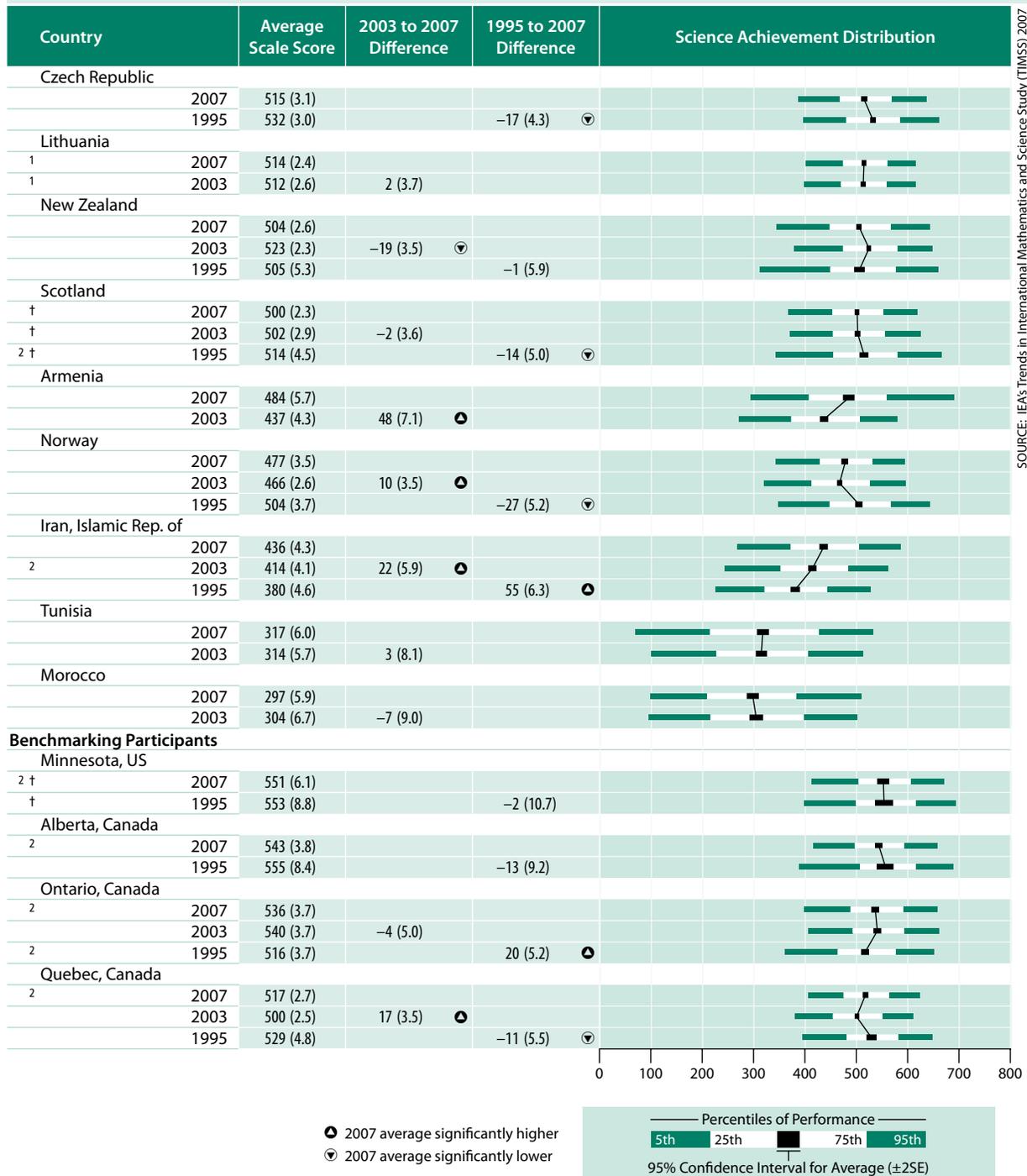


† Met guidelines for sample participation rates only after replacement schools were included.  
‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included.  
‡ Did not satisfy guidelines for sample participation rates.  
1 National Target Population does not include all of the International Target Population defined by TIMSS.

2 National Defined Population covers 90% to 95% of National Target Population.  
3 National Defined Population covers less than 90% of National Target Population (but at least 77%).  
Trend notes: Data are not shown for Kuwait, because comparable data from previous cycles are not available. Data for Tunisia do not include private schools.  
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 1.3 Trends in Science Achievement – 1995 Through 2007 (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

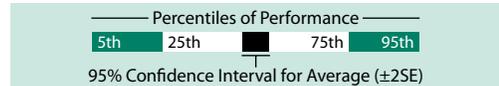
Exhibit 1.3 Trends in Science Achievement – 1995 Through 2007 (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

● 2007 average significantly higher  
▼ 2007 average significantly lower

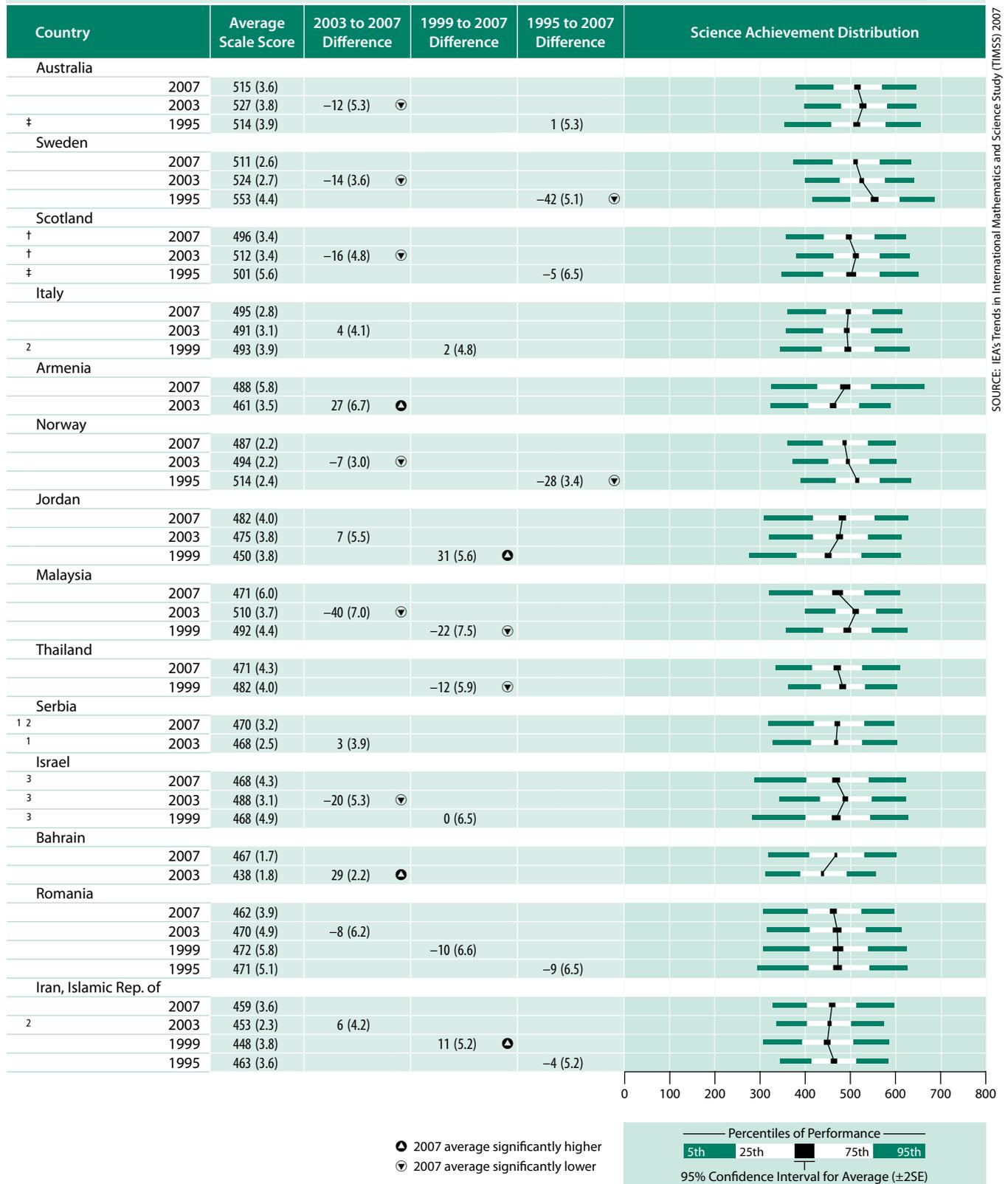


† Met guidelines for sample participation rates only after replacement schools were included.  
‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included.  
‡ Did not satisfy guidelines for sample participation rates.

1 National Target Population does not include all of the International Target Population defined by TIMSS.  
2 National Defined Population covers 90% to 95% of National Target Population.  
3 National Defined Population covers less than 90% of National Target Population (but at least 77%).

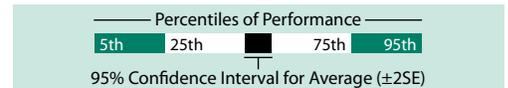
Exhibit 1.3 Trends in Science Achievement – 1995 Through 2007 (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 average significantly higher  
▼ 2007 average significantly lower



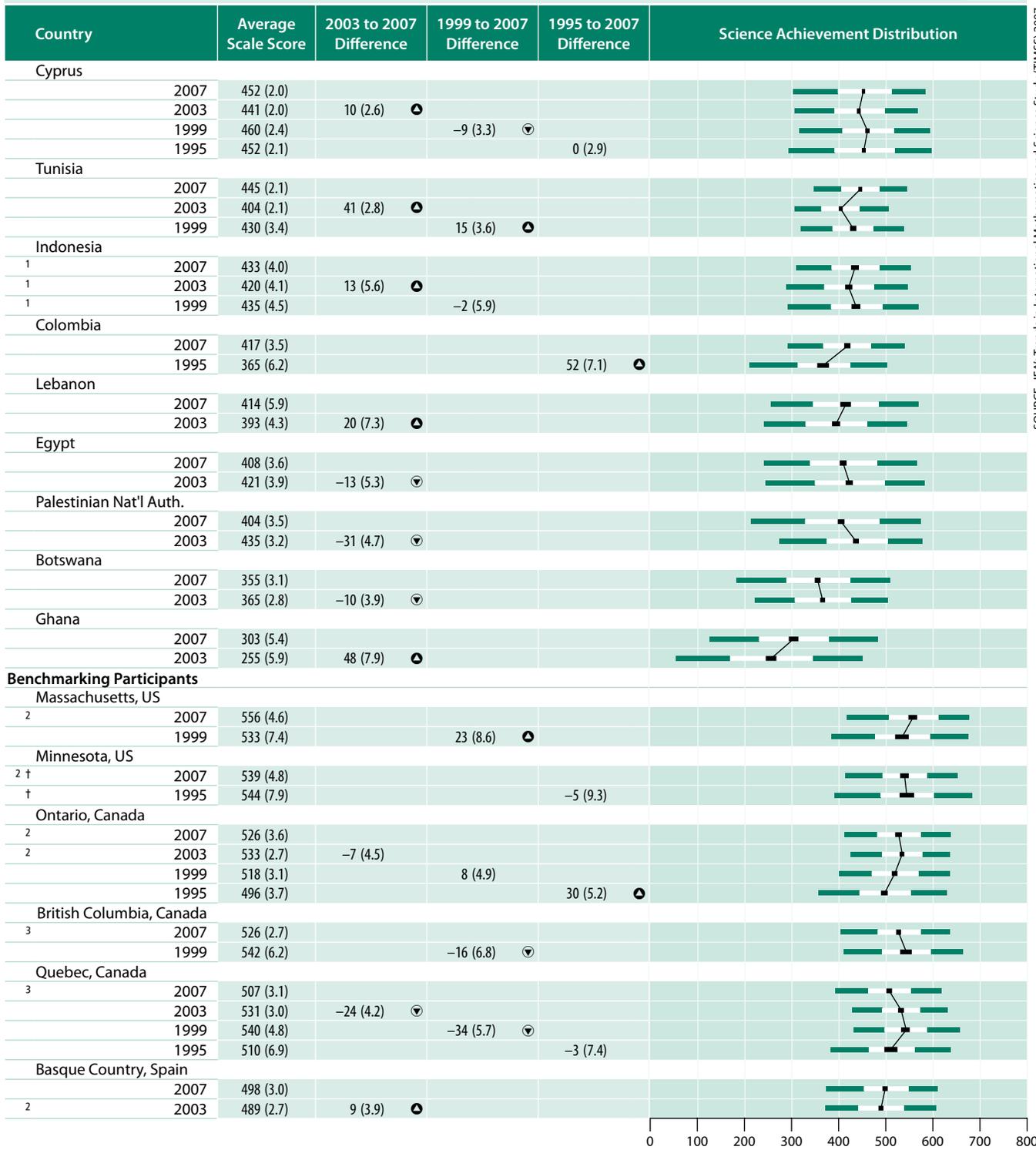
¹ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

Trend notes: Data are not shown for Bulgaria, Kuwait, Morocco, Saudi Arabia, and Turkey, because comparable data from previous cycles are not available. Data for Indonesia do not include Islamic schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

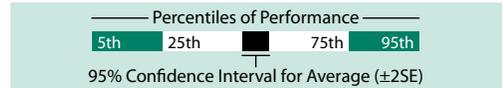
Exhibit 1.3 Trends in Science Achievement – 1995 Through 2007 (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 average significantly higher  
▼ 2007 average significantly lower



It is interesting to consider the TIMSS 2007 achievement results in light of the information countries provided in the *TIMSS 2007 Encyclopedia*. For example, the trend results illustrate how TIMSS data can be used to monitor the impact of structural and curricular changes in education systems. Many countries are engaged in implementing important structural, curricular, and instructional reforms. For example, according to ongoing reforms described in the *TIMSS 2007 Encyclopedia*, improvement in the Russian Federation and Slovenia may have been anticipated. As described previously, these two countries have been undergoing structural changes in their educational system that involved adding one more year of schooling at the primary level, as well as associated curricular and instructional reforms. For trend participants, Exhibit A.8 in Appendix A documents the years of formal schooling, average ages, percentages of exclusions, and participation rates for each assessment. In general, these have been relatively stable across the participants from assessment to assessment. However, as mentioned, there have been some structural changes in educational systems.

Looking at trends across all of the participating countries, not taking into account whether countries have participated in two, three, or four cycles (eighth grade) of TIMSS, more showed improvement in average achievement between their first cycle of participation and TIMSS 2007 than declines at both fourth and eighth grades, although the pattern was less pronounced at eighth grade. At the fourth grade, 11 countries had higher average achievement in 2007 than in their first TIMSS assessment, 5 had lower average achievement, and 7 showed no significant change. At the eighth grade, 11 countries had higher average achievement in 2007 than in their initial assessment, 8 lower average achievement, and 16 showed no significant change. Proportionately more countries showed no change at eighth grade than at fourth grade and proportionately fewer countries had higher or lower achievement.

Comparing only across the past 12 years, at the fourth grade, 16 countries have comparison data between 1995 and 2007. Of those, 7 had increased average achievement in 2007 compared to 1995, 4 had similar achievement, and 5 had decreases. At the eighth grade, of the 19 countries with 1995 data,

5 had increased average achievement in 2007, 11 similar achievement, and 3 had decreases. Taking an even closer look at the 12 countries that have trend data between 1995 and 2007 at both grades, this pattern persists, with slightly more improvements at the fourth than the eighth grade. Six of the 12 countries had higher achievement at the fourth grade in 2007 than in 1995 but only 2 showed improvements at the eighth grade (Hong Kong SAR and Slovenia, which also improved at the fourth grade). Eight of the 12 countries showed no achievement difference between 1995 and 2007 at the eighth grade, compared to only two countries (the United States and Australia) at fourth grade. Four of the 12 countries showed a decrease at fourth grade in average achievement between 1995 and 2007, but only two countries (the Czech Republic and Norway) at eighth grade. Thus, even in the same countries, between 1995 and 2007 there has been a tendency toward more improvement than declines at the fourth grade accompanied by less improvement at the eighth grade.

There was a more consistent pattern between fourth and eighth grades in changes between 2003 and 2007, although there were more countries with declines at eighth grade. Looking across countries with trend data between 2003 and 2007, average achievement at the fourth grade either increased (10 countries) or stayed the same (10 countries) in most countries, with only one country having a decrease. At the eighth grade less than one-third of the countries (9) showed improvements, more than one-third (11) stayed the same, and more than one-third (12) showed declines. Among the 17 countries that participated in both grades, the pattern was maintained. At the fourth grade, 9 countries showed improvement and no country had a decline, whereas at the eighth grade, 4 countries had improvements and 5 had declines. There were 8 countries at each grade showing no achievement difference between 2003 and 2007. Five of these (Japan, England, the United States, Hungary, and Lithuania) showed no change at both grades.

At the fourth grade, 7 countries and one benchmarking participant showed higher average science achievement in 2007 than in 1995. Five of these countries had significant improvement from 1995 together with

significant improvement from 2003 to 2007—Singapore, Hong Kong SAR, Latvia, Slovenia, and Iran—suggesting a sustained improvement over the 12-year period from 1995 to 2007. England, Hungary, and the province of Ontario also had higher average achievement in 2007 than 1995, but not between the two most recent assessments, indicating that the gains were essentially between 1995 and 2003. Chinese Taipei and Armenia showed increased average achievement between 2003 and 2007, the two assessments they participated in. The Russian Federation and Italy also showed increased achievement between 2003 and 2007 (although Italy participated in TIMSS 1999 and the Russian Federation in both 1995 and 1999, these countries do not have comparable data from these assessments). Norway and the province of Quebec appear to have partly recovered from a decrease between 1995 and 2003, with significant improvement between 2003 and 2007 partly mitigating the earlier decline. However, average achievement in 2007 was still below that of 1995.

At the fourth grade, 4 countries (in addition to Norway and the province of Quebec described above) had lower average science achievement in 2007 than in 1995. Of these, the decline in Japan and Scotland occurred between 1995 and 2003, whereas Austria and the Czech Republic have previous data only from 1995. In New Zealand, there was an increase between 1995 and 2003 that was offset by a decline between 2003 and 2007. In the United States, Australia, the Netherlands, the state of Minnesota, and the province of Alberta, average science achievement has remained essentially the same since 1995. In Lithuania, Tunisia, and Morocco, average science achievement is basically unchanged since 2003.

At the eighth grade, Korea, Hong Kong SAR, and Lithuania, and the province of Ontario participated in all four assessments and had higher average science achievement in 2007 than in 1995. After a decline from 1999, the Russian Federation improved from 2003 to 2007. Slovenia improved from 1995 to 2007 and from 2003 to 2007. Jordan participated in the 1999, 2003, and 2007 assessments and showed improvement, mostly from 1999 to 2003. Tunisia and Indonesia also participated in these three assessments. Tunisia

improved over this period, but with a decline from 1999 to 2003. Average science achievement in Indonesia was about at the same level in 2007 as in 1999, having recovered from a decline from 1999 to 2003. Armenia, Bahrain, Lebanon, Ghana, and the Basque Country of Spain showed improvement between 2003 and 2007, the two assessments in which they participated. Average achievement increased in Colombia between 1995 and 2007, but it did not participate in the interim assessments. The state of Massachusetts improved between its two assessments in 1999 and 2007.

Average science achievement at the eighth grade remained relatively constant across assessments in Singapore, Japan, England, the United States, Italy, Serbia, Romania, and the state of Minnesota. Also, several countries participating at the eighth grade have had compensating increases and decreases in average science achievement from assessment to assessment. For example, after an initial increase in 1999, Hungary had a decrease in 2003 that essentially balanced it out. Australia had an increase between 1995 and 2003 that was balanced out by a decrease in 2007. Similarly, Israel had an increase between 1999 and 2003 that was balanced out by a decrease in 2007. Cyprus had higher achievement in 2007 than 2003, essentially recovering from a previous decline and returning back to their 1995 level of achievement. After an initial increase, the province of Quebec had decreases in 2003 and 2007, bringing achievement back to their 1995 level.

At the eighth grade, only three countries had lower average science achievement in 2007 than in 1995—the Czech Republic, Sweden, and Norway. In the Czech Republic, the decrease was almost entirely from 1995 to 1999, while in Sweden and Norway there were declines from both 1995 and 2003. Chinese Taipei, Scotland, Egypt, the Palestinian National Authority, and Botswana had decreases from 2003 to 2007. Thailand and the provinces of British Columbia and Quebec had a decrease between 1999 and 2007. Malaysia had lower average achievement in 2007 than in 2003 and in 1999, despite an improvement from 1999 to 2003.

### Trends Across Grades: Fourth to Eighth Grade Cohort Analysis

Because TIMSS is conducted on a four-year cycle, the cohort of students that was assessed in the fourth grade in 2003 had reached the eighth grade by 2007, and thus was assessed as the eighth grade in 2007. This enables the 17 countries and 2 benchmarking participants that assessed both grades in both assessments to examine how their performance relative to each other changed as the fourth grade students of 2003 became the eighth grade students of 2007. The results are presented in Exhibit 1.4, which shows average science achievement as a difference from the TIMSS scale average (500) for the fourth grade students in 2003 (upper-left panel) and in 2007 (top-right panel). The exhibit shows also achievement for the eighth grade students in 2003 (bottom-left panel) and in 2007 (bottom-right panel). The trends for fourth and eighth grade, however, were presented more fully in Exhibit 1.3. The purpose of Exhibit 1.4 is to provide information about relative progress across grades as the cohort of students assessed at the fourth grade in 2003 moved to the eighth grade four years later in 2007. That is, to compare relative performance at the fourth grade in 2003 (upper-left panel) to relative performance at the eighth grade in 2007 (lower-right panel) as indicated by the arrow pointing diagonally downward.

Ten countries, including Singapore, Chinese Taipei, Japan, Hong Kong SAR, England, the United States, Hungary, the Russian Federation, Australia, and Lithuania, as well as the Canadian province of Ontario performed above the scale average at the fourth grade in 2003 and again at the eighth grade in 2007 (although not in the same order of average achievement). Scotland had achievement similar to the scale average in both 2003 and 2007. Armenia, Norway, Iran, and Tunisia also retained the same relative positions, performing below the scale average in the fourth grade in 2003 and again at the eighth grade in 2007. In comparison, Slovenia moved from being below the scale average at the fourth grade in 2003 to being above it at eighth grade in 2007, and the province of Quebec moved from being similar to the scale average at fourth grade in 2003 to above it at eighth grade in 2007. Italy had achievement at the fourth grade above the scale average in 2003, but similar to it at the eighth grade in 2007.

Exhibit 1.4 Cohort Comparison: 2003 Fourth Grade Students in Eighth Grade in 2007

TIMSS2007  
Science 4<sup>th</sup> & 8<sup>th</sup> Grades

2003 – Fourth Grade			2007 – Fourth Grade		
Country	Difference From TIMSS Scale Avg.		Country	Difference From TIMSS Scale Avg.	
Singapore	65 (5.5)	▲	Singapore	87 (4.1)	▲
Chinese Taipei	51 (1.7)	▲	Chinese Taipei	57 (2.0)	▲
Japan	43 (1.5)	▲	Hong Kong SAR	54 (3.5)	▲
Hong Kong SAR	42 (3.1)	▲	Japan	48 (2.1)	▲
England	40 (3.6)	▲	Russian Federation	46 (4.8)	▲
United States	36 (2.5)	▲	England	42 (2.9)	▲
Hungary	30 (3.0)	▲	United States	39 (2.7)	▲
Russian Federation	26 (5.2)	▲	Hungary	36 (3.3)	▲
Australia	21 (4.2)	▲	Italy	35 (3.2)	▲
Italy	16 (3.8)	▲	Australia	27 (3.3)	▲
Lithuania	12 (2.6)	▲	Slovenia	18 (1.9)	▲
Scotland	2 (2.9)	▲	Lithuania	14 (2.4)	▲
Slovenia	-10 (2.5)	▼	Scotland	0 (2.3)	▲
Norway	-34 (2.6)	▼	Armenia	-16 (5.7)	▼
Armenia	-63 (4.3)	▼	Norway	-23 (3.5)	▼
Iran, Islamic Rep. of	-86 (4.1)	▼	Iran, Islamic Rep. of	-64 (4.3)	▼
Tunisia	-186 (5.7)	▼	Tunisia	-182 (5.9)	▼
<b>TIMSS Scale Avg.</b>	<b>500</b>		<b>TIMSS Scale Avg.</b>	<b>500</b>	
<b>Benchmarking Participants</b>			<b>Benchmarking Participants</b>		
Ontario, Canada	40 (3.7)	▲	Ontario, Canada	36 (3.7)	▲
Quebec, Canada	0 (2.5)	▲	Quebec, Canada	17 (2.7)	▲

2003 – Eighth Grade			2007 – Eighth Grade		
Country	Difference From TIMSS Scale Avg.		Country	Difference From TIMSS Scale Avg.	
Singapore	78 (4.3)	▲	Singapore	67 (4.4)	▲
Chinese Taipei	71 (3.5)	▲	Chinese Taipei	61 (3.7)	▲
Hong Kong SAR	56 (3.0)	▲	Japan	54 (1.9)	▲
Japan	52 (1.7)	▲	England	42 (4.5)	▲
England	44 (4.1)	▲	Hungary	39 (2.9)	▲
Hungary	43 (2.8)	▲	Slovenia	38 (2.2)	▲
United States	27 (3.1)	▲	Hong Kong SAR	30 (4.9)	▲
Australia	27 (3.8)	▲	Russian Federation	30 (3.9)	▲
Slovenia	20 (1.8)	▲	United States	20 (2.9)	▲
Lithuania	19 (2.1)	▲	Lithuania	19 (2.5)	▲
Russian Federation	14 (3.7)	▲	Australia	15 (3.6)	▲
Scotland	12 (3.4)	▲	Scotland	-4 (3.4)	▲
Norway	-6 (2.2)	▼	Italy	-5 (2.8)	▲
Italy	-9 (3.1)	▼	Armenia	-12 (5.8)	▼
Armenia	-39 (3.5)	▼	Norway	-13 (2.2)	▼
Iran, Islamic Rep. of	-47 (2.3)	▼	Iran, Islamic Rep. of	-41 (3.6)	▼
Tunisia	-96 (2.1)	▼	Tunisia	-55 (2.1)	▼
<b>TIMSS Scale Avg.</b>	<b>500</b>		<b>TIMSS Scale Avg.</b>	<b>500</b>	
<b>Benchmarking Participants</b>			<b>Benchmarking Participants</b>		
Ontario, Canada	33 (2.7)	▲	Ontario, Canada	26 (3.6)	▲
Quebec, Canada	31 (3.0)	▲	Quebec, Canada	7 (3.1)	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Country average significantly higher than TIMSS scale average  
▼ Country average significantly lower than TIMSS scale average

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

### What Are the Gender Differences in Science Achievement?

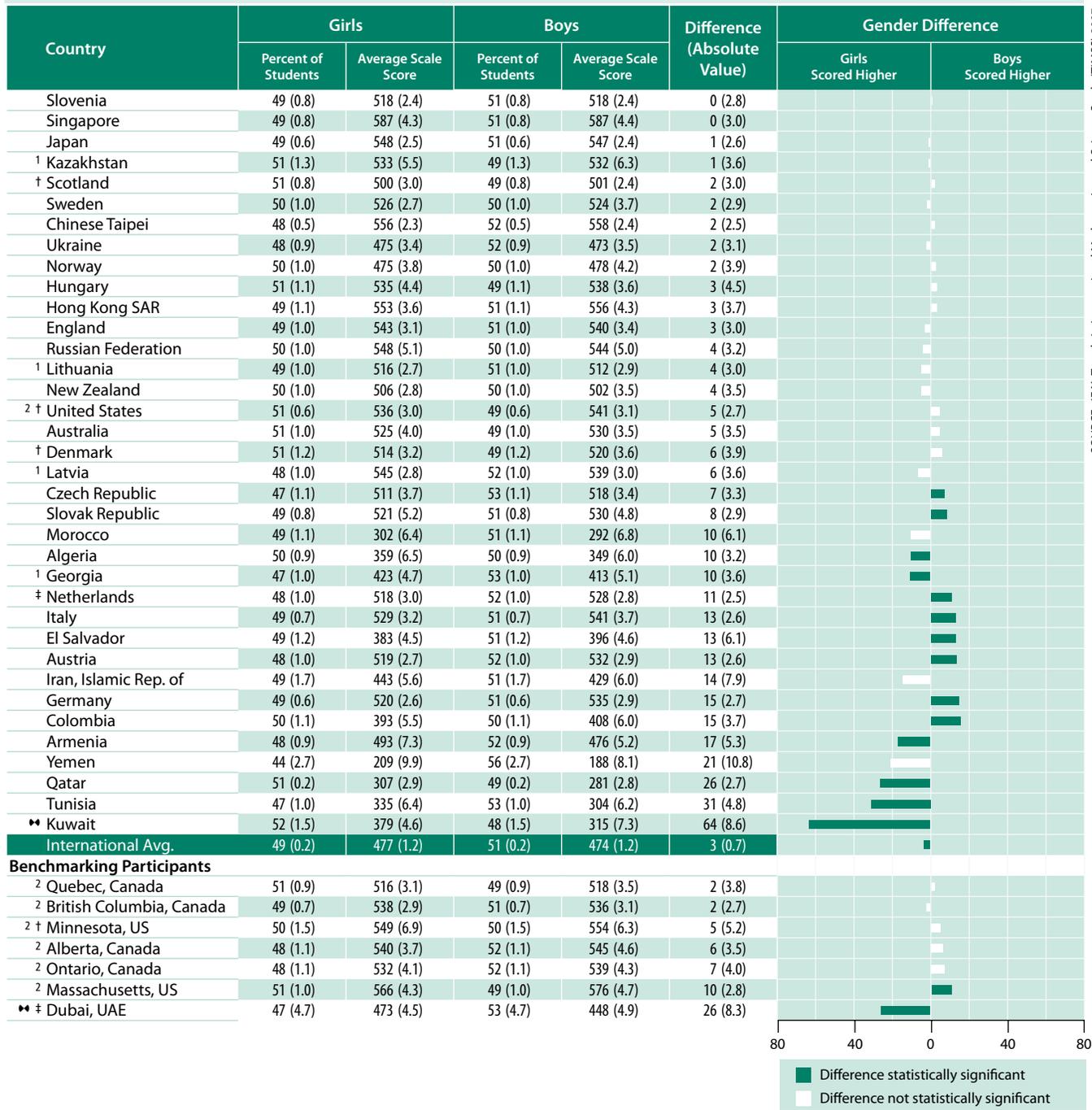
Exhibit 1.5 shows gender differences in fourth- and eighth-grade science achievement in 2007. It presents average achievement separately for girls and boys for the TIMSS 2007 countries and benchmarking participants, as well as the difference between the averages. The difference between the average achievement for girls and for boys is shown by a bar indicating the amount of the difference, whether the direction of the difference was positive for girls or boys, and whether the difference is statistically significant (indicated by a darkened bar). Countries are shown in increasing order of this difference in average achievement between girls and boys. International averages also are shown. These were obtained by averaging across the mean scores for girls in each of the countries and the mean scores for boys in each of the countries. Benchmarking participants were not included in the calculation of the international averages.

At the fourth grade, average science achievement for girls was a little higher than for boys across the participating countries (by three points), although the situation varied from country to country. In more than half the countries (22), the difference in average achievement in science between girls and boys was negligible at the fourth grade. Boys had higher average science achievement than girls in 8 countries, including the Czech and Slovak Republics, the Netherlands, Italy, El Salvador, Austria, Germany, and Colombia. Girls had higher average achievement than boys in 6 countries, including Algeria, Georgia, Armenia, Qatar, Tunisia, and Kuwait. Among the benchmarking participants, boys had higher achievement than girls in the U.S. state of Massachusetts, while girls performed better than boys in Dubai, UAE.

At the eighth grade, on average across the TIMSS 2007 countries, girls had higher average achievement than boys (6 points). Girls had higher achievement than boys in 14 of the participating countries, including Romania, Bulgaria, Cyprus, Egypt, Thailand, Botswana, Georgia, Jordan, the Palestinian National Authority, Saudi Arabia, Kuwait, Oman, Bahrain, and Qatar. Girls had higher average achievement than boys in many, but not all,

Exhibit 1.5 TIMSS 2007 Average Science Achievement by Gender

TIMSS2007  
Science 4<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

<sup>†</sup> Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>‡</sup> Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
<sup>♦♦</sup> Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 1.5 TIMSS 2007 Average Science Achievement by Gender (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Girls		Boys		Difference (Absolute Value)	Gender Difference	
	Percent of Students	Average Scale Score	Percent of Students	Average Scale Score		Girls Scored Higher	Boys Scored Higher
Algeria	49 (0.6)	408 (1.9)	51 (0.6)	408 (2.2)	1 (2.3)		
Norway	49 (0.7)	487 (2.4)	51 (0.7)	486 (3.0)	1 (3.2)		
<sup>1</sup> Lithuania	50 (1.1)	518 (3.2)	50 (1.1)	519 (2.7)	1 (2.9)		
Indonesia	51 (1.0)	426 (3.8)	49 (1.0)	428 (3.6)	2 (3.2)		
Ukraine	52 (0.8)	484 (3.9)	48 (0.8)	486 (3.6)	2 (3.0)		
Slovenia	50 (0.8)	536 (2.6)	50 (0.8)	539 (2.7)	2 (3.0)		
Malta	51 (0.3)	456 (1.8)	49 (0.3)	458 (2.2)	2 (2.9)		
Sweden	48 (0.9)	512 (3.0)	52 (0.9)	510 (2.8)	2 (2.8)		
Bosnia and Herzegovina	49 (0.8)	464 (3.4)	51 (0.8)	467 (2.9)	3 (2.8)		
<sup>1 2</sup> Serbia	49 (0.7)	472 (3.7)	51 (0.7)	469 (3.8)	3 (4.0)		
Japan	50 (1.0)	552 (2.8)	50 (1.0)	556 (2.5)	4 (3.8)		
Chinese Taipei	48 (1.3)	559 (3.7)	52 (1.3)	563 (4.4)	5 (3.5)		
† Hong Kong SAR	50 (1.3)	533 (4.5)	50 (1.3)	528 (6.6)	5 (5.6)		
Turkey	47 (0.8)	457 (4.0)	53 (0.8)	452 (4.0)	5 (3.0)		
† Scotland	51 (1.0)	493 (3.5)	49 (1.0)	498 (4.2)	5 (3.7)		
Russian Federation	52 (0.9)	527 (4.3)	48 (0.9)	533 (4.2)	6 (3.4)		
Lebanon	54 (1.8)	410 (6.2)	46 (1.8)	417 (6.7)	7 (4.9)		
Singapore	49 (0.9)	571 (4.7)	51 (0.9)	563 (5.2)	8 (4.4)		
Korea, Rep. of	48 (2.7)	549 (2.7)	52 (2.7)	557 (2.5)	8 (3.2)		
Italy	48 (0.7)	491 (3.3)	52 (0.7)	499 (3.1)	8 (3.1)		
Armenia	50 (0.9)	492 (7.1)	50 (0.9)	484 (5.2)	8 (4.8)		
Romania	49 (0.9)	466 (4.1)	51 (0.9)	458 (4.6)	8 (4.1)		
† England	51 (1.9)	537 (4.6)	49 (1.9)	546 (5.8)	9 (5.5)		
Czech Republic	48 (0.8)	534 (2.2)	52 (0.8)	543 (2.4)	9 (2.7)		
<sup>3</sup> Israel	53 (1.6)	472 (4.9)	47 (1.6)	463 (5.2)	9 (5.2)		
Malaysia	53 (1.5)	475 (6.4)	47 (1.5)	466 (6.7)	9 (5.5)		
Syrian Arab Republic	52 (1.9)	448 (3.3)	48 (1.9)	457 (4.2)	9 (4.7)		
<sup>2</sup> † United States	51 (0.7)	514 (3.0)	49 (0.7)	526 (3.2)	12 (2.3)		
<sup>3</sup> Bulgaria	47 (1.4)	477 (6.2)	53 (1.4)	464 (6.8)	12 (5.9)		
Iran, Islamic Rep. of	46 (1.5)	466 (4.6)	54 (1.5)	453 (5.4)	12 (7.2)		
Hungary	50 (1.1)	533 (3.5)	50 (1.1)	545 (3.3)	12 (3.3)		
Cyprus	50 (0.6)	460 (2.8)	50 (0.6)	444 (2.4)	16 (3.2)		
Egypt	49 (2.7)	417 (4.8)	51 (2.7)	400 (4.6)	17 (6.3)		
Thailand	50 (1.3)	480 (4.5)	50 (1.3)	462 (4.9)	18 (4.2)		
Australia	48 (1.9)	505 (5.1)	52 (1.9)	524 (5.4)	18 (7.7)		
Tunisia	52 (0.8)	436 (2.3)	48 (0.8)	455 (2.6)	19 (2.4)		
El Salvador	52 (1.4)	377 (3.7)	48 (1.4)	399 (4.1)	22 (5.1)		
Botswana	53 (0.8)	365 (3.7)	47 (0.8)	343 (3.6)	22 (4.1)		
<sup>1</sup> Georgia	50 (1.0)	432 (4.8)	50 (1.0)	410 (5.2)	22 (3.2)		
Ghana	45 (0.8)	288 (5.9)	55 (0.8)	316 (5.6)	29 (4.2)		
Jordan	48 (2.0)	499 (5.8)	52 (2.0)	466 (5.5)	34 (8.2)		
Colombia	51 (1.6)	400 (4.4)	49 (1.6)	435 (3.7)	35 (4.5)		
Palestinian Nat'l Auth.	51 (1.4)	422 (4.5)	49 (1.4)	386 (5.1)	36 (6.5)		
Saudi Arabia	48 (1.6)	426 (2.9)	52 (1.6)	383 (3.9)	43 (4.6)		
♦♦ Kuwait	54 (2.1)	441 (3.4)	46 (2.1)	391 (4.2)	49 (5.1)		
Oman	52 (2.0)	452 (3.6)	48 (2.0)	391 (4.6)	61 (5.9)		
Bahrain	49 (0.4)	499 (1.9)	51 (0.4)	437 (2.6)	62 (3.0)		
Qatar	50 (0.2)	354 (2.3)	50 (0.2)	284 (2.3)	70 (3.1)		
‡ Morocco	53 (1.3)	403 (3.7)	47 (1.3)	401 (3.6)	2 (4.5)		
International Avg.	50 (0.2)	469 (0.8)	50 (0.2)	463 (0.7)	6 (0.7)		
<b>Benchmarking Participants</b>							
<sup>3</sup> British Columbia, Canada	51 (1.1)	523 (2.9)	49 (1.1)	529 (3.3)	7 (3.1)		
<sup>2</sup> † Minnesota, US	52 (1.3)	535 (4.3)	48 (1.3)	542 (6.1)	7 (4.4)		
<sup>3</sup> Quebec, Canada	49 (1.5)	503 (3.3)	51 (1.5)	511 (4.1)	8 (4.2)		
<sup>2</sup> Ontario, Canada	50 (1.1)	521 (3.8)	50 (1.1)	531 (4.3)	10 (3.6)		
<sup>2</sup> Massachusetts, US	50 (1.0)	551 (5.1)	50 (1.0)	561 (5.0)	11 (4.3)		
♦♦ ‡ Dubai, UAE	49 (4.8)	495 (5.1)	51 (4.8)	483 (6.1)	11 (9.9)		
Basque Country, Spain	48 (1.7)	490 (3.6)	52 (1.7)	505 (3.9)	15 (4.7)		

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

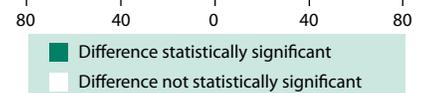
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

of the countries in the Middle East. Boys had higher achievement than girls in 11 countries, including Korea, Italy, the Czech Republic, the Syrian Arab Republic, the United States, Hungary, Australia, Tunisia, El Salvador, Ghana, and Colombia, as well as in 2 Canadian provinces, British Columbia and Ontario, the U.S. state of Massachusetts, and the Basque Country of Spain.

Exhibit 1.6 shows changes in average achievement separately for boys and girls. At the fourth grade, changes are shown between 2003 and 2007 and between 1995 and 2007 (fourth grade was not assessed in 1999). Across the TIMSS participants, fourth grade girls showed improvement in 7 countries compared to 1995. In 3 of these countries, Latvia, Singapore, and Slovenia, there also was improvement from 2003 to 2007. Also, girls in Armenia, Chinese Taipei, Italy, Japan, the Russian Federation, and Tunisia, as well as the province of Quebec, had higher average science achievement in 2007 than in 2003. Girls had decreased average achievement across the 12-year period in Austria, the Czech Republic, Norway, and Scotland, and from 2003 to 2007 in New Zealand.

Fourth grade boys often showed increases or decreases in achievement in the same countries as girls, indicating overall trends typically were reflected in trends for both sexes. The most notable exceptions to this pattern were in Japan and the Netherlands, where boys showed decreases between 1995 and 2007 compared to no change for girls, and Tunisia, where boys had no change from 2003 while girls had an increase.

At the eighth grade, looking at the changes by gender between 1995 and 2007, girls had increases in average achievement in 8 countries and one province, and declines in 2 countries. The increases were in Colombia, England, Hong Kong SAR, Iran, Japan, Korea, Lithuania, Slovenia, and the Canadian province of Ontario; and girls in these countries did not show declines between the intervening assessments except for Hong Kong SAR.

In addition to these changes, girls also had increases between 1999 and 2007 in the Czech Republic, Jordan, Tunisia, and the U.S. state of Massachusetts. Countries showing improvement for girls only from 2003 to 2007 included Armenia, Bahrain, Cyprus, Ghana, Indonesia, Lebanon, and the Russian Federation.

There were fewer countries with improvements for boys than for girls. Only 3 countries and one province had an increase for boys from 1995 to 2007, compared with 9 countries with a decrease. The increases were in Colombia, Lithuania, Slovenia, and the province of Ontario. Participants with increases for boys from 1999 to 2007 included Jordan and Tunisia, as well as the state of Massachusetts, while countries with increases from 2003 to 2007 included Armenia, Bahrain, Ghana, Lebanon, and the Russian Federation.

The two countries with declines from 1995 to 2007 in average achievement for girls at the eighth grade were Norway and Sweden. In addition to these, however, Chinese Taipei, Hong Kong SAR, Malaysia, the Palestinian National Authority, and Scotland had decreases for girls from 2003, and the Canadian provinces of British Columbia and Quebec had decreases from 1999.

The 9 countries with a decrease from 1995 to 2007 in average achievement for boys at the eighth grade included Cyprus, the Czech Republic, Iran, Japan, Norway, Romania, Scotland, Singapore, and Sweden. A further 4 countries (Chinese Taipei, Hungary, Malaysia, and Thailand) and the province of Quebec had a decrease from 1999, and a further 7 countries a decrease from 2003 (Botswana, Egypt, Hong Kong SAR, Israel, Korea, the Palestinian National Authority, and the United States).

Exhibit 1.6 Trends in Average Science Achievement by Gender – 1995 Through 2007

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Girls			Boys		
	2007 Average Scale Score	2003 to 2007 Difference	1995 to 2007 Difference	2007 Average Scale Score	2003 to 2007 Difference	1995 to 2007 Difference
Armenia	493 (7.3)	52 (8.6) ▲	◇ ◇	476 (5.2)	44 (7.0) ▲	◇ ◇
Australia	525 (4.0)	3 (5.5)	6 (5.4)	530 (3.5)	11 (6.5)	6 (6.0)
Austria	519 (2.7)	◇ ◇	-11 (5.2) ▼	532 (2.9)	◇ ◇	-13 (5.1) ▼
Chinese Taipei	556 (2.3)	8 (3.1) ▲	◇ ◇	558 (2.4)	3 (3.3)	◇ ◇
Czech Republic	511 (3.7)	◇ ◇	-12 (5.1) ▼	518 (3.4)	◇ ◇	-22 (4.8) ▼
England	543 (3.1)	1 (4.5)	18 (4.7) ▲	540 (3.4)	2 (5.7)	10 (5.2)
Hong Kong SAR	553 (3.6)	9 (4.9)	52 (5.0) ▲	556 (4.3)	15 (5.3) ▲	41 (5.8) ▲
Hungary	535 (4.4)	8 (5.8)	34 (5.8) ▲	538 (3.6)	5 (4.9)	22 (5.3) ▲
Iran, Islamic Rep. of	443 (5.6)	17 (8.9)	66 (7.8) ▲	429 (6.0)	22 (7.6) ▲	46 (9.5) ▲
Italy	529 (3.2)	15 (5.3) ▲	– –	541 (3.7)	24 (5.3) ▲	– –
Japan	548 (2.5)	6 (3.1) ▲	1 (3.2)	547 (2.4)	2 (3.1)	-12 (3.2) ▼
Latvia	545 (2.8)	11 (4.0) ▲	58 (6.3) ▲	539 (3.0)	13 (4.8) ▲	54 (6.2) ▲
Lithuania	516 (2.7)	3 (4.0)	◇ ◇	512 (2.9)	-1 (4.1)	◇ ◇
Morocco	302 (6.4)	-3 (10.2)	◇ ◇	292 (6.8)	-11 (9.6)	◇ ◇
Netherlands	518 (3.0)	-3 (3.7)	-1 (4.5)	528 (2.8)	-1 (3.6)	-15 (4.8) ▼
New Zealand	506 (2.8)	-19 (4.2) ▼	-5 (5.6)	502 (3.5)	-19 (4.2) ▼	3 (7.8)
Norway	475 (3.8)	8 (5.0)	-21 (5.3) ▼	478 (4.2)	12 (5.1) ▲	-32 (6.4) ▼
Russian Federation	548 (5.1)	21 (7.8) ▲	◇ ◇	544 (5.0)	19 (7.0) ▲	◇ ◇
Scotland	500 (3.0)	3 (4.4)	-12 (5.4) ▼	501 (2.4)	-6 (4.6)	-15 (5.8) ▼
Singapore	587 (4.3)	21 (6.9) ▲	66 (7.3) ▲	587 (4.4)	22 (7.8) ▲	61 (6.9) ▲
Slovenia	518 (2.4)	27 (3.8) ▲	60 (4.1) ▲	518 (2.4)	28 (4.0) ▲	49 (4.8) ▲
Tunisia	334 (6.5)	18 (8.9) ▲	◇ ◇	302 (6.2)	-10 (8.6)	◇ ◇
United States	536 (3.0)	3 (3.9)	1 (4.7)	541 (3.1)	3 (4.1)	-7 (4.5)
<b>Benchmarking Participants</b>						
Alberta, Canada	540 (3.7)	◇ ◇	-12 (9.8)	545 (4.6)	◇ ◇	-13 (9.7)
Minnesota, US	549 (6.9)	◇ ◇	-8 (12.6)	554 (6.3)	◇ ◇	4 (11.2)
Ontario, Canada	532 (4.1)	-5 (5.7)	19 (5.8) ▲	539 (4.3)	-4 (6.3)	21 (6.0) ▲
Quebec, Canada	516 (3.1)	16 (4.1) ▲	-8 (6.1)	518 (3.5)	18 (4.7) ▲	-14 (7.2) ▼

▲ 2007 average significantly higher  
▼ 2007 average significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Trend notes: Data are not shown for Kuwait, because comparable data from previous cycles are not available. Data for Tunisia do not include private schools.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

A diamond (◇) indicates the country did not participate in the assessment.



**Exhibit 1.6 Trends in Average Science Achievement by Gender – 1995 Through 2007 (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Girls				Boys			
	2007 Average Scale Score	2003 to 2007 Difference	1999 to 2007 Difference	1995 to 2007 Difference	2007 Average Scale Score	2003 to 2007 Difference	1999 to 2007 Difference	1995 to 2007 Difference
Armenia	492 (7.1)	25 (8.2)	♣	0 0	484 (5.2)	29 (6.2)	♣	0 0
Australia	505 (5.1)	-12 (6.9)		--	524 (5.4)	-14 (7.1)		4 (7.6)
Bahrain	499 (1.9)	46 (3.3)	♣	0 0	437 (2.6)	14 (3.5)	♣	0 0
Botswana	365 (3.7)	1 (4.9)		0 0	343 (3.6)	-23 (4.9)	▼	0 0
Chinese Taipei	559 (3.7)	-12 (5.3)	▼	-2 (5.4)	563 (4.4)	-8 (5.8)		-14 (7.2)
Colombia	400 (4.4)	0 0		0 0	435 (3.7)	0 0		56 (9.3)
Cyprus	460 (2.8)	16 (3.6)	♣	5 (4.2)	444 (2.4)	4 (3.6)		-22 (3.8)
Czech Republic	534 (2.2)	0 0		11 (5.3)	543 (2.4)	0 0		-13 (5.4)
Egypt	417 (4.8)	-5 (6.8)		0 0	400 (4.6)	-21 (7.2)	▼	0 0
England	537 (4.6)	0 (6.6)		15 (7.7)	546 (5.8)	-4 (7.7)		-8 (7.8)
Ghana	288 (5.9)	51 (8.7)	♣	0 0	316 (5.6)	45 (8.6)	♣	0 0
Hong Kong SAR	533 (4.5)	-19 (5.7)	▼	10 (6.3)	528 (6.6)	-33 (7.6)	▼	-9 (8.3)
Hungary	533 (3.5)	3 (4.9)		-7 (5.3)	545 (3.3)	-10 (4.4)	▼	-20 (5.6)
Indonesia	432 (4.3)	18 (5.8)	♣	5 (7.7)	435 (4.4)	9 (6.4)		-10 (6.5)
Iran, Islamic Rep. of	466 (4.6)	12 (6.1)		36 (7.3)	453 (5.4)	0 (6.6)		-7 (7.0)
Israel	472 (4.9)	-7 (5.9)		11 (7.8)	463 (5.2)	-35 (6.7)	▼	-12 (7.6)
Italy	491 (3.3)	5 (4.3)		7 (5.3)	499 (3.1)	3 (4.9)		-3 (6.4)
Japan	552 (2.8)	4 (4.1)		9 (4.0)	556 (2.5)	-1 (3.7)		-1 (4.4)
Jordan	499 (5.8)	11 (7.3)		40 (7.7)	466 (5.5)	4 (7.9)		24 (8.1)
Korea, Rep. of	549 (2.7)	-3 (3.4)		11 (4.8)	557 (2.5)	-7 (3.1)	▼	-2 (4.1)
Lebanon	410 (6.2)	18 (7.9)	♣	0 0	417 (6.7)	23 (9.0)	♣	0 0
Lithuania	518 (3.2)	2 (4.2)		40 (5.5)	519 (2.7)	-3 (3.6)		20 (5.7)
Malaysia	475 (6.4)	-30 (7.8)	▼	-13 (8.5)	466 (6.7)	-49 (7.9)	▼	-32 (8.9)
Norway	487 (2.4)	-2 (3.3)		0 0	486 (3.0)	-12 (4.2)	▼	0 0
Palestinian Nat'l Auth.	422 (4.5)	-19 (5.8)	▼	0 0	386 (5.1)	-42 (7.3)	▼	0 0
Romania	466 (4.1)	1 (6.8)		-2 (7.6)	458 (4.6)	-16 (6.8)	▼	-18 (7.9)
Russian Federation	527 (4.3)	18 (5.6)	♣	7 (8.3)	533 (4.2)	14 (5.9)	♣	-7 (7.5)
Scotland	493 (3.5)	-13 (5.3)	▼	0 0	498 (4.2)	-19 (5.5)	▼	0 0
Serbia	472 (3.7)	7 (4.7)		0 0	469 (3.8)	-2 (4.6)		0 0
Singapore	571 (4.7)	-5 (6.1)		14 (9.2)	563 (5.2)	-16 (7.2)	▼	-14 (11.0)
Slovenia	536 (2.6)	19 (3.5)	♣	--	539 (2.7)	15 (3.6)	♣	--
Sweden	512 (3.0)	-9 (4.4)		0 0	510 (2.8)	-19 (3.9)	▼	0 0
Thailand	480 (4.5)	0 0		-1 (6.4)	462 (4.9)	0 0		-22 (6.6)
Tunisia	436 (2.3)	43 (3.3)	♣	19 (4.0)	455 (2.6)	39 (3.7)	♣	13 (5.1)
United States	514 (3.0)	-5 (4.5)		9 (5.5)	526 (3.2)	-10 (4.6)	▼	1 (6.3)
<b>Benchmarking Participants</b>								
Basque Country, Spain	490 (3.6)	9 (4.7)		0 0	505 (3.9)	9 (5.1)		0 0
British Columbia, Canada	523 (2.9)	0 0		-16 (7.0)	529 (3.3)	0 0		-15 (7.8)
Massachusetts, US	551 (5.1)	0 0		24 (9.1)	561 (5.0)	0 0		22 (9.4)
Minnesota, US	535 (4.3)	0 0		0 0	542 (6.1)	0 0		0 0
Ontario, Canada	521 (3.8)	-4 (4.9)		13 (5.1)	531 (4.3)	-10 (5.1)		3 (5.5)
Quebec, Canada	503 (3.3)	-19 (5.0)	▼	-33 (7.4)	511 (4.1)	-30 (5.2)	▼	-34 (6.3)

♣ 2007 average significantly higher  
▼ 2007 average significantly lower

Trend notes: Data are not shown for Bulgaria, Kuwait, Morocco, Saudi Arabia, and Turkey, because comparable data from previous cycles are not available. Data for Indonesia do not include Islamic schools.

A dash (–) indicates comparable data are not available.  
A diamond (0) indicates the country did not participate in the assessment.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.



# Chapter 2



## *Performance at the TIMSS 2007 International Benchmarks for Science Achievement*

The TIMSS science achievement scale summarizes student performance on test items designed to measure breadth of content in the life, physical, and earth sciences as well as a range of cognitive processes within the knowing, applying, and reasoning domains. To interpret the achievement results in meaningful ways, it is important to understand the content of the assessment. As a way of interpreting the scaled results, TIMSS uses four points on the scale as international benchmarks and describes achievement at those benchmarks in relation to students' performance on the test questions. The benchmarks represent the range of performance shown by students internationally (and, at the fourth grade, complement the PIRLS International Benchmarks). The Advanced International Benchmark is 625, the High International Benchmark is 550, the Intermediate International Benchmark is 475, and the Low International Benchmark is 400.

The TIMSS & PIRLS International Study Center worked with the TIMSS 2007 Science and Mathematics Item Review Committee (SMIRC)<sup>1</sup> to conduct a detailed scale anchoring analysis to describe science achievement at these benchmarks. Scale anchoring is a way of describing TIMSS 2007 performance at different points on the TIMSS science scale in terms of the types of items students answered correctly. In addition to a data analysis component to identify items that discriminated between successive points

1 The members of the Science and Mathematics Item Review Committee (SMIRC) are listed in Appendix F.

on the scale,<sup>2</sup> the analysis also involved a judgmental component in which the SMIRC members examined the science content and cognitive processing dimensions assessed by each item and generalized to describe students' knowledge and understandings.

This chapter presents the TIMSS 2007 science achievement results for the International Benchmarks for the countries and benchmarking participants. Then, benchmark by benchmark for each grade, there is a detailed description of the understanding of science content and the cognitive processing skills and strategies demonstrated by students at each of the international benchmarks, together with illustrative items. For each example item, the percent correct for each of the TIMSS 2007 participants is given as well as the international average across countries. The correct answer is circled for multiple-choice items. For open-ended items, the answers exemplify the types of student responses that were given full credit.<sup>3</sup> Of course, the items published herein were selected from the items released for public use.<sup>4</sup> Beyond illustrating the benchmark and being released, an effort was made across the benchmarks to include examples of different item formats and content area domains.

### **How Do Countries Compare with the TIMSS 2007 International Benchmarks of Science Achievement?**

Exhibit 2.1 summarizes what fourth- and eighth-grade students scoring at the TIMSS International Benchmarks typically know and can do in science. At each grade, there was a substantial variation in performance between students achieving at the high end of the scale and the low end of the scale. At the fourth grade, students at the Advanced International Benchmark applied knowledge and understanding of scientific processes and relationships in beginning scientific inquiry whereas those at the Low International Benchmark displayed some elementary knowledge of life science and physical science. At the eighth grade, students at the Advanced International Benchmark demonstrated a grasp of some complex and abstract concepts in biology, chemistry, physics, and Earth science. In comparison, those at the

2 For example, in brief, a multiple-choice item anchored at the Advanced International Benchmark if at least 65 percent of students scoring at 625 answered the item correctly and fewer than 50 percent of students scoring at the High International Benchmark (550) answered correctly, and so on, for each successively lower benchmark. Since constructed-response questions nearly eliminate guessing, the criterion for the constructed-response items was simply 50 percent at the particular benchmark. For more information, see the "Scale Anchoring Analysis" section of Appendix A as well as the *TIMSS 2007 Technical Report*.

3 All of the constructed-response items were scored according to detailed scoring guides containing descriptions and examples of the types of responses that should receive credit. Although most constructed-response items were worth 1 point, some were worth 2 points (with 1 point awarded for partial credit). If the example item was worth 2 points, the data are for responses receiving 2 points (full credit).

4 After each TIMSS assessment, approximately one-third of the items are released into the public domain and the rest of the items are kept secure for use in measuring trends over time in subsequent assessments.

Low International Benchmark simply recognized some basic facts from the life and physical sciences.

Exhibit 2.2 displays the percentage of students in each country and benchmarking entity that reached each international benchmark. At each grade, the results are presented in descending order according to the percentage of students reaching the Advanced International Benchmark (indicated by the green dots, and shown in the column labeled “Advanced”).

Generally, the TIMSS 2007 participants with the highest average achievement had greater percentages of students reaching each benchmark, and lower achieving countries had smaller percentages. Thus, consistent with the results in Exhibit 1.1, Singapore and Chinese Taipei had the highest percentages of students reaching the advanced benchmark and appear at the top in Exhibit 2.2. Keeping in mind that the Advanced International Benchmark represents fluency on items involving the most complex topics and reasoning skills in the *TIMSS 2007 Science Framework*, Singapore in particular had high percentages of students reaching the advanced benchmark—36 percent at fourth grade and 32 percent at eighth grade.

As a point of reference, Exhibit 2.2 provides the median percentage in TIMSS 2007 for each of the international benchmarks. By definition, half the countries (not including the benchmarking participants) will have a percentage above the median and half below. The median percentage of students reaching the Advanced International Benchmark was 7 percent at the fourth grade and 3 percent at the eighth grade. Following Singapore at the fourth grade, Chinese Taipei had 19 percent and the Russian Federation 16 percent of their students reaching the advanced benchmark. Other countries with at least 10 percent of fourth grade students reaching the advanced benchmark included the United States (15%), England and Hong Kong SAR (14%), Hungary and Italy (13%), Japan and Armenia (12%), the Slovak Republic (11%), and Australia, Latvia, Germany, and Kazakhstan (10%). Among the benchmarking participants, about one-fifth of fourth-grade students in the U.S. states of Massachusetts and Minnesota reached the

Exhibit 2.1 **TIMSS 2007 International Benchmarks of Science Achievement**TIMSS2007  
Science **4<sup>th</sup>**  
Grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Advanced International Benchmark – 625**

*Students can apply knowledge and understanding of scientific processes and relationships in beginning scientific inquiry.* Students communicate their understanding of characteristics and life processes of organisms as well as of factors relating to human health. They demonstrate understanding of relationships among various physical properties of common materials and have some practical knowledge of electricity. Students demonstrate some understanding of the solar system and Earth's physical features and processes. They show a developing ability to interpret the results of investigations and draw conclusions as well as a beginning ability to evaluate and support an argument.

**High International Benchmark – 550**

*Students can apply knowledge and understanding to explain everyday phenomena.* Students demonstrate some understanding of plant and animal structure, life processes, and the environment and some knowledge of properties of matter and physical phenomena. They show some knowledge of the solar system, and of Earth's structure, processes, and resources. Students demonstrate beginning scientific inquiry knowledge and skills, and provide brief descriptive responses combining knowledge of science concepts with information from everyday experience of physical and life processes.

**Intermediate International Benchmark – 475**

*Students can apply basic knowledge and understanding to practical situations in the sciences.* Students recognize some basic information related to characteristics of living things and their interaction with the environment, and show some understanding of human biology and health. They also show some understanding of familiar physical phenomena. Students know some basic facts about the solar system and have a developing understanding of Earth's resources. They demonstrate some ability to interpret information in pictorial diagrams and apply factual knowledge to practical situations.

**Low International Benchmark – 400**

*Students have some elementary knowledge of life science and physical science.* Students can demonstrate knowledge of some simple facts related to human health and the behavioral and physical characteristics of animals. They recognize some properties of matter, and demonstrate a beginning understanding of forces. Students interpret labeled pictures and simple diagrams, complete simple tables, and provide short written responses to questions requiring factual information.



Exhibit 2.1 **TIMSS 2007 International Benchmarks of Science Achievement (Continued)**TIMSS2007  
Science 8<sup>th</sup>  
Grade**Advanced International Benchmark – 625**

*Students can demonstrate a grasp of some complex and abstract concepts in biology, chemistry, physics, and Earth science. They have an understanding of the complexity of living organisms and how they relate to their environment. They show understanding of the properties of magnets, sound, and light, as well as demonstrating understanding of structure of matter and physical and chemical properties and changes. Students apply knowledge of the solar system and of Earth's features and processes, and apply understanding of major environmental issues. They understand some fundamentals of scientific investigation and can apply basic physical principles to solve some quantitative problems. They can provide written explanations to communicate scientific knowledge.*

**High International Benchmark – 550**

*Students can demonstrate conceptual understanding of some science cycles, systems, and principles. They have some understanding of biological concepts including cell processes, human biology and health, and the interrelationship of plants and animals in ecosystems. They apply knowledge to situations related to light and sound, demonstrate elementary knowledge of heat and forces, and show some evidence of understanding the structure of matter, and chemical and physical properties and changes. They demonstrate some understanding of the solar system, Earth's processes and resources, and some basic understanding of major environmental issues. Students demonstrate some scientific inquiry skills. They combine information to draw conclusions, interpret tabular and graphical information, and provide short explanations conveying scientific knowledge.*

**Intermediate International Benchmark – 475**

*Students can recognize and communicate basic scientific knowledge across a range of topics. They demonstrate some understanding of characteristics of animals, food webs, and the effect of population changes in ecosystems. They are acquainted with some aspects of sound and force and have elementary knowledge of chemical change. They demonstrate elementary knowledge of the solar system, Earth's processes, and resources and the environment. Students extract information from tables and interpret pictorial diagrams. They can apply knowledge to practical situations and communicate their knowledge through brief descriptive responses.*

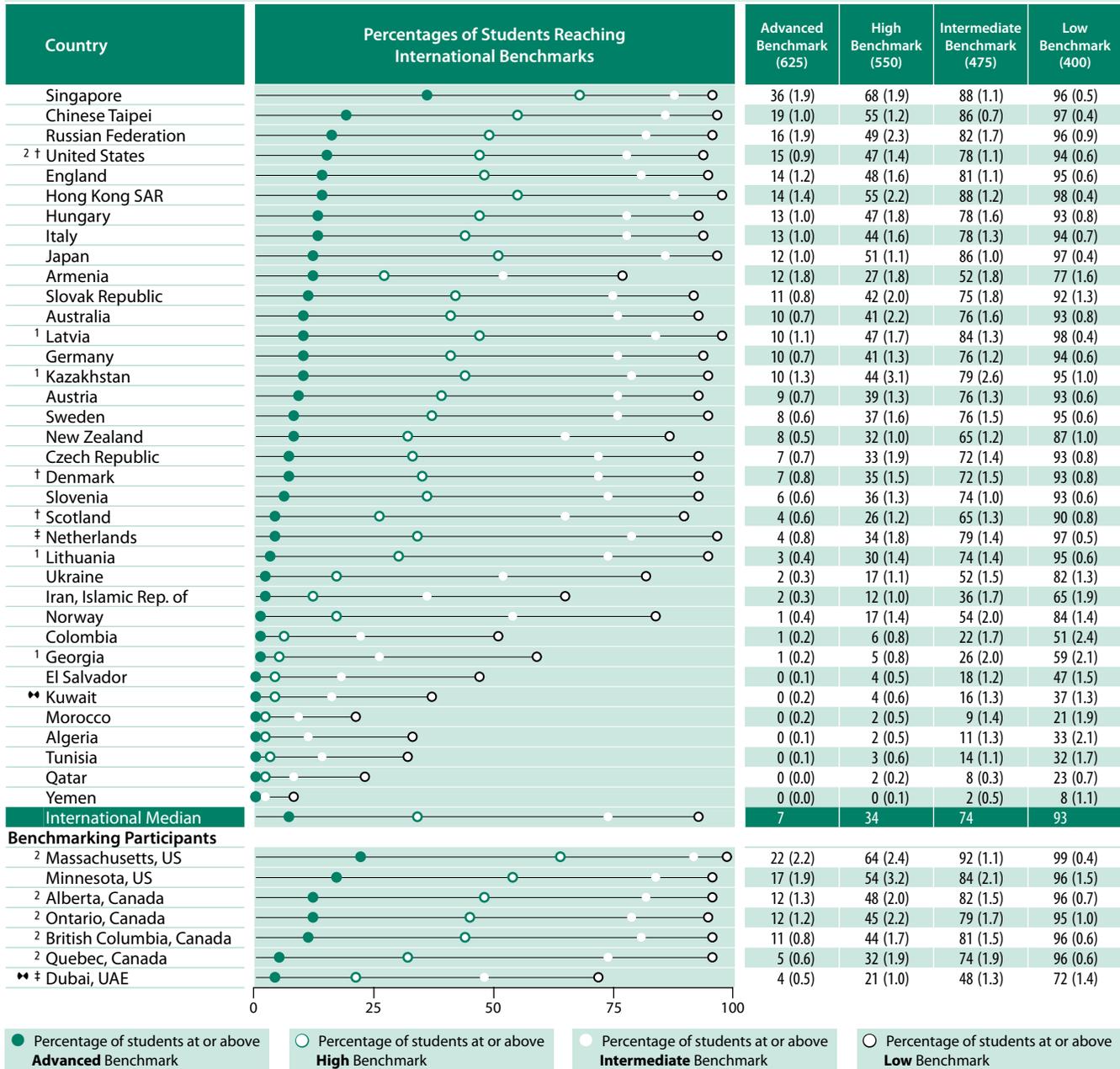
**Low International Benchmark – 400**

*Students can recognize some basic facts from the life and physical sciences. They have some knowledge of the human body, and demonstrate some familiarity with everyday physical phenomena. Students can interpret pictorial diagrams and apply knowledge of simple physical concepts to practical situations.*



**Exhibit 2.2 Percentages of Students Reaching the TIMSS 2007 International Benchmarks of Science Achievement**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade



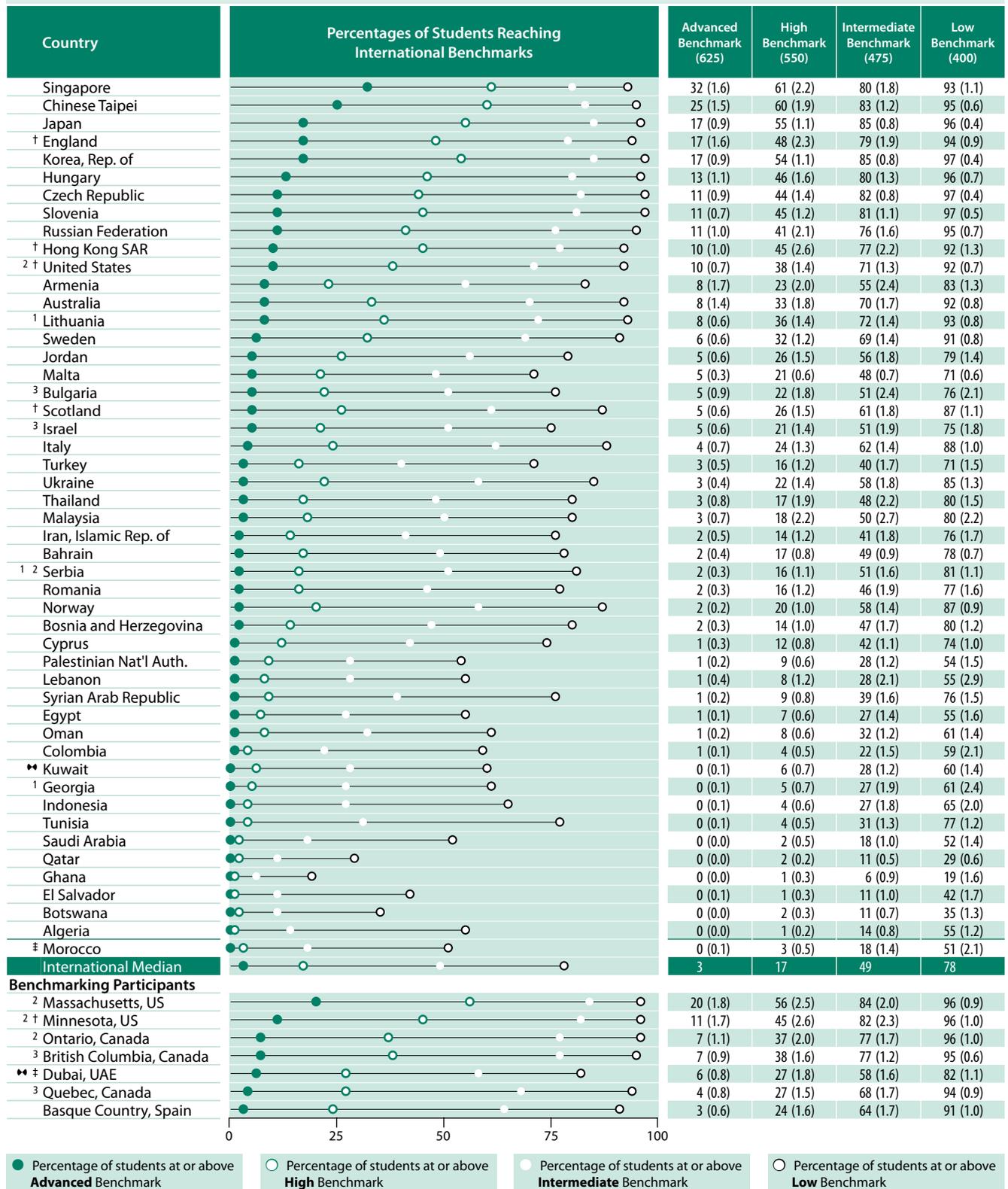
SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

<sup>†</sup> Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>‡</sup> Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
<sup>\*\*</sup> Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 2.2 Percentages of Students Reaching the TIMSS 2007 International Benchmarks of Science Achievement (Continued)

TIMSS 2007  
Science 8<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

● Percentage of students at or above **Advanced** Benchmark    ○ Percentage of students at or above **High** Benchmark    ● Percentage of students at or above **Intermediate** Benchmark    ○ Percentage of students at or above **Low** Benchmark

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).  
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

advanced benchmark (22 and 17 percent, respectively), and three Canadian provinces had more than 10 percent of students reaching this benchmark—Alberta and Ontario (12%) and British Columbia (11%). At the eighth grade, following Singapore, one-fourth (25%) of students in Chinese Taipei reached the advanced benchmark. Other countries with at least 10 percent of students reaching this benchmark included Japan, England, and Korea (17%), Hungary (13%), the Czech Republic, Slovenia, and the Russian Federation (11%), and Hong Kong SAR and the United States (10%).

Although Exhibit 2.2 is organized to draw particular attention to the percentage of high-achieving students in each country and benchmarking participant, it also conveys information about the distribution of middle and low performers. Since students reaching a particular benchmark also reached lower benchmarks, the percentages illustrated graphically and shown in the table are cumulative. At the fourth grade, the median for the Low International Benchmark was an impressive 93 percent, indicating that in at least half the countries almost all of the fourth grade students had elementary knowledge and skills in science. A number of countries had 95 percent or more of fourth grade students reaching this benchmark, including Singapore, Chinese Taipei, the Russian Federation, England, Hong Kong SAR, Japan, Latvia, Kazakhstan, Sweden, the Netherlands, and Lithuania. The two U.S. states and four Canadian provinces also had 95 percent or more of their students reaching the low benchmark. At the other end of the achievement distribution, however, less than half the students reached the low benchmark in El Salvador (47%), Kuwait (37%), Algeria (33%), Tunisia (32%), Qatar (23%), Morocco (21%), and Yemen (8%).

At the fourth grade, the median for the Intermediate International Benchmark was 74 percent and the High Benchmark median was 34 percent, indicating that in half the countries, three-quarters or more of students could apply basic science knowledge and understanding in practical situations and one-third or more could apply knowledge and understanding to explain everyday phenomena. Many countries have patterns consistent with the median results, although there are some exceptions. For example, the results

for Armenia are above the median for the advanced benchmark (12%), but well below the median at the high (27%), intermediate (52%), and low (77%) benchmarks.

At the eighth grade, the substantial variation in achievement at the Advanced International Benchmark was mirrored at each of the other benchmarks. For example, the High International Benchmark was reached by more than 50 percent of students in Singapore, Chinese Taipei, Japan, and Korea, but by only 1 percent in Ghana, El Salvador, and Algeria. The range at the Intermediate International Benchmark was from 85 percent in Japan and Korea to 6 percent in Ghana. The Low International Benchmark was reached by 95 percent or more in seven countries (Chinese Taipei, Japan, Korea, Hungary, the Czech Republic, Slovenia, and the Russian Federation), the two U.S. states, and the Canadian provinces of Ontario and British Columbia. However, several countries had fewer than half of students reaching the low benchmark, El Salvador (42%), Botswana (35%), Qatar (29%), and Ghana (19%).

Exhibit 2.3 presents changes in the percentages of students reaching the benchmarks. Trends across the four benchmarks generally were consistent with the patterns of overall changes across the previous assessments. A number of countries have shown steady improvement at the fourth grade at all benchmarks. For example, Slovenia and Iran had increased percentages of students at each of the benchmarks in each assessment, and Singapore, Hong Kong SAR, Italy, Armenia, and Latvia at each benchmark in at least one cycle of the assessment. Among those with lower average achievement in 2007 compared to 1995, Norway had decreased percentages at all four benchmarks, and the Czech Republic and Austria had decreased percentages at the three top benchmarks.

**Exhibit 2.3 Trends in Percentages of Students Reaching the TIMSS 2007 International Benchmarks of Science Achievement**
**TIMSS2007**  
**Science** **4<sup>th</sup>**  
**Grade**

Country	Advanced International Benchmark (625)			High International Benchmark (550)		
	2007 Percent of Students	2003 Percent of Students	1995 Percent of Students	2007 Percent of Students	2003 Percent of Students	1995 Percent of Students
Singapore	36 (1.9)	25 (2.4)	▲ 14 (1.6)	▲ 68 (1.9)	▲ 61 (2.6)	▲ 42 (2.2)
Chinese Taipei	19 (1.0)	14 (1.0)	▲ ◊ ◊	55 (1.2)	52 (1.1)	◊ ◊
Russian Federation	16 (1.9)	11 (1.4)	◊ ◊	49 (2.3)	39 (2.7)	▲ ◊ ◊
United States	15 (0.9)	13 (0.8)	19 (1.2)	▼ 47 (1.4)	45 (1.4)	50 (1.6)
England	14 (1.2)	15 (1.4)	15 (1.1)	48 (1.6)	47 (1.8)	42 (1.7)
Hong Kong SAR	14 (1.4)	7 (0.8)	▲ 5 (0.6)	▲ 55 (2.2)	47 (2.2)	▲ 30 (1.6)
Hungary	13 (1.0)	10 (0.9)	▲ 7 (0.7)	▲ 47 (1.8)	42 (1.6)	▲ 32 (1.7)
Italy	13 (1.0)	9 (1.1)	▲ –	44 (1.6)	35 (1.9)	▲ –
Japan	12 (1.0)	12 (0.6)	15 (0.8)	▼ 51 (1.1)	49 (1.1)	54 (1.3)
Armenia	12 (1.8)	2 (0.4)	▲ ◊ ◊	27 (1.8)	10 (1.0)	▲ ◊ ◊
Australia	10 (0.7)	9 (1.0)	13 (1.1)	41 (2.2)	38 (1.7)	40 (1.3)
Latvia	10 (1.1)	7 (0.7)	▲ 5 (1.4)	▲ 47 (1.7)	39 (1.9)	▲ 21 (2.1)
Austria	9 (0.7)	◊ ◊	13 (1.4)	▼ 39 (1.3)	◊ ◊	45 (1.8)
New Zealand	8 (0.5)	9 (0.7)	11 (1.2)	▼ 32 (1.0)	39 (1.3)	▼ 35 (1.8)
Czech Republic	7 (0.7)	◊ ◊	12 (1.1)	▼ 33 (1.9)	◊ ◊	42 (1.5)
Slovenia	6 (0.6)	3 (0.4)	▲ 2 (0.4)	▲ 36 (1.3)	22 (1.3)	▲ 14 (1.1)
Scotland	4 (0.6)	5 (0.5)	12 (1.1)	▼ 26 (1.2)	27 (1.5)	37 (1.8)
Netherlands	4 (0.8)	3 (0.5)	6 (0.7)	▼ 34 (1.8)	32 (1.5)	38 (2.1)
Lithuania	3 (0.4)	3 (0.5)	◊ ◊	30 (1.4)	30 (1.3)	◊ ◊
Iran, Islamic Rep. of	2 (0.3)	1 (0.2)	▲ 0 (0.1)	▲ 12 (1.0)	7 (0.7)	▲ 3 (0.7)
Norway	1 (0.4)	2 (0.3)	8 (0.9)	▼ 17 (1.4)	15 (0.9)	32 (1.6)
Morocco	0 (0.2)	0 (0.0)	◊ ◊	2 (0.5)	1 (0.3)	◊ ◊
Tunisia	0 (0.1)	0 (0.1)	◊ ◊	3 (0.5)	2 (0.3)	▲ ◊ ◊
<b>Benchmarking Participants</b>						
Minnesota, US	17 (1.9)	◊ ◊	21 (2.8)	54 (3.2)	◊ ◊	54 (3.9)
Alberta, Canada	12 (1.3)	◊ ◊	21 (2.2)	▼ 48 (2.0)	◊ ◊	▼ 57 (3.5)
Ontario, Canada	12 (1.2)	13 (1.6)	10 (0.7)	45 (2.2)	47 (1.9)	37 (1.7)
Quebec, Canada	5 (0.6)	3 (0.4)	▲ 9 (1.3)	▼ 32 (1.9)	25 (1.3)	▲ 40 (3.7)

▲ 2007 percent significantly higher  
 ▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Trend notes: Data are not shown for Kuwait, because comparable data from previous cycles are not available. Data for Tunisia do not include private schools.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

A diamond (◊) indicates the country did not participate in the assessment.

**Exhibit 2.3 Trends in Percentages of Students Reaching the TIMSS 2007 International Benchmarks of Science Achievement (Continued)**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Intermediate International Benchmark (475)			Low International Benchmark (400)		
	2007 Percent of Students	2003 Percent of Students	1995 Percent of Students	2007 Percent of Students	2003 Percent of Students	1995 Percent of Students
Singapore	88 (1.1)	86 (1.6)	71 (1.7) ▲	96 (0.5)	95 (0.9)	89 (0.9) ▲
Chinese Taipei	86 (0.7)	87 (0.7)	◊ ◊	97 (0.4)	98 (0.3) ▼	◊ ◊
Russian Federation	82 (1.7)	74 (2.4) ▲	◊ ◊	96 (0.9)	93 (1.1)	◊ ◊
United States	78 (1.1)	78 (1.0)	78 (1.1)	94 (0.6)	94 (0.5)	92 (0.7)
England	81 (1.1)	79 (1.3)	72 (1.3) ▲	95 (0.6)	94 (0.7)	90 (0.8) ▲
Hong Kong SAR	88 (1.2)	87 (1.2)	69 (1.7) ▲	98 (0.4)	98 (0.3)	91 (1.1) ▲
Hungary	78 (1.6)	76 (1.4)	67 (1.8) ▲	93 (0.8)	94 (0.7)	90 (1.0) ▲
Italy	78 (1.3)	70 (1.6) ▲	– –	94 (0.7)	91 (0.9) ▲	– –
Japan	86 (1.0)	84 (0.7) ▲	87 (0.7)	97 (0.4)	96 (0.4)	97 (0.4)
Armenia	52 (1.8)	38 (1.7) ▲	◊ ◊	77 (1.6)	66 (1.8) ▲	◊ ◊
Australia	76 (1.6)	74 (2.0)	72 (1.7) ▲	93 (0.8)	92 (1.1)	89 (1.1) ▲
Latvia	84 (1.3)	80 (1.5) ▲	55 (2.1) ▲	98 (0.4)	96 (0.6)	85 (1.4) ▲
Austria	76 (1.3)	◊ ◊	79 (1.5) ▼	93 (0.6)	◊ ◊	94 (0.7)
New Zealand	65 (1.2)	74 (1.2) ▼	66 (1.8)	87 (1.0)	92 (0.7) ▼	85 (1.7)
Czech Republic	72 (1.4)	◊ ◊	77 (1.2) ▼	93 (0.8)	◊ ◊	95 (0.6)
Slovenia	74 (1.0)	61 (1.4) ▲	45 (1.5) ▲	93 (0.6)	87 (0.9) ▲	79 (1.4) ▲
Scotland	65 (1.3)	66 (1.5)	68 (1.9)	90 (0.8)	90 (0.9)	88 (1.3)
Netherlands	79 (1.4)	83 (1.2) ▼	82 (1.6)	97 (0.5)	99 (0.4)	98 (0.7)
Lithuania	74 (1.4)	73 (1.6)	◊ ◊	95 (0.6)	95 (0.7)	◊ ◊
Iran, Islamic Rep. of	36 (1.7)	28 (1.5) ▲	15 (1.5) ▲	65 (1.9)	58 (1.7) ▲	42 (2.1) ▲
Norway	54 (2.0)	49 (1.4) ▲	65 (1.7) ▼	84 (1.4)	79 (1.5) ▲	88 (1.1) ▼
Morocco	9 (1.4)	9 (0.8)	◊ ◊	21 (1.9)	24 (1.6)	◊ ◊
Tunisia	14 (1.1)	10 (1.0) ▲	◊ ◊	31 (1.7)	27 (1.7) ▲	◊ ◊
<b>Benchmarking Participants</b>						
Minnesota, US	84 (2.1)	◊ ◊	82 (2.6)	96 (1.5)	◊ ◊	95 (2.1)
Alberta, Canada	82 (1.5)	◊ ◊	84 (3.2)	96 (0.7)	◊ ◊	94 (2.5)
Ontario, Canada	79 (1.7)	81 (1.4)	71 (1.7) ▲	95 (1.0)	96 (0.6)	90 (1.0) ▲
Quebec, Canada	74 (1.9)	66 (1.4) ▲	77 (2.5)	96 (0.6)	91 (0.8) ▲	94 (1.3)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



**Exhibit 2.3 Trends in Percentages of Students Reaching the TIMSS 2007 International Benchmarks of Science Achievement (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Advanced International Benchmark (625)				High International Benchmark (550)			
	2007 Percent of Students	2003 Percent of Students	1999 Percent of Students	1995 Percent of Students	2007 Percent of Students	2003 Percent of Students	1999 Percent of Students	1995 Percent of Students
Singapore	32 (1.6)	33 (1.6)	29 (3.2)	29 (3.2)	61 (2.2)	66 (2.3)	60 (3.5)	64 (2.8)
Chinese Taipei	25 (1.5)	26 (1.5)	27 (1.8)	◇ ◇	60 (1.9)	63 (1.9)	61 (2.1)	◇ ◇
Japan	17 (0.9)	15 (0.7)	16 (1.0)	18 (0.9)	55 (1.1)	53 (1.1)	52 (1.3)	54 (1.1)
England	17 (1.6)	15 (1.7)	17 (1.7)	15 (1.7)	48 (2.3)	48 (2.7)	45 (2.4)	43 (1.8)
Korea, Rep. of	17 (0.9)	17 (0.9)	19 (1.1)	17 (1.0)	54 (1.1)	57 (1.1)	50 (1.2)	50 (1.2) ▲
Hungary	13 (1.1)	14 (1.1)	19 (1.3) ▼	12 (1.1)	46 (1.6)	46 (1.7)	53 (1.8) ▼	44 (1.7)
Czech Republic	11 (0.9)	◇ ◇	14 (1.4)	17 (1.8) ▼	44 (1.4)	◇ ◇	45 (2.2)	52 (2.5) ▼
Slovenia	11 (0.7)	6 (0.5) ▲	--	8 (0.8) ▲	45 (1.2)	33 (1.3) ▲	--	32 (1.5) ▲
Russian Federation	11 (1.0)	6 (0.8) ▲	15 (2.3)	11 (1.1)	41 (2.1)	32 (1.8) ▲	41 (2.8)	38 (2.3)
Hong Kong SAR	10 (1.0)	13 (1.2) ▼	7 (0.9)	7 (1.0) ▲	45 (2.6)	58 (1.9) ▼	40 (2.1)	33 (2.7) ▲
United States	10 (0.7)	11 (0.8)	12 (1.0) ▼	11 (1.1)	38 (1.4)	41 (1.7)	37 (1.9)	38 (2.0)
Armenia	8 (1.7)	1 (0.3) ▲	◇ ◇	◇ ◇	23 (2.0)	14 (1.3) ▲	◇ ◇	◇ ◇
Australia	8 (1.4)	9 (1.1)	--	10 (1.1)	33 (1.8)	40 (2.0) ▼	--	36 (1.7)
Lithuania	8 (0.6)	6 (0.6) ▲	5 (0.9) ▲	2 (0.5) ▲	36 (1.4)	34 (1.2)	22 (1.8) ▲	14 (1.5) ▲
Sweden	6 (0.6)	8 (0.8)	◇ ◇	19 (1.6) ▼	32 (1.2)	38 (1.6) ▼	◇ ◇	52 (2.4) ▼
Jordan	5 (0.6)	3 (0.5) ▲	4 (0.5) ▲	◇ ◇	26 (1.5)	21 (1.4) ▲	17 (1.0) ▲	◇ ◇
Scotland	5 (0.6)	6 (0.7)	◇ ◇	9 (1.4) ▼	26 (1.5)	32 (1.9) ▼	◇ ◇	30 (2.5)
Israel	5 (0.6)	5 (0.5)	5 (0.5)	--	21 (1.4)	24 (1.3)	23 (1.4)	--
Italy	4 (0.7)	4 (0.6)	6 (0.9) ▼	--	24 (1.3)	23 (1.5)	26 (1.8)	--
Thailand	3 (0.8)	◇ ◇	2 (0.5)	--	17 (1.9)	◇ ◇	18 (2.1)	--
Malaysia	3 (0.7)	4 (0.8)	5 (0.8)	◇ ◇	18 (2.2)	28 (2.2) ▼	24 (2.0)	◇ ◇
Iran, Islamic Rep. of	2 (0.5)	1 (0.2) ▲	1 (0.3)	1 (0.4)	14 (1.2)	9 (0.6) ▲	11 (1.3)	11 (1.3)
Bahrain	2 (0.4)	0 (0.1) ▲	◇ ◇	◇ ◇	17 (0.8)	6 (0.6) ▲	◇ ◇	◇ ◇
Serbia	2 (0.3)	2 (0.3)	◇ ◇	◇ ◇	16 (1.1)	16 (1.0)	◇ ◇	◇ ◇
Romania	2 (0.3)	4 (0.8)	5 (0.8) ▼	5 (0.8) ▼	16 (1.2)	20 (1.8)	21 (2.1) ▼	22 (1.8) ▼
Norway	2 (0.2)	2 (0.3)	◇ ◇	6 (0.6) ▼	20 (1.0)	21 (1.1)	◇ ◇	32 (1.5) ▼
Cyprus	1 (0.3)	0 (0.2) ▲	2 (0.4)	2 (0.4)	12 (0.8)	8 (0.6) ▲	14 (0.8)	15 (1.0) ▼
Palestinian Nat'l Auth.	1 (0.2)	1 (0.2)	◇ ◇	◇ ◇	9 (0.6)	10 (0.8)	◇ ◇	◇ ◇
Lebanon	1 (0.4)	0 (0.1)	◇ ◇	◇ ◇	8 (1.2)	4 (0.7) ▲	◇ ◇	◇ ◇
Egypt	1 (0.1)	1 (0.2) ▼	◇ ◇	◇ ◇	7 (0.6)	10 (0.7) ▼	◇ ◇	◇ ◇
Colombia	1 (0.1)	◇ ◇	◇ ◇	0 (0.2)	4 (0.5)	◇ ◇	◇ ◇	2 (0.4) ▲
Indonesia	0 (0.2)	0 (0.1)	1 (0.3) ▼	◇ ◇	5 (0.7)	4 (0.5)	8 (1.0)	◇ ◇
Tunisia	0 (0.1)	0 (0.0)	0 (0.1)	◇ ◇	4 (0.5)	1 (0.2) ▲	3 (0.5)	◇ ◇
Ghana	0 (0.0)	0 (0.0)	◇ ◇	◇ ◇	1 (0.3)	0 (0.1) ▲	◇ ◇	◇ ◇
Botswana	0 (0.0)	0 (0.1)	◇ ◇	◇ ◇	2 (0.3)	1 (0.5)	◇ ◇	◇ ◇
<b>Benchmarking Participants</b>								
Massachusetts, US	20 (1.8)	◇ ◇	15 (2.4)	◇ ◇	56 (2.5)	◇ ◇	43 (3.1) ▲	◇ ◇
Minnesota, US	11 (1.7)	◇ ◇	◇ ◇	17 (2.4) ▼	45 (2.6)	◇ ◇	◇ ◇	50 (3.8)
Ontario, Canada	7 (1.1)	7 (0.7)	7 (0.9)	5 (0.6)	37 (2.0)	41 (1.8)	34 (1.6)	26 (1.6) ▲
British Columbia, Canada	7 (0.9)	◇ ◇	14 (2.2) ▼	◇ ◇	38 (1.6)	◇ ◇	47 (3.0) ▼	◇ ◇
Quebec, Canada	4 (0.8)	6 (1.0)	10 (2.2) ▼	7 (1.5)	27 (1.5)	39 (2.0) ▼	43 (3.7) ▼	30 (2.8)
Basque Country, Spain	3 (0.6)	3 (0.6)	◇ ◇	◇ ◇	24 (1.6)	20 (1.5)	◇ ◇	◇ ◇

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Trend notes: Data are not shown for Bulgaria, Kuwait, Morocco, Saudi Arabia, and Turkey, because comparable data from previous cycles are not available. Data for Indonesia do not include Islamic schools.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

A diamond (◇) indicates the country did not participate in the assessment.

**Exhibit 2.3 Trends in Percentages of Students Reaching the TIMSS 2007 International Benchmarks of Science Achievement (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Intermediate International Benchmark (475)				Low International Benchmark (400)			
	2007 Percent of Students	2003 Percent of Students	1999 Percent of Students	1995 Percent of Students	2007 Percent of Students	2003 Percent of Students	1999 Percent of Students	1995 Percent of Students
Singapore	80 (1.8)	85 (1.7) ▼	84 (2.4)	91 (1.3) ▼	93 (1.1)	95 (0.8) ▼	95 (1.2)	99 (0.2) ▼
Chinese Taipei	83 (1.2)	88 (1.1) ▼	86 (1.3)	◊ ◊	95 (0.6)	98 (0.4) ▼	96 (0.6)	◊ ◊
Japan	85 (0.8)	86 (0.8)	84 (0.9)	85 (0.7)	96 (0.4)	98 (0.3) ▼	97 (0.4)	97 (0.3)
England	79 (1.9)	81 (1.8)	76 (1.9)	75 (1.4)	94 (0.9)	96 (0.6)	94 (0.7)	93 (0.7)
Korea, Rep. of	85 (0.8)	88 (0.7) ▼	81 (1.0) ▲	81 (0.9) ▲	97 (0.4)	98 (0.4) ▼	96 (0.4) ▲	95 (0.5) ▲
Hungary	80 (1.3)	82 (1.1)	83 (1.3)	80 (1.5)	96 (0.7)	97 (0.6)	96 (0.8)	95 (0.7)
Czech Republic	82 (0.8)	◊ ◊	79 (1.7)	86 (1.3) ▼	97 (0.4)	◊ ◊	96 (0.8)	98 (0.5)
Slovenia	81 (1.1)	75 (1.3) ▲	--	69 (1.6) ▲	97 (0.5)	96 (0.6)	--	93 (0.7) ▲
Russian Federation	76 (1.6)	70 (1.8) ▲	73 (2.3)	71 (2.2)	95 (0.7)	93 (0.9)	92 (1.0) ▲	92 (1.1)
Hong Kong SAR	77 (2.2)	89 (1.4) ▼	80 (1.9)	70 (2.7) ▲	92 (1.3)	98 (0.7) ▼	96 (0.9) ▼	90 (1.7)
United States	71 (1.3)	75 (1.4)	67 (1.9)	68 (2.2)	92 (0.7)	93 (0.8)	87 (1.3) ▲	87 (1.6) ▲
Armenia	55 (2.4)	45 (1.9) ▲	◊ ◊	◊ ◊	83 (1.3)	77 (1.4) ▲	◊ ◊	◊ ◊
Australia	70 (1.7)	76 (1.9) ▼	--	69 (1.6)	92 (0.8)	95 (0.8) ▼	--	89 (1.0) ▲
Lithuania	72 (1.4)	74 (1.3)	57 (2.0) ▲	45 (2.2) ▲	93 (0.8)	95 (0.6) ▼	86 (1.7) ▲	79 (1.6) ▲
Sweden	69 (1.4)	75 (1.4) ▼	◊ ◊	83 (1.7) ▼	91 (0.8)	95 (0.7) ▼	◊ ◊	97 (0.7) ▼
Jordan	56 (1.8)	53 (1.8)	42 (1.4) ▲	◊ ◊	79 (1.4)	80 (1.3)	69 (1.6) ▲	◊ ◊
Scotland	61 (1.8)	70 (1.7) ▼	◊ ◊	61 (2.2)	87 (1.1)	92 (0.9) ▼	◊ ◊	86 (1.4)
Israel	51 (1.9)	57 (1.6) ▼	50 (2.1)	--	75 (1.8)	85 (1.1) ▼	75 (2.0)	--
Italy	62 (1.4)	59 (1.5)	59 (2.0)	--	88 (1.0)	87 (1.1)	86 (1.2)	--
Thailand	48 (2.2)	◊ ◊	54 (2.3) ▼	--	80 (1.5)	◊ ◊	87 (1.2) ▼	--
Malaysia	50 (2.7)	71 (2.0) ▼	59 (2.2) ▼	◊ ◊	80 (2.2)	95 (0.7) ▼	87 (1.4) ▼	◊ ◊
Iran, Islamic Rep. of	41 (1.8)	38 (1.3)	38 (1.8)	43 (2.2)	76 (1.7)	77 (1.3)	72 (1.8)	81 (1.8) ▼
Bahrain	49 (0.9)	33 (1.1) ▲	◊ ◊	◊ ◊	78 (0.7)	70 (1.2) ▲	◊ ◊	◊ ◊
Serbia	51 (1.6)	48 (1.3)	◊ ◊	◊ ◊	81 (1.1)	79 (1.0)	◊ ◊	◊ ◊
Romania	46 (1.9)	49 (2.2)	50 (2.6)	51 (2.2)	77 (1.6)	78 (1.9)	78 (2.0)	77 (1.7)
Norway	58 (1.4)	63 (1.3) ▼	◊ ◊	72 (1.3) ▼	87 (0.9)	91 (0.8) ▼	◊ ◊	94 (0.9) ▼
Cyprus	42 (1.1)	35 (1.0) ▲	45 (1.5)	43 (1.3)	74 (1.0)	71 (1.2) ▲	77 (1.1) ▼	72 (1.1)
Palestinian Nat'l Auth.	28 (1.2)	36 (1.4) ▼	◊ ◊	◊ ◊	54 (1.5)	66 (1.5) ▼	◊ ◊	◊ ◊
Lebanon	28 (2.1)	20 (1.5) ▲	◊ ◊	◊ ◊	55 (2.9)	48 (2.0) ▲	◊ ◊	◊ ◊
Egypt	27 (1.4)	33 (1.4) ▼	◊ ◊	◊ ◊	55 (1.6)	59 (1.6) ▼	◊ ◊	◊ ◊
Colombia	22 (1.5)	◊ ◊	◊ ◊	9 (1.3) ▲	59 (2.1)	◊ ◊	◊ ◊	35 (2.4) ▲
Indonesia	30 (2.1)	25 (1.8)	33 (1.7)	◊ ◊	68 (2.4)	61 (2.1) ▲	68 (2.5)	◊ ◊
Tunisia	31 (1.3)	12 (1.0) ▲	25 (1.6) ▲	◊ ◊	77 (1.2)	52 (1.5) ▲	68 (2.1) ▲	◊ ◊
Ghana	6 (0.9)	3 (0.4) ▲	◊ ◊	◊ ◊	19 (1.6)	13 (1.3) ▲	◊ ◊	◊ ◊
Botswana	11 (0.7)	10 (0.9)	◊ ◊	◊ ◊	35 (1.3)	35 (1.3)	◊ ◊	◊ ◊
<b>Benchmarking Participants</b>								
Massachusetts, US	84 (2.0)	◊ ◊	75 (3.2) ▲	◊ ◊	96 (0.9)	◊ ◊	93 (1.4)	◊ ◊
Minnesota, US	82 (2.3)	◊ ◊	◊ ◊	79 (3.1)	96 (1.0)	◊ ◊	◊ ◊	94 (1.4)
Ontario, Canada	77 (1.7)	81 (1.2)	72 (1.6) ▲	61 (1.9) ▲	96 (1.0)	97 (0.5)	95 (0.5)	88 (1.1) ▲
British Columbia, Canada	77 (1.2)	◊ ◊	81 (2.6)	◊ ◊	95 (0.6)	◊ ◊	96 (1.1)	◊ ◊
Quebec, Canada	68 (1.7)	82 (1.5) ▼	83 (2.4) ▼	69 (3.5)	94 (0.9)	98 (0.4) ▼	98 (0.5) ▼	92 (2.6)
Basque Country, Spain	64 (1.7)	58 (1.9) ▲	◊ ◊	◊ ◊	91 (1.0)	89 (0.9)	◊ ◊	◊ ◊

▲ 2007 percent significantly higher  
▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

At the eighth grade, countries showing consistent improvement at each benchmark across assessments since 1995 included Slovenia and Lithuania. Armenia, Bahrain, and Cyprus had increased percentages from 2003 reaching all four benchmarks, and the Russian Federation for the top three benchmarks. Lebanon, Tunisia, and Ghana showed improvement at the high, intermediate, and low benchmarks, but not at the advanced benchmark.

#### **Fourth Grade: Achievement at the Advanced International Benchmark**

At the fourth grade, almost half the assessment items (45%) were devoted to assessing the *life science* content domain. According to the *TIMSS 2007 Science Framework*, students should demonstrate knowledge of the characteristics and life processes of living things, know and compare the life cycles of common organisms such as the butterfly and frog, describe relationships between plants and animals in common ecosystems, and have a rudimentary knowledge of human health, nutrition, and disease. Within the *physical science* domain (35% of the assessment), students should compare or classify objects and materials on the basis of physical properties, identify common energy sources and have some understanding of heat flow, relate familiar physical phenomena to the behavior of light and sound, have some notion of a complete electrical circuit and some practical knowledge of magnets and their uses, and have some grasp of the idea of forces as they relate to movement. In the *earth science* content domain (20% of the assessment), fourth grade students were expected to demonstrate some general knowledge about the structure and physical characteristics of Earth; Earth's processes, cycles, and history; and some understandings about Earth's place in the solar system. Within each of the content domains, students were expected to demonstrate knowledge as well as application and reasoning skills.

Exhibit 2.4 describes fourth-grade performance at the Advanced International Benchmark. Students achieving at or above this benchmark demonstrated fluency with many framework topics. They communicated their understanding of characteristics and life processes of organisms and of relationships among physical properties of materials. They demonstrated

some understanding of the solar system and of Earth's physical features and processes, and a developing ability to interpret the results of investigations and draw conclusions. They typically demonstrated success on the knowledge and skills represented by this benchmark, as well as those demonstrated at the high, intermediate, and low benchmarks.

Although not expected to have mastered the concept of density as yet, students at the fourth grade are expected to appreciate that an object's capacity to float or sink is not determined by its size. Example Item 1 (Exhibit 2.5) presents a physical science item likely to be answered correctly by students performing at the advanced benchmark. In this example, students were shown a diagram depicting three beakers of the same size and containing the same amount of water, and three ice cubes of varying size. On average internationally across countries, 39 percent of students recognized that all three ice-cubes would float, regardless of their size. In Chinese Taipei, 60 percent of the fourth grade students chose the correct option, followed closely by Japan (58%), Singapore (57%), and Austria and Australia (both 56%).

In the life science domain at the fourth grade, students are expected to understand some basic principles of heredity and reproduction, including that animals produce offspring by reproducing with their own kind. One such item likely to be answered by students reaching the advanced level is shown in Exhibit 2.6. Example Item 2 is a constructed-response item that asks students to explain whether the last remaining member of a species (a giant turtle) can reproduce so that the species does not die out. To gain credit on this item, students explained that turtles cannot reproduce by themselves, and that a male turtle would need a female. On average internationally, just 30 percent of the students answered this item correctly. More than half the students in Lithuania (58%) and Latvia (55%) gained credit on this item.

## Exhibit 2.4 Description of the TIMSS 2007 Advanced International Benchmark (625) of Science Achievement

TIMSS2007  
Science **4**<sup>th</sup>  
Grade

### Advanced International Benchmark – 625

#### Summary

*Students can apply knowledge and understanding of scientific processes and relationships in beginning scientific inquiry.* Students communicate their understanding of characteristics and life processes of organisms as well as of factors relating to human health. They demonstrate understanding of relationships among various physical properties of common materials and have some practical knowledge of electricity. Students demonstrate some understanding of the solar system and Earth's physical features and processes. They show a developing ability to interpret the results of investigations and draw conclusions as well as a beginning ability to evaluate and support an argument.

In life science, students communicate their understanding of characteristics and life processes of organisms as well as of factors relating to human health. From a diagram, they recognize an animal that has a skeleton on the outside of its body, identify the body covering that protects a reptile, and recognize a group of mammals. They state one physical feature or behavior of sea mammals that distinguishes them from fish and, from a diagram of an animal's skull, describe a function of particular types of teeth. Students show some knowledge of reproduction and recognize examples of animals that take care of their young. They describe one physical change that can take place in a mammal as the weather gets cold, state how migration increases the survival of birds, and recognize an advantage to monarch butterflies of being poisonous to birds. They also describe human activities that can lead to the extinction of animals. Students evaluate and support an argument for the need for a balanced diet, select the best source of calcium from a list of common foods, and explain why people should drink liquids frequently. They suggest one way to avoid catching flu and one cause for higher than normal human body temperature, and recognize that food provides the energy needed to heal a cut.

In physical science, students demonstrate understanding of relationships among various physical properties of common materials. They recognize that ice cubes float in water regardless of their size, and identify the diagram that best shows how ice floats in water. Using information about physical properties of familiar items, students identify another item with matching properties and, from partial diagrammatic information, draw a conclusion about the relative weight of one of four cubes. Students name a property that can be used

to separate balls of the same volume but made of different metals. They recognize the best conductor of heat from a list of familiar materials, and can label the freezing point of water on a diagram of a thermometer. Students name one thing that shows that sunlight is made up of different colors and distinguish objects that produce their own light from those that do not. From a description of a multi-step investigation, students can describe the results and conclude that the color of an object looks different under different colored light. Students demonstrate some practical knowledge of electricity. Given two electric circuit diagrams showing different battery configurations, students explain which circuit will allow a bulb to light. They also name a source of energy other than coal, oil, or natural gas that is used to produce electricity.

In Earth science, students demonstrate some understanding of the solar system and Earth's physical features and processes. They recognize how long it takes for Earth to rotate on its axis and to orbit the Sun, and that the Moon is visible because it reflects light from the Sun. They recognize the relative proportions of land and water on Earth and have some understanding of the composition of Earth's crust. Students recognize that decaying plants and animals enrich the soil and make plants grow. They describe the use of a natural resource and identify a change in soil from natural causes. They can interpret a map indicating that a river flows from mountains to the ocean and describe one disadvantage of farming near a river.

Students demonstrate a developing ability to interpret the results of investigations and drawing conclusions as well as a beginning ability to evaluate and support an argument.

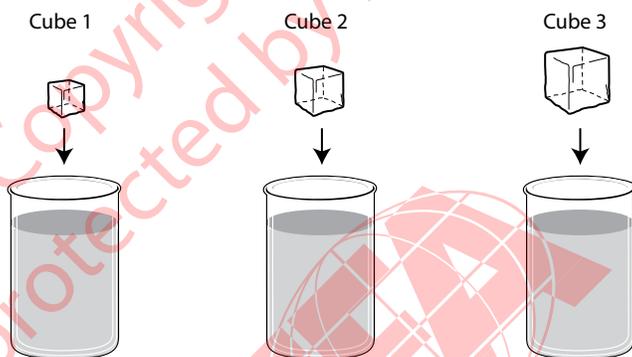
**Exhibit 2.5 TIMSS 2007 Advanced International Benchmark (625) of Science Achievement – Example Item 1**

**TIMSS 2007**  
Science **4<sup>th</sup>** Grade

**Content Domain: Physical Science**

**Description: Recognizes that, regardless of their size, ice cubes float in water.**

Susie has three ice cubes of different sizes. She places each ice cube into an identical beaker containing the same volume of water, as shown in the diagram.



What happens to the ice cubes when they are placed in the water?

- (A) Cubes 1, 2, and 3 will sink.
- (B) Cubes 1, 2, and 3 will float.
- (C) Cube 1 will float, and cubes 2 and 3 will sink.
- (D) Cubes 1 and 2 will float, and cube 3 will sink.

Country	Percent Correct	
Chinese Taipei	60 (2.1)	●
Japan	58 (2.3)	●
Singapore	57 (1.8)	●
Austria	56 (2.4)	●
Australia	56 (2.4)	●
Sweden	51 (2.1)	●
† Denmark	50 (2.5)	●
Germany	49 (1.7)	●
Norway	49 (2.3)	●
Hong Kong SAR	48 (2.1)	●
Russian Federation	46 (2.1)	●
<sup>2</sup> † United States	44 (1.6)	●
New Zealand	44 (2.5)	●
<sup>1</sup> Latvia	43 (2.7)	●
Czech Republic	41 (2.7)	●
Slovenia	40 (2.0)	●
<sup>1</sup> Kazakhstan	40 (2.4)	●
Italy	39 (2.1)	●
<b>International Avg.</b>	<b>39 (0.4)</b>	
El Salvador	38 (1.9)	●
Colombia	37 (2.3)	●
England	37 (2.2)	●
Slovak Republic	36 (2.2)	●
† Scotland	36 (2.4)	●
<sup>1</sup> Lithuania	36 (2.7)	●
‡ Netherlands	35 (2.5)	●
Hungary	34 (2.4)	▼
Armenia	33 (3.2)	▼
♣ Kuwait	31 (2.0)	▼
Qatar	28 (1.5)	▼
Ukraine	27 (2.3)	▼
<sup>1</sup> Georgia	26 (2.3)	▼
Yemen	25 (1.8)	▼
Morocco	24 (2.7)	▼
Iran, Islamic Rep. of	21 (2.1)	▼
Tunisia	20 (1.9)	▼
Algeria	20 (1.8)	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	55 (2.7)	●
<sup>2</sup> † Minnesota, US	52 (4.3)	●
<sup>2</sup> Quebec, Canada	48 (2.7)	●
<sup>2</sup> British Columbia, Canada	47 (2.6)	●
<sup>2</sup> Alberta, Canada	46 (2.4)	●
<sup>2</sup> Ontario, Canada	42 (3.0)	●
♣ ‡ Dubai, UAE	29 (2.1)	▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Percent significantly higher than international average ●  
Percent significantly lower than international average ▼

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
♣ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

**Exhibit 2.6 TIMSS 2007 Advanced International Benchmark (625) of Science Achievement – Example Item 2**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

**Content Domain: Life Science**
**Description: Explains that the last surviving member of a species of a turtle cannot reproduce and gives a reason.**

There is a giant turtle that lives on an island. He is the only turtle left of a special type of giant turtle.

Can he reproduce so that this type of turtle does not die out?

(Check one box.)

Yes

No

Give a reason for your answer.

*Turtles cannot reproduce all by themselves.  
It is a male turtle so he needs a female.*

The answer shown illustrates the type of student response that was given full credit

Country	Percent Full Credit	
<sup>1</sup> Lithuania	58 (2.4)	▲
<sup>1</sup> Latvia	55 (2.4)	▲
Germany	49 (2.1)	▲
Australia	48 (2.5)	▲
Czech Republic	47 (2.2)	▲
England	47 (2.4)	▲
Hungary	45 (2.6)	▲
Japan	45 (2.1)	▲
Slovak Republic	45 (2.5)	▲
Chinese Taipei	43 (2.4)	▲
‡ Netherlands	43 (2.2)	▲
<sup>2 †</sup> United States	42 (1.6)	▲
<sup>†</sup> Denmark	42 (2.5)	▲
Russian Federation	41 (2.4)	▲
Singapore	38 (2.4)	▲
Italy	38 (2.3)	▲
Hong Kong SAR	36 (2.2)	▲
<sup>†</sup> Scotland	36 (2.1)	▲
New Zealand	35 (2.0)	▲
Sweden	34 (2.7)	▲
Slovenia	32 (2.0)	▲
<b>International Avg.</b>	<b>30 (0.3)</b>	
Armenia	25 (2.4)	▼
<sup>1</sup> Kazakhstan	25 (2.4)	▼
Ukraine	23 (1.9)	▼
Norway	18 (2.1)	▼
Algeria	12 (1.6)	▼
Colombia	12 (1.7)	▼
El Salvador	12 (1.3)	▼
♦♦ Kuwait	9 (1.4)	▼
<sup>1</sup> Georgia	9 (2.0)	▼
Morocco	8 (1.4)	▼
Tunisia	5 (0.9)	▼
Iran, Islamic Rep. of	4 (1.0)	▼
Qatar	2 (0.5)	▼
Yemen	1 (0.4)	▼
Austria	--	
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	49 (3.3)	▲
<sup>2 †</sup> Minnesota, US	42 (3.1)	▲
<sup>2</sup> Ontario, Canada	35 (2.8)	▲
<sup>2</sup> Alberta, Canada	33 (2.5)	▲
<sup>2</sup> British Columbia, Canada	33 (2.4)	▲
<sup>2</sup> Quebec, Canada	29 (2.6)	▲
♦♦ ‡ Dubai, UAE	12 (1.7)	▼

Percent significantly higher than international average ▲  
 Percent significantly lower than international average ▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

<sup>†</sup> Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

<sup>‡</sup> Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.



### **Fourth Grade: Achievement at the High International Benchmark**

Exhibit 2.7 describes performance at the high benchmark. Students reaching this level demonstrated some competency with many of the topics in the framework. For example, in the life science domain they demonstrated some understanding of plant and animal structure, life processes, and the environment; and in the physical science domain, some knowledge of properties of matter and physical phenomena. Students at this level also demonstrate some knowledge of the solar system, and of Earth's structure, processes, and resources, as well as beginning scientific inquiry knowledge and skills.

Exhibit 2.8 presents a multiple-choice item involving heat transfer that illustrates one type of physical science item typically answered correctly by students reaching the high benchmark. Example Item 3 requires students to recognize that, when heat is applied to one end of a metal ruler, the heat will be conducted from the heated end to the other end. Internationally, 57 percent of students, on average, were able to provide a correct response. More than 80 percent of students provided the correct answer in Japan (92%) and Singapore (88%).

Example Item 4 shown in Exhibit 2.9 is an example of a life science task likely to be completed by students reaching the high benchmark. In this constructed-response item, students were given a diagram of the life cycle of a moth and asked to label three of the four stages. Internationally on average, 33 percent of students correctly labeled the egg, caterpillar, and pupa stages of the cycle. More than 60 percent of students in the Slovak Republic (66%), Singapore (64%), and Chinese Taipei (61%) answered this item correctly, and more than 90 percent did so in Japan (93%).

## Exhibit 2.7 Description of the TIMSS 2007 High International Benchmark (550) of Science Achievement

TIMSS2007  
Science **4<sup>th</sup>**  
Grade

### High International Benchmark – 550

#### Summary

*Students can apply knowledge and understanding to explain everyday phenomena.* Students demonstrate some understanding of plant and animal structure, life processes, and the environment and some knowledge of properties of matter and physical phenomena. They show some knowledge of the solar system, and of Earth's structure, processes, and resources. Students demonstrate beginning scientific inquiry knowledge and skills, and provide brief descriptive responses combining knowledge of science concepts with information from everyday experience of physical and life processes.

In life science, students demonstrate some understanding of plant and animal structure and life processes. They recognize from a diagram the part of a flowering plant that produces seeds and that plants make food using energy from the sun. They identify fish and sea mammals by their physical features and behaviors, and distinguish between plant eaters and meat eaters by their teeth. Students demonstrate some understanding of life cycles and reproduction. For example, they can complete a diagram showing the life cycle of a moth and recognize that if the only remaining members of a species of mammal are female, they will not be able to reproduce. Students demonstrate some understanding of ecosystems and the environment. They complete a food chain and identify a predator-prey relationship, and from a picture of a pond ecosystem, identify living and non-living things. They identify human activities with positive or negative effects on the environment.

In physical science, students demonstrate some understanding of properties of matter and common physical phenomena. They explain that objects with more volume than others do not necessarily weigh more and identify examples of matter that exist as solid, liquid, or gas at room temperature. Students describe changes in matter, such as how a liquid can be turned into a solid or gas, and demonstrate a basic understanding of mixtures and solutions. For example, they identify the steps in separating a mixture of iron filings and sand, and recognize that salt water is a mixture. Students recognize that a material dissolves faster in hot water than in cold and that more of it will dissolve in hot water. In addition, they explain that small pieces of material dissolve faster than larger pieces. Students demonstrate a basic understanding of heat and conductivity, recognizing, for example, that metal conducts heat better than wood, and that ice in a closed container melts more slowly than ice

exposed to the open air. Students demonstrate awareness of magnetic and gravitational forces, and of electricity. From a diagram, students complete the labeling of the poles on magnets, and predict the movement of two magnets with labeled poles. They recognize an example of an object moving because of the force of gravity and that gravity causes objects to fall to the ground. From a diagram of an electric circuit, students state why an unbroken bulb does not light up. Students demonstrate a basic understanding of the properties of light. They recognize from a diagram the direction of a shadow and what causes a shadow to be formed.

In Earth science, students demonstrate some knowledge of the solar system, and Earth's structure, processes, and resources. They identify Earth, the Moon, and the Sun from a diagram, and, from a table showing planetary distance, identify the planet closest to the Sun and the planet most likely to have the lowest surface temperature. Students recognize that most of Earth's surface is covered by water and can describe one advantage of farming near a river. They explain that when moist air becomes very cold, water in the air may condense or freeze and early-morning moisture can be due to condensation. From tabular information about weather conditions, students identify a place where it is likely to snow. Students recognize that a mountain-side rock layer containing shellfish fossils was once part of a sea floor, and that animal fossils are the best evidence that there once were many kinds of animals on Earth that no longer exist today.

Students demonstrate beginning scientific inquiry knowledge and skills. They compare, contrast, and draw conclusions, and provide brief descriptive responses combining knowledge of science concepts with information from everyday experience of physical and life processes.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit 2.8 TIMSS 2007 High International Benchmark (550) of Science Achievement – Example Item 3

TIMSS2007 Science 4<sup>th</sup> Grade

Content Domain: Physical Science

Description: From a diagram showing a metal ruler heated at one end, recognizes the direction of heat transfer starting from the heated end.

Beans are fixed on a metal ruler with butter as shown in the figure above. The ruler is heated at one end. In which order will the beans fall off?

- 1, 2, 3, 4, 5
- Ⓐ 5, 4, 3, 2, 1
- Ⓑ 1, 3, 5, 4, 2
- Ⓓ All at the same time

Country	Percent Correct
Japan	92 (1.2)
Singapore	88 (1.4)
Hong Kong SAR	75 (2.1)
Russian Federation	70 (2.4)
Slovenia	70 (2.1)
Czech Republic	69 (2.4)
<sup>1</sup> Latvia	69 (2.3)
Hungary	67 (2.0)
<sup>1</sup> Kazakhstan	67 (2.6)
England	67 (2.3)
<sup>2</sup> † United States	66 (1.7)
‡ Netherlands	65 (2.5)
Chinese Taipei	65 (2.0)
Italy	65 (2.2)
Ukraine	65 (2.0)
Germany	64 (1.8)
Austria	63 (2.2)
Lithuania	63 (2.8)
Slovak Republic	63 (2.4)
† Denmark	62 (2.4)
Australia	59 (2.8)
† Scotland	58 (2.6)
New Zealand	58 (2.2)
<b>International Avg.</b>	<b>57 (0.4)</b>
Armenia	56 (3.2)
Sweden	55 (2.2)
Norway	53 (2.5)
<sup>1</sup> Georgia	41 (2.7)
Qatar	40 (1.5)
Colombia	39 (2.3)
El Salvador	36 (2.2)
Algeria	35 (2.3)
♦♦ Kuwait	35 (2.3)
Tunisia	31 (2.2)
Morocco	24 (3.2)
Iran, Islamic Rep. of	24 (2.2)
Yemen	20 (1.6)
<b>Benchmarking Participants</b>	
<sup>2</sup> † Minnesota, US	65 (3.8)
<sup>2</sup> Alberta, Canada	63 (2.4)
<sup>2</sup> Massachusetts, US	63 (3.6)
<sup>2</sup> Quebec, Canada	61 (2.4)
<sup>2</sup> British Columbia, Canada	61 (2.6)
<sup>2</sup> Ontario, Canada	60 (3.1)
♦♦ ‡ Dubai, UAE	52 (2.3)

Percent significantly higher than international average ●  
 Percent significantly lower than international average ▼

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Exhibit 2.9 TIMSS 2007 High International Benchmark (550) of Science Achievement – Example Item 4**

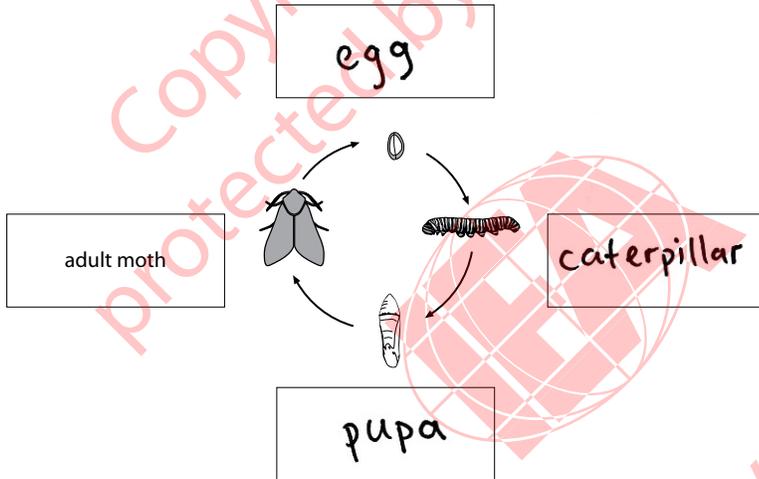
**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

**Content Domain: Life Science**

**Description: Complete a diagram showing the life cycle of a moth.**

The diagram below shows the life cycle of a moth.

Write the name of each stage in the boxes provided.  
One stage has been completed for you.



The answer shown illustrates the type of student response that was given full credit

Country	Percent Full Credit	
Japan	93 (1.3)	▲
Slovak Republic	66 (2.3)	▲
Singapore	64 (2.0)	▲
Chinese Taipei	61 (2.4)	▲
Hungary	56 (2.5)	▲
Australia	56 (2.5)	▲
Sweden	53 (2.6)	▲
New Zealand	52 (1.9)	▲
<sup>2</sup> † United States	48 (1.8)	▲
† Denmark	45 (2.6)	▲
<sup>1</sup> Lithuania	43 (2.8)	▲
Czech Republic	40 (2.7)	▲
<sup>1</sup> Latvia	39 (3.0)	▲
Germany	38 (1.8)	▲
‡ Netherlands	37 (2.6)	▲
Austria	36 (1.8)	▲
England	36 (2.2)	▲
† Scotland	33 (2.5)	▲
<b>International Avg.</b>	<b>33 (0.4)</b>	
♦ Kuwait	32 (2.5)	▼
Italy	32 (2.3)	▼
<sup>1</sup> Kazakhstan	26 (4.4)	▼
Slovenia	25 (2.0)	▼
Iran, Islamic Rep. of	23 (2.4)	▼
Russian Federation	23 (1.7)	▼
Hong Kong SAR	22 (2.1)	▼
Armenia	21 (2.4)	▼
Norway	20 (2.0)	▼
Ukraine	18 (2.0)	▼
<sup>1</sup> Georgia	16 (2.4)	▼
Qatar	7 (0.8)	▼
El Salvador	5 (0.9)	▼
Colombia	4 (1.1)	▼
Algeria	1 (0.4)	▼
Tunisia	1 (0.3)	▼
Yemen	0 (0.0)	▼
Morocco	0 (0.0)	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	59 (4.1)	▲
<sup>2</sup> Alberta, Canada	55 (2.2)	▲
<sup>2</sup> † Minnesota, US	54 (3.6)	▲
<sup>2</sup> British Columbia, Canada	49 (2.4)	▲
<sup>2</sup> Ontario, Canada	48 (3.1)	▲
<sup>2</sup> Quebec, Canada	27 (2.7)	▼
♦ ‡ Dubai, UAE	17 (2.1)	▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Percent significantly higher than international average  
▼ Percent significantly lower than international average

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

### **Fourth Grade: Achievement at the Intermediate International Benchmark**

Exhibit 2.10 shows the description of performance at the intermediate benchmark. Students reaching this benchmark applied basic knowledge and understanding to practical situations in the sciences. For example, they recognize some basic information about characteristics of living things and about human biology and health. They show some understanding of familiar physical phenomena, as well as some basic facts about the solar system and Earth's resources. They demonstrate some ability to interpret information in pictorial diagrams and apply factual knowledge to practical situations.

Example Item 5 at the intermediate benchmark addresses scientific investigation in a life science context. As displayed in Exhibit 2.11, students were shown a picture of two sunflower plants grown in similar pots of soil from seeds from the same plant. One plant was larger and healthier-looking than the other. To earn credit on this item, students had to describe one way that the larger plant may have been treated differently from the smaller one. On average across countries, almost two-thirds of students (63%) explained correctly that, for example, it might have been given more light or water. Eighty percent or more of students answered correctly in Singapore, Lithuania, the Netherlands, Sweden, Australia, England, Slovenia, Hong Kong SAR, and Austria. For the benchmarking participants, the two U.S. states and four Canadian provinces also achieved at this level.

Example Item 6 presented in Exhibit 2.12 is a physical science problem set in an everyday context likely to be answered correctly by students reaching the intermediate benchmark. Illustrated by a diagram, the item asked students to explain why, when a person blows through a straw into a glass of water, bubbles form and rise to the surface. Students earned credit on this constructed-response item by explaining that the bubbles are formed from air, and rise to the surface of the water because air is lighter than water. Approximately half the students (51%), internationally on average, were able to provide an acceptable explanation, with the highest performance in the Russian Federation (79%), Chinese Taipei (77%), Denmark (74%), Singapore (72%), Kazakhstan (71%), and the Czech Republic (70%).

## Exhibit 2.10 Description of the TIMSS 2007 Intermediate International Benchmark (475) of Science Achievement

TIMSS2007  
Science **4**<sup>th</sup>  
Grade

### Intermediate International Benchmark – 475

#### Summary

*Students can apply basic knowledge and understanding to practical situations in the sciences. Students recognize some basic information related to characteristics of living things and their interaction with the environment, and show some understanding of human biology and health. They also show some understanding of familiar physical phenomena. Students know some basic facts about the solar system and have a developing understanding of Earth's resources. They demonstrate some ability to interpret information in pictorial diagrams and apply factual knowledge to practical situations.*

In life science, students demonstrate knowledge of some basic facts related to human biology and health. For example, they recognize the stomach as an organ where digestion takes place, and that the body needs more oxygen during exercise. Students recognize that fruits and vegetables are the best source of vitamins and minerals, describe one way people can protect their teeth from decay in addition to brushing, and how influenza can be passed from person to person. Students demonstrate some knowledge of the characteristics of living things and their interaction with the environment. For example, from pictures of animals, students pair each animal with its distinguishing biological characteristics (skeleton, milk production, number of legs). They recognize the foot structure that belongs to a pond-dwelling bird and that fat layers help keep a walrus warm. Students interpret a simple food chain diagram and, from pictorial diagrams, recognize a bird likely to eat mammals. They recognize that trees make food using sunlight, and in the context of an investigation of plant growth, describe a treatment that can cause one plant to grow better than another. Students show some understanding of life cycles of organisms, recognizing that tadpoles hatch from frogs' eggs and that snakes shed their outer covering as they grow. They also recognize that the function of seeds is to produce new plants.

In physical science, students show some understanding of familiar physical phenomena. They recognize that an iron nail can complete an

electrical circuit and allow a light bulb to glow. From a diagram showing a person blowing into water using a straw, students explain why bubbles rise to the top, and they recognize that a floating body is lighter than bodies of the same shape and size that sink. They can infer the color of a white shirt under a blue light. Students apply factual knowledge to some practical situations. For example, they identify electricity as the energy source for three household objects shown in a diagram and can state two uses of electricity in daily life. Students can state one way that water in either ice or liquid form is used by humans and can identify materials that burn.

In Earth science, students know some basic facts about the solar system. For example, they name two planets other than Earth that orbit the Sun and state one difference between the Sun and the Moon. Also, they can state one difference in weather between two seasons and recognize the effect of wind strength on a ribbon attached to a pole. Students are developing understanding of Earth's resources. For example, they can state two different uses humans have for wood and explain why people should not drink water directly from oceans and seas.

Students demonstrate some ability to interpret information in pictorial diagrams, apply factual knowledge to everyday situations, and provide simple explanations for physical phenomena.

Exhibit 2.11 TIMSS 2007 Intermediate International Benchmark (475) of Science Achievement – Example Item 5

TIMSS 2007 Science 4<sup>th</sup> Grade

Content Domain: Life Science

Description: In the context of an investigation of plant growth, describes a treatment that can cause one plant to grow better than another.

Carl and Jan each had a sunflower seed taken from the same plant. They took two identical pots and put potting soil in each. They then planted one seed in each pot. Carl looked after one pot in his home, and Jan looked after the other pot in her home.

After some time, they compared the plants and saw that there was a large difference in their growth, as shown in the pictures below.



Carl's plant

Jan's plant

Describe one way in which Carl may have treated his plant differently from the way Jan treated hers.

*Carl might have given it more light and water.*

The answer shown illustrates the type of student response that was given full credit

Country	Percent Full Credit	
Singapore	85 (1.8)	⬤
<sup>1</sup> Lithuania	85 (1.7)	⬤
<sup>‡</sup> Netherlands	84 (2.0)	⬤
Sweden	84 (1.9)	⬤
Australia	83 (2.3)	⬤
England	81 (1.8)	⬤
Slovenia	81 (1.6)	⬤
Hong Kong SAR	81 (2.0)	⬤
Austria	80 (1.9)	⬤
<sup>1</sup> Latvia	79 (2.4)	⬤
Germany	79 (1.6)	⬤
<sup>†</sup> Denmark	79 (2.3)	⬤
Italy	79 (1.7)	⬤
Norway	78 (2.0)	⬤
<sup>2 †</sup> United States	78 (1.2)	⬤
New Zealand	77 (1.6)	⬤
<sup>†</sup> Scotland	74 (2.0)	⬤
Chinese Taipei	73 (2.1)	⬤
Hungary	71 (2.9)	⬤
Czech Republic	71 (2.3)	⬤
Russian Federation	69 (2.4)	⬤
Ukraine	66 (2.3)	⬤
<b>International Avg.</b>	<b>63 (0.4)</b>	
<sup>1</sup> Kazakhstan	62 (3.0)	⬤
Colombia	60 (3.1)	⬤
Iran, Islamic Rep. of	59 (2.3)	⬇
Armenia	59 (2.6)	⬇
Slovak Republic	58 (2.4)	⬇
Japan	49 (2.3)	⬇
El Salvador	47 (2.3)	⬇
<sup>1</sup> Georgia	40 (2.5)	⬇
Algeria	37 (2.8)	⬇
Tunisia	30 (2.2)	⬇
Morocco	23 (3.4)	⬇
<sup>**</sup> Kuwait	22 (1.8)	⬇
Qatar	16 (1.0)	⬇
Yemen	7 (1.2)	⬇
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	88 (1.7)	⬤
<sup>2</sup> Quebec, Canada	84 (2.0)	⬤
<sup>2</sup> Ontario, Canada	84 (2.3)	⬤
<sup>2</sup> Alberta, Canada	83 (2.1)	⬤
<sup>2 †</sup> Minnesota, US	83 (3.1)	⬤
<sup>2</sup> British Columbia, Canada	81 (1.8)	⬤
<sup>** ‡</sup> Dubai, UAE	56 (3.2)	⬇

Percent significantly higher than international average ⬤  
 Percent significantly lower than international average ⬇

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

<sup>†</sup> Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>‡</sup> Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
<sup>\*\*</sup> Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

**Exhibit 2.12 TIMSS 2007 Intermediate International Benchmark (475) of Science Achievement – Example Item 6**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Content Domain: Physical Science

Description: From a diagram showing a person blowing into water using a straw, explains why bubbles rise to the top.



When you blow into water using a straw, bubbles are formed and rise to the top. Why do the bubbles rise in water?

They rise because they are made from air which is lighter than water.

The answer shown illustrates the type of student response that was given full credit

Country	Percent Full Credit	
Russian Federation	79 (2.3)	▲
Chinese Taipei	77 (1.7)	▲
† Denmark	74 (2.3)	▲
Singapore	72 (1.9)	▲
<sup>1</sup> Kazakhstan	71 (3.1)	▲
Czech Republic	70 (2.2)	▲
Australia	67 (2.8)	▲
Slovenia	67 (2.3)	▲
England	66 (2.3)	▲
Austria	66 (2.0)	▲
Ukraine	65 (2.0)	▲
Japan	65 (2.0)	▲
New Zealand	64 (1.8)	▲
Slovak Republic	64 (2.5)	▲
Norway	63 (2.7)	▲
<sup>2</sup> † United States	61 (1.7)	▲
<sup>1</sup> Lithuania	61 (2.4)	▲
‡ Netherlands	59 (2.6)	▲
Hungary	59 (2.2)	▲
† Scotland	54 (2.4)	▲
Germany	52 (2.0)	▲
<b>International Avg.</b>	<b>51 (0.4)</b>	
Sweden	50 (2.3)	▲
Armenia	49 (3.2)	▲
Hong Kong SAR	48 (2.4)	▲
Italy	47 (2.2)	▼
Iran, Islamic Rep. of	31 (2.4)	▼
Algeria	29 (2.1)	▼
Colombia	28 (2.6)	▼
El Salvador	27 (1.7)	▼
<sup>1</sup> Georgia	25 (2.1)	▼
Morocco	23 (2.5)	▼
♦♦ Kuwait	23 (2.0)	▼
Qatar	21 (1.2)	▼
Yemen	15 (1.5)	▼
Tunisia	11 (1.5)	▼
<sup>1</sup> Latvia	--	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> Ontario, Canada	65 (3.0)	▲
<sup>2</sup> British Columbia, Canada	65 (2.5)	▲
<sup>2</sup> Alberta, Canada	65 (2.7)	▲
<sup>2</sup> † Minnesota, US	59 (3.7)	▲
<sup>2</sup> Massachusetts, US	59 (3.8)	▲
<sup>2</sup> Quebec, Canada	58 (2.5)	▲
♦♦ ‡ Dubai, UAE	43 (2.1)	▼

 Percent significantly higher than international average ▲  
 Percent significantly lower than international average ▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (–) indicates comparable data are not available.



### **Fourth Grade: Achievement at the Low International Benchmark**

Exhibit 2.13 presents the description of student achievement at the low benchmark. At this benchmark students demonstrated some elementary knowledge of the life and physical sciences, including simple facts related to human health and the behavioral and physical characteristics of animals. They recognized some properties of matter and demonstrated a beginning understanding of forces. They could interpret labeled pictures and simple diagrams, complete simple tables, and provide short written responses to questions requiring factual information about the sciences.

Example Item 7 (Exhibit 2.14) is a multiple-choice item from the life science domain that characterizes student performance at the low international benchmark. Given a pictorial representation of four animals, students were required to identify the animal most likely to live in a desert. On average internationally, 68% of fourth grade students correctly recognized the lizard as the most likely desert dweller. More than 90 percent of students in the United States recognized the correct answer.

Example Item 8 presented in Exhibit 2.15 assesses a topic within the physical science domain that measures students' ability to compare and classify objects and materials on the basis of physical properties (e.g., weight/mass, shape, volume, color, hardness, texture, odor, taste, magnetic attraction). This multiple-choice item presents three objects of the same size and shape and requires students to recognize that the object made of iron is the heaviest. With an international average of 80 percent, this item was relatively easy for students in many countries. In 25 countries, the two U.S. states, and the Canadian province of Quebec, 80 percent or more of the students answered correctly.

## Exhibit 2.13 Description of the TIMSS 2007 Low International Benchmark (400) of Science Achievement

TIMSS2007  
Science **4**<sup>th</sup>  
Grade

### Low International Benchmark – 400

#### Summary

*Students have some elementary knowledge of life science and physical science. Students can demonstrate knowledge of some simple facts related to human health and the behavioral and physical characteristics of animals. They recognize some properties of matter, and demonstrate a beginning understanding of forces. Students interpret labeled pictures and simple diagrams, complete simple tables, and provide short written responses to questions requiring factual information.*

In life science, students demonstrate knowledge of some simple facts related to human health. They state one effect the Sun can have on unprotected skin and recognize that the lung is the body organ most harmed by smoking. They also demonstrate some knowledge of behavioral and physical characteristics of animals. They recognize that birds sit on their eggs to keep them warm and recognize wings as being common to birds, bats, and butterflies. Students exhibit a rudimentary understanding of ecosystems. For example, they identify an animal that lives in the desert, recognize a wolf as a predator, and match animals to their ecosystems.

In physical science, students are familiar with some properties of matter. For example, they recognize that ice is the solid form of water, that iron nails rust,

and that iron objects are likely to be heavier than wood or Styrofoam objects of the same size and shape. Students have a beginning understanding of forces. From a diagram, they identify the direction of the force of Earth's gravity and identify wind as the cause of movement in a sail boat. Students recognize that the vibrations that produce sound in a guitar start with the strings and, from a diagram, recognize the thermometer reading showing the hottest water.

Students interpret labeled pictures and simple diagrams (e.g., forces on a block, thermometer readings), complete simple tables (match animals to ecosystems), and provide short written responses to questions requiring factual information (e.g., state an effect the Sun can have on unprotected skin).

Exhibit 2.14 TIMSS 2007 Low International Benchmark (400) of Science Achievement – Example Item 7

TIMSS2007 Science 4<sup>th</sup> Grade

Content Domain: Life Science

Description: Recognizes from diagrams of animals which is most likely to live in a desert.

Which of these animals is most likely to live in the desert?

The image shows four animal illustrations labeled A, B, C, and D. A is a bear, B is a crab, C is a lizard, and D is a tiger. A large red watermark 'Copyright by IEA' is overlaid on the image.

Country	Percent Correct	
<sup>2</sup> † United States	92 (0.8)	⬆
Russian Federation	89 (2.2)	⬆
Australia	88 (1.8)	⬆
<sup>1</sup> Kazakhstan	86 (2.3)	⬆
England	84 (1.9)	⬆
† Denmark	84 (2.1)	⬆
‡ Netherlands	83 (1.9)	⬆
New Zealand	81 (1.4)	⬆
♣ Kuwait	80 (1.8)	⬆
Sweden	80 (1.7)	⬆
Germany	78 (1.4)	⬆
Austria	78 (1.7)	⬆
Norway	77 (2.3)	⬆
† Scotland	77 (1.9)	⬆
Armenia	76 (2.4)	⬆
Hong Kong SAR	74 (1.8)	⬆
Singapore	71 (1.8)	⬆
Ukraine	71 (2.2)	⬆
Lithuania	70 (2.2)	⬆
Hungary	69 (2.4)	⬆
Chinese Taipei	69 (2.1)	⬆
<b>International Avg.</b>	<b>68 (0.4)</b>	
<sup>1</sup> Latvia	68 (2.8)	⬆
Iran, Islamic Rep. of	67 (2.3)	⬆
Japan	66 (2.1)	⬆
Qatar	64 (1.5)	⬇
<sup>1</sup> Georgia	62 (3.1)	⬇
Slovenia	61 (2.0)	⬇
Italy	61 (2.4)	⬇
El Salvador	53 (2.4)	⬇
Czech Republic	53 (2.8)	⬇
Algeria	49 (3.2)	⬇
Slovak Republic	46 (2.4)	⬇
Morocco	43 (2.7)	⬇
Tunisia	42 (2.5)	⬇
Colombia	38 (2.4)	⬇
Yemen	28 (2.1)	⬇
<b>Benchmarking Participants</b>		
<sup>2</sup> † Minnesota, US	89 (2.6)	⬆
<sup>2</sup> Massachusetts, US	88 (1.4)	⬆
<sup>2</sup> Alberta, Canada	84 (1.7)	⬆
<sup>2</sup> Quebec, Canada	84 (2.0)	⬆
<sup>2</sup> British Columbia, Canada	82 (1.4)	⬆
<sup>2</sup> Ontario, Canada	82 (2.3)	⬆
♣ ‡ Dubai, UAE	74 (2.4)	⬆

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Percent significantly higher than international average ⬆  
 Percent significantly lower than international average ⬇

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 1 National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

2 National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
 ♣ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 () Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

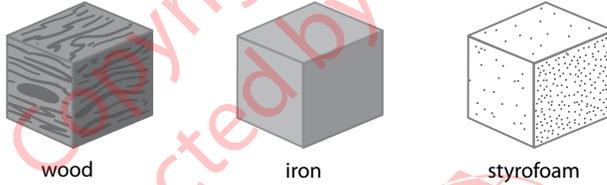
**Exhibit 2.15 TIMSS 2007 Low International Benchmark (400) of Science Achievement – Example Item 8**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

**Content Domain: Physical Science**

**Description: Recognizes that an iron object is most likely to be heavier than a wood or styrofoam object of the same shape and size.**

The three objects below are the same shape and size.



Which statement about the weight of the objects is most likely to be correct?

- (A) The wood object is the heaviest.
- (B) The iron object is the heaviest.
- (C) The styrofoam object is the heaviest.
- (D) All three objects weigh the same.

Country	Percent Correct	
Japan	94 (1.2)	▲
Russian Federation	92 (1.3)	▲
Chinese Taipei	91 (1.4)	▲
Hong Kong SAR	90 (1.4)	▲
Germany	90 (1.2)	▲
Slovenia	89 (1.2)	▲
England	89 (1.6)	▲
Hungary	89 (1.4)	▲
<sup>1</sup> Kazakhstan	89 (2.5)	▲
Italy	88 (1.4)	▲
Austria	88 (1.5)	▲
Singapore	88 (1.4)	▲
Czech Republic	87 (1.7)	▲
‡ Netherlands	86 (1.8)	▲
<sup>1</sup> Latvia	86 (2.2)	▲
Slovak Republic	85 (1.4)	▲
Sweden	84 (1.8)	▲
<sup>1</sup> Georgia	84 (2.0)	▲
† Denmark	84 (1.9)	▲
<sup>1</sup> Lithuania	83 (2.1)	▲
Ukraine	82 (2.2)	▲
† Scotland	82 (1.8)	▲
Norway	81 (1.7)	▲
<sup>2</sup> † United States	80 (1.1)	▲
El Salvador	80 (1.9)	▲
<b>International Avg.</b>	<b>80 (0.3)</b>	
Colombia	77 (2.4)	▼
Armenia	69 (2.0)	▼
♦♦ Kuwait	69 (2.3)	▼
Morocco	69 (2.4)	▼
Iran, Islamic Rep. of	68 (2.5)	▼
Australia	68 (3.1)	▼
New Zealand	67 (2.3)	▼
Algeria	66 (3.3)	▼
Tunisia	60 (2.5)	▼
Yemen	48 (2.6)	▼
Qatar	47 (1.6)	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	86 (2.2)	▲
<sup>2</sup> † Minnesota, US	85 (3.3)	▲
<sup>2</sup> Quebec, Canada	84 (1.8)	▲
<sup>2</sup> Ontario, Canada	79 (2.8)	▲
<sup>2</sup> Alberta, Canada	79 (2.0)	▲
<sup>2</sup> British Columbia, Canada	78 (2.3)	▲
♦♦ ‡ Dubai, UAE	68 (1.9)	▼

▲ Percent significantly higher than international average  
▼ Percent significantly lower than international average

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

### **Eighth Grade: Achievement at the Advanced International Benchmark**

At the eighth grade, TIMSS 2007 assessed four content domains with each given similar weight—biology (35%), chemistry (20%), physics (25%), and earth science (20%). According to the TIMSS 2007 Science Framework, in biology, students should be able to classify organisms into the major taxonomic groups, identify cell structures and their function, distinguish between growth and development in different organisms, and show some understanding of diversity, adaptation, and natural selection among organisms. By the eighth grade, students are expected to have an understanding of the interdependence of living organisms and their relationship to the physical environment, and demonstrate knowledge of human health, nutrition, and disease. In chemistry, students should be able to classify substances on the basis of characteristic physical properties and have a clear understanding of the properties of matter. Students should recognize the differences between physical and chemical changes and recognize the conservation of matter during these changes. In physics, students are expected to be able to describe processes involved in changes of state and apply knowledge of energy transformations, heat, and temperature. They should know basic properties of light and sound, understand the relationship between current and voltage in electrical circuits, and describe properties and forces of permanent magnets and electromagnets. Students are expected to have a quantitative knowledge of mechanics, as well as a commonsense understanding of density and pressure as they relate to familiar physical phenomena. In the earth science domain, eighth grade students are expected to demonstrate knowledge of the structure and physical characteristics of Earth's crust, mantle, and core, and apply the concept of cycles and patterns to describe Earth's processes, including the rock and water cycles. Students should have an understanding of Earth's resources and their use and conservation, and demonstrate knowledge of the solar system in terms of the relative distances, sizes, and motions of the sun, the planets, and their moons, and of how phenomena on Earth relate to the motion of bodies in the solar system. Within each content domain, students needed to draw on a range of

cognitive skills and go beyond the solution of routine problems to encompass unfamiliar situations, complex contexts, and multi-step problems.

Exhibit 2.16 describes performance at the Advanced International Benchmark. Students achieving at or above the advanced benchmark demonstrated a grasp of some complex and abstract science concepts. For example, they have an understanding of the complexity of living organisms and how they relate to their environment, and show knowledge of the structure of matter and of physical and chemical properties and changes. They show understanding of the properties of magnets, sound, and light. Students apply knowledge and understanding of the solar system and Earth's features and processes, and of major environmental issues. They understand some fundamentals of scientific investigation, can apply basic physical principles to solve quantitative problems, and can provide written explanations to communicate scientific knowledge.

Exhibit 2.17 shows the type of chemistry item likely to be answered correctly by students reaching the Advanced International Benchmark. In Example Item 1, students were told that two substances together had a mass of 110 grams, and asked to predict the mass of a new substance formed by combining the two original substances and explain their reasoning. On average, 23 percent of the students across countries received full credit by applying knowledge of conservation of mass in a chemical reaction to explain that the mass of the new substance also will be 100 grams. More than half the students in Japan (65%), Korea (51%), and Chinese Taipei (51%) earned full credit on this item.

Example Item 2 (Exhibit 2.18) from the physics domain assesses students understanding of the properties of magnets and, in particular, magnetic polarity. Given a diagram depicting three magnets, two of which are touching and a third which is separated from the touching pair, students were asked to provide two explanations: firstly, why the touching magnets touch, and secondly, why the separated pair remain separated. To earn full credit, students had to apply knowledge of the polarity of magnets (i.e., that opposite poles attract and like poles repel) to explain that the touching magnets had

facing north and south poles, while the separated magnets either had facing south poles or facing north poles. Internationally on average, 23 percent of the eighth grade students earned full credit, while more than half the students did so in Japan (71%), Singapore (61%), and Korea (52%).

## Exhibit 2.16 Description of the TIMSS 2007 Advanced International Benchmark (625) of Science Achievement

TIMSS2007  
Science **8**<sup>th</sup>  
Grade

### Advanced International Benchmark – 625

#### Summary

*Students can demonstrate a grasp of some complex and abstract concepts in biology, chemistry, physics, and Earth science. They have an understanding of the complexity of living organisms and how they relate to their environment. They show understanding of the properties of magnets, sound, and light, as well as demonstrating understanding of structure of matter and physical and chemical properties and changes. Students apply knowledge of the solar system and of Earth's features and processes, and apply understanding of major environmental issues. They understand some fundamentals of scientific investigation and can apply basic physical principles to solve some quantitative problems. They can provide written explanations to communicate scientific knowledge.*

In biology, students demonstrate understanding of the complexity of living organisms and how they relate to their environment. They recognize a function of the cell membrane and know the purpose of cellular respiration. Students recognize an organism in which oxygen and carbon dioxide are exchanged between air and blood through the skin, and recognize an organ in a frog that has a function similar to that of lungs. They also identify a function shared by lungs, skin, and kidneys. Students identify a developing stage and a growth stage in the life cycle of an organism and describe what takes place during each stage. They recognize that organisms in an ecosystem that are producers use energy from the sun to make food, and complete a diagram to show the direction of energy flow in a food web. Students demonstrate some appreciation of the impact of human population growth on the environment and know some animal adaptations needed for survival, including physical and behavioral characteristics.

In chemistry, students demonstrate an understanding of the structure of matter as well as of physical and chemical properties and changes. They recognize the particulate structure of matter (molecules, atoms, subatomic particles), and identify a model of subatomic particles in an atom and a representation of the structure of water molecules. Students apply knowledge of density to explain why oil floats on water and to explain that the addition of salt to water produces a solution of greater density. They apply knowledge of expansion of water during freezing and recognize that electrical conductivity may be used to classify materials. Students show some understanding of chemical change. For example, they describe what might be observed as a chemical reaction takes place, identify oxygen as the gas that causes rust, and state that litmus paper changing from blue to pink is a sign that a chemical change took place. They apply knowledge of conservation of mass during neutralization and other chemical reactions.

In physics, students demonstrate a sound understanding of states of matter and phase change. For example, they explain that the temperature of water does not exceed its boiling point despite the addition of heat and explain why the mass of water remains unchanged after freezing. Students demonstrate a good understanding of the properties of magnets. For example, they describe how to use a magnet to determine if a metal bar is also a magnet, and apply knowledge of magnetic poles to explain why some magnets will touch while others remain separated. Students apply scientific knowledge of gravity, sound and light in everyday situations. They recognize that gravity acts on a person regardless of position and movement, predict the effect of removing air on the propagation of sound, and recognize that color comes from light waves reflected by an object.

In Earth science, students apply knowledge of the solar system and of Earth's features and processes. They relate the changing seasons to the tilt in Earth's axis as it orbits the Sun and the phases of the Moon to its motion around Earth. Students interpret contour maps and diagrams showing weather conditions and describe changes in atmospheric conditions that occur with increasing elevation. Students demonstrate understanding of major environmental issues such as causes of acid rain and global warming.

Students have some understanding of fundamentals of scientific investigation. In an experimental situation, they recognize which variables to control and can design an investigation to determine, for example, the effect of fertilizer on plant growth. They apply basic physical principles to solve some quantitative problems and develop explanations involving abstract concepts. They can compare information from several sources, combine information to predict and draw conclusions, and interpret information in diagrams, maps, graphs, and tables to solve problems. They can provide written explanations to communicate scientific knowledge.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



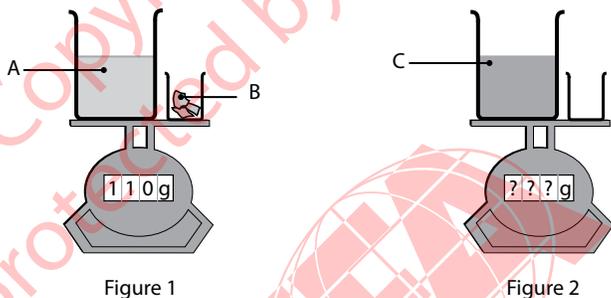
Exhibit 2.17 TIMSS 2007 Advanced International Benchmark (625) of Science Achievement – Example Item 1

TIMSS 2007 Science 8<sup>th</sup> Grade

Content Domain: Chemistry

Description: Applies knowledge of conservation of mass during a chemical reaction to explain what happens to mass when a new substance is formed.

The mass of substances A and B are measured on a balance, as shown in Figure 1. Substance B is put into the beaker and substance C is formed. The empty beaker is put back on the balance, as shown in Figure 2.



The scale in Figure 1 shows a mass of 110 grams.

What will it show in Figure 2?

(Check one box.)

- More than 110 grams
- 110 grams
- Less than 110 grams

Explain your answer.

The mass will be the same because the mass of reactants equals the mass of products.

The answer shown illustrates the type of student response that was given full credit

Country	Percent Full Credit	
Japan	65 (2.1)	▲
Korea, Rep. of	51 (2.0)	▲
Chinese Taipei	51 (2.3)	▲
Italy	46 (2.4)	▲
Czech Republic	43 (2.1)	▲
Slovenia	39 (2.4)	▲
Hungary	39 (2.4)	▲
Russian Federation	39 (2.5)	▲
Sweden	38 (2.0)	▲
Singapore	37 (1.9)	▲
<sup>1</sup> Lithuania	37 (2.1)	▲
<sup>3</sup> Israel	33 (2.1)	▲
† Hong Kong SAR	30 (2.3)	▲
Ukraine	29 (2.4)	▲
† England	28 (2.1)	▲
Armenia	28 (2.5)	▲
Malta	27 (1.5)	▲
Australia	25 (2.4)	▲
Norway	25 (1.9)	▲
Thailand	25 (1.7)	▲
<sup>2</sup> † United States	24 (1.6)	▲
Cyprus	24 (1.6)	▲
<b>International Avg.</b>	<b>23 (0.3)</b>	
† Scotland	22 (1.9)	▲
Tunisia	22 (1.9)	▲
Romania	22 (2.4)	▲
<sup>1</sup> <sup>2</sup> Serbia	20 (2.1)	▲
Jordan	19 (2.0)	▲
<sup>3</sup> Bulgaria	19 (2.4)	▲
Bahrain	18 (1.6)	▼
Lebanon	18 (2.3)	▼
Bosnia and Herzegovina	17 (2.1)	▼
Colombia	16 (1.6)	▼
Turkey	16 (1.6)	▼
Malaysia	14 (1.7)	▼
Iran, Islamic Rep. of	13 (1.5)	▼
Syrian Arab Republic	13 (1.5)	▼
Palestinian Nat'l Auth.	11 (1.5)	▼
El Salvador	9 (1.3)	▼
Oman	9 (1.4)	▼
Egypt	8 (1.2)	▼
Algeria	7 (1.0)	▼
♦ Kuwait	7 (1.2)	▼
Indonesia	6 (1.0)	▼
Saudi Arabia	5 (1.0)	▼
<sup>1</sup> Georgia	4 (0.8)	▼
Qatar	3 (0.6)	▼
Ghana	3 (0.7)	▼
Botswana	1 (0.4)	▼
‡ Morocco	15 (2.0)	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	44 (3.3)	▲
<sup>2</sup> Ontario, Canada	39 (3.5)	▲
<sup>3</sup> Quebec, Canada	36 (2.8)	▲
<sup>2</sup> † Minnesota, US	33 (2.9)	▲
<sup>3</sup> British Columbia, Canada	32 (2.3)	▲
Basque Country, Spain	22 (2.3)	▲
♦ ‡ Dubai, UAE	19 (2.3)	▲

Percent significantly higher than international average ▲  
 Percent significantly lower than international average ▼

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

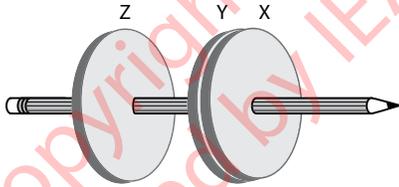
<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).  
 ♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

**Exhibit 2.18 TIMSS 2007 Advanced International Benchmark (625) of Science Achievement – Example Item 2**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**Content Domain: Physics**

**Description:** From a diagram showing three magnets, explain why two of them are touching and why the third remains separated.



The diagram shows what happens to three magnets when they are placed close together on a pencil.

Magnets X and Y move until they touch each other, but magnets Y and Z remain separated.

1. Explain why magnets X and Y touch each other.

*Because north and south poles were facing each other.*

2. Explain why magnets Y and Z remain separated.

*Because they may have had south and south or north and north facing each other.*

The answer shown illustrates the type of student response that was given full credit

Country	Percent Full Credit
Japan	71 (2.0) ▲
Singapore	61 (1.8) ▲
Korea, Rep. of	52 (2.3) ▲
Hungary	47 (2.6) ▲
† England	46 (2.5) ▲
Malaysia	46 (2.5) ▲
Czech Republic	45 (2.7) ▲
Romania	43 (2.7) ▲
<sup>1 2</sup> Serbia	43 (3.0) ▲
Iran, Islamic Rep. of	40 (2.8) ▲
Italy	36 (2.3) ▲
Russian Federation	34 (2.7) ▲
Bosnia and Herzegovina	28 (2.3) ▲
Egypt	27 (2.0) ▲
Bahrain	26 (2.1) ▲
<sup>3</sup> Bulgaria	24 (2.5) ▲
Tunisia	24 (1.7) ▲
Australia	23 (2.2) ▲
Sweden	23 (2.1) ▲
Thailand	23 (1.9) ▲
International Avg.	23 (0.3)
Indonesia	23 (1.9) ▲
Ukraine	21 (2.0) ▲
Jordan	20 (2.3) ▲
† Hong Kong SAR	20 (2.1) ▲
♦♦ Kuwait	19 (1.8) ▼
Turkey	17 (1.9) ▼
<sup>2</sup> † United States	16 (1.6) ▼
Oman	16 (1.7) ▼
Botswana	15 (1.7) ▼
Armenia	15 (1.5) ▼
Malta	14 (1.0) ▼
Norway	14 (1.8) ▼
Palestinian Nat'l Auth.	13 (1.9) ▼
† Scotland	11 (1.8) ▼
<sup>3</sup> Israel	10 (1.5) ▼
Slovenia	10 (1.3) ▼
Qatar	9 (0.9) ▼
Ghana	9 (1.2) ▼
<sup>1</sup> Lithuania	8 (1.2) ▼
Saudi Arabia	8 (1.0) ▼
Syrian Arab Republic	7 (1.1) ▼
Lebanon	6 (1.4) ▼
Colombia	6 (1.1) ▼
<sup>1</sup> Georgia	5 (1.4) ▼
El Salvador	3 (0.6) ▼
Cyprus	2 (0.6) ▼
Algeria	2 (0.6) ▼
Chinese Taipei	– –
‡ Morocco	15 (2.3) ▼
<b>Benchmarking Participants</b>	
<sup>2</sup> Massachusetts, US	28 (2.9) ▲
<sup>2</sup> Ontario, Canada	27 (2.7) ▲
♦♦ ‡ Dubai, UAE	26 (2.5) ▲
Basque Country, Spain	21 (2.3) ▲
<sup>3</sup> British Columbia, Canada	16 (1.8) ▼
<sup>2</sup> † Minnesota, US	13 (2.3) ▼
<sup>3</sup> Quebec, Canada	11 (1.1) ▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

▲ Percent significantly higher than international average  
 ▼ Percent significantly lower than international average  
<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).  
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (–) indicates comparable data are not available.

### **Eighth Grade: Achievement at the High International Benchmark**

Exhibit 2.19 describes performance at the High International Benchmark. Students reaching the high benchmark demonstrated conceptual understanding of some science cycles, systems, and principles, and were able to show understanding of some cell processes, human biology and health, and the interrelationship of plants and animals in ecosystems. They demonstrated elementary knowledge of light, sound, heat, and forces, and showed some evidence of understanding the structure of matter, and chemical and physical properties and changes. Students performing at this level showed some understanding of the solar system and Earth's processes and resources, and some basic understanding of major environmental issues. Students demonstrated some scientific inquiry skills, and could combine information to draw conclusions, interpret tabular and graphical information, and provide short explanations conveying scientific knowledge.

Example Item 3 in Exhibit 2.20 shows the type of physics item likely to be answered correctly by students reaching the high benchmark. In the context of an investigation into thermal conductivity, this multiple-choice question asks students to choose among glass, wood, metal, and plastic as the best conductor of heat. On average, internationally, 47 percent of students correctly chose metal as the best conductor. More than 70 percent of students answered correctly in Singapore (79%) and in Chinese Taipei (75%).

Exhibit 2.21 presents an item from the biology domain exemplifying the high benchmark. Example Item 4 asks students to name two factors that are needed for photosynthesis in addition to chlorophyll. Students needed to mention carbon dioxide and sunlight to receive full credit, which was achieved by 40 percent of students, on average internationally. The highest percentages of students answering correctly were in Hong Kong SAR (81%), Singapore (76%), and Japan (75%).

## Exhibit 2.19: Description of the TIMSS 2007 High International Benchmark (550) of Science Achievement

### High International Benchmark – 550

#### Summary

*Students can demonstrate conceptual understanding of some science cycles, systems, and principles. They have some understanding of biological concepts including cell processes, human biology and health, and the interrelationship of plants and animals in ecosystems. They apply knowledge to situations related to light and sound, demonstrate elementary knowledge of heat and forces, and show some evidence of understanding the structure of matter, and chemical and physical properties and changes. They demonstrate some understanding of the solar system, Earth's processes and resources, and some basic understanding of major environmental issues. Students demonstrate some scientific inquiry skills. They combine information to draw conclusions, interpret tabular and graphical information, and provide short explanations conveying scientific knowledge.*

In biology, students demonstrate some understanding of cells and cell processes. They recognize the hierarchy of organization in living organisms and can state one structure that is found in plant cells but not in animal cells. They have an understanding of photosynthesis, and can recognize the main function of chlorophyll and indicate which gas is released into the air during photosynthesis and which gas is removed. Students demonstrate some understanding of human biology and health. For example, they recognize a description of digestion, and identify which food source contains the highest percentage of protein. Students also have some understanding of reproduction and heredity. For example, they state one function of the uterus and recognize that one can determine whether two people are related by comparing genes. Students show an understanding of interrelations of plants and animals in ecosystems. They explain why birds of prey cannot survive in an environment without plants, and that camouflage helps animals survive. They recognize that the loss of a food supply is a likely cause of a drop in population size and can complete the food web of an ocean ecosystem based on information in a table. They apply knowledge of competition to explain why weeds should be removed from crop fields.

In chemistry, students show some evidence of understanding the structure of matter, and chemical and physical properties and changes. Given the chemical formula for sulfuric acid, students complete a table to show the number of atoms of each element in a molecule of the acid. They interpret data in a table of physical properties to identify iron, water, and oxygen, and recognize a graph that shows the effect of temperature on the solubility of sugar in water. In the context of an investigation, students identify which of two solutions is more dilute and justify the selection. Students recognize that oxygen is necessary for burning, and explain what causes a balloon to inflate when sodium bicarbonate in the balloon is mixed with vinegar. Students work through multi-step investigations of density to interpret the results

of various methods of measuring mass and explain the differences, select information from a table, and use this information to calculate mass and draw a conclusion.

In physics, students apply knowledge to situations related to light and sound. For example, they recognize the pathway of light for an object to be seen and explain why lightning is seen before thunder is heard. They recognize how sound waves with large amplitude differ in energy and loudness from sound waves with smaller amplitude. Students demonstrate elementary knowledge of heat and forces. They recognize that conduction is a process by which heat is transferred along a metal rod; that metal conducts heat faster than glass, wood, or plastic; and that the thermal expansion of alcohol is greater than that of glass. They state the forces acting on students sitting on a wall and recognize an object likely to be used as a lever.

In Earth science, students demonstrate some understanding of the solar system and Earth's processes. Students recognize the main difference between planets and moons, and the definition of an Earth year. They explain why light from the Moon reaches Earth in less time than light from the Sun, and recognize the gravitational pull of the moon on Earth as the major cause of tides. Students recognize the Sun as the source of energy for the water cycle, and explain how water evaporated from the sea ends up as rain on land. They describe what causes earthquakes. Students demonstrate some understanding of Earth's resources and major environmental issues. They describe how soil is formed and describe how trees can reduce soil erosion. They recognize that increased carbon dioxide in the atmosphere may lead to global warming.

Students demonstrate some scientific inquiry skills. They combine information to draw conclusions; interpret information in various types of diagrams, contour maps, graphs, and tables; and provide short explanations conveying scientific knowledge and cause/effect relationships.

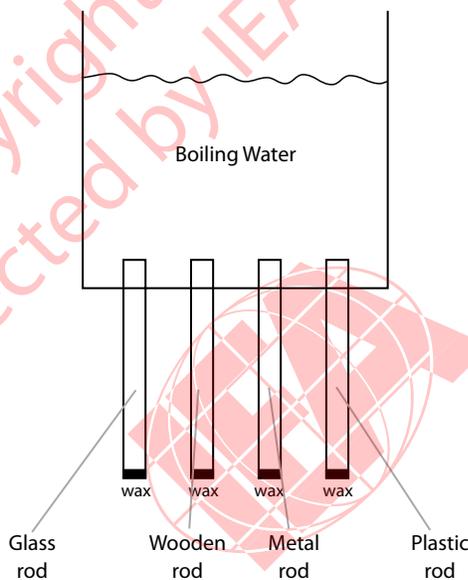


Exhibit 2.20 TIMSS 2007 High International Benchmark (550) of Science Achievement – Example Item 3

TIMSS 2007 Science 8<sup>th</sup> Grade

Content Domain: Physics

Description: Based on a diagram demonstrating an investigation of thermal conductivity, recognizes that metal conducts heat faster than glass, wood, or plastic.



The diagram shows four identical size rods each of a different material sealed into the bottom of a container. The same amount of wax is placed on the end of each rod and then the container is filled with boiling water. On which rod will the wax melt first?

- (A) Glass rod
- (B) Wooden rod
- (C) Metal rod
- (D) Plastic rod

Country	Percent Correct	
Singapore	79 (1.7)	●
Chinese Taipei	75 (1.8)	●
Japan	68 (1.9)	●
† England	66 (2.3)	●
Russian Federation	63 (2.4)	●
Sweden	61 (2.1)	●
† Scotland	61 (2.4)	●
Australia	60 (2.5)	●
Korea, Rep. of	60 (2.3)	●
<sup>3</sup> Israel	60 (2.4)	●
<sup>2</sup> † United States	57 (1.8)	●
Cyprus	57 (2.0)	●
Hungary	57 (2.6)	●
Czech Republic	57 (2.0)	●
† Hong Kong SAR	55 (2.8)	●
Malaysia	55 (2.4)	●
Slovenia	53 (2.4)	●
Thailand	53 (2.1)	●
Ukraine	51 (2.3)	●
Armenia	50 (3.1)	●
Bosnia and Herzegovina	48 (2.7)	●
<b>International Avg.</b>	<b>47 (0.3)</b>	
Romania	47 (2.2)	●
Bahrain	47 (2.0)	●
<sup>3</sup> Bulgaria	47 (2.9)	●
Malta	46 (1.7)	●
Iran, Islamic Rep. of	45 (2.5)	●
Italy	45 (2.2)	●
Jordan	45 (2.2)	●
Norway	44 (2.3)	●
<sup>1</sup> <sup>2</sup> Serbia	44 (3.1)	●
✦ Kuwait	43 (2.4)	●
Algeria	42 (1.9)	●
Palestinian Nat'l Auth.	41 (2.4)	●
<sup>1</sup> Lithuania	40 (2.2)	●
Oman	40 (2.2)	●
Egypt	38 (1.9)	●
Turkey	37 (2.1)	●
Qatar	36 (1.4)	●
Syrian Arab Republic	36 (2.0)	●
Botswana	35 (2.2)	●
Tunisia	34 (2.4)	●
Lebanon	34 (3.0)	●
El Salvador	33 (2.1)	●
Colombia	31 (1.9)	●
Saudi Arabia	31 (2.7)	●
<sup>1</sup> Georgia	29 (2.6)	●
Ghana	28 (2.1)	●
Indonesia	21 (2.1)	●
‡ Morocco	38 (3.4)	●
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	67 (2.9)	●
✦ ‡ Dubai, UAE	61 (2.0)	●
<sup>2</sup> Ontario, Canada	61 (2.7)	●
<sup>2</sup> † Minnesota, US	58 (3.3)	●
<sup>3</sup> British Columbia, Canada	53 (2.4)	●
<sup>3</sup> Quebec, Canada	52 (2.5)	●
Basque Country, Spain	48 (3.0)	●

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

✦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Percent significantly higher than international average ●  
 Percent significantly lower than international average ●

**Exhibit 2.21 TIMSS 2007 High International Benchmark (550) of Science Achievement – Example Item 4**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**Content Domain: Biology**

**Description: Given that chlorophyll is needed for photosynthesis, states two other factors that are needed.**

Food and oxygen are produced during photosynthesis in green plants. Chlorophyll is one thing that is needed for photosynthesis.

Name two more factors that are needed for photosynthesis.

1. Sunlight
2. Carbon dioxide

The answer shown illustrates the type of student response that was given full credit

Country	Percent Full Credit	
† Hong Kong SAR	81 (2.4)	▲
Singapore	76 (1.6)	▲
Japan	75 (2.0)	▲
Chinese Taipei	66 (2.3)	▲
Korea, Rep. of	65 (2.1)	▲
† England	57 (2.4)	▲
Slovenia	55 (2.3)	▲
Jordan	54 (2.3)	▲
<sup>2</sup> † United States	49 (1.5)	▲
Malaysia	48 (2.6)	▲
Bahrain	46 (2.2)	▲
Bosnia and Herzegovina	46 (2.7)	▲
Palestinian Nat'l Auth.	45 (2.6)	▲
<sup>1</sup> <sup>2</sup> Serbia	45 (3.0)	▲
Indonesia	43 (2.6)	▲
♦♦ Kuwait	43 (2.1)	▲
Cyprus	43 (2.1)	▲
Russian Federation	43 (3.2)	▲
Egypt	42 (2.1)	▲
Armenia	41 (2.8)	▲
<b>International Avg.</b>	<b>40 (0.3)</b>	
Sweden	39 (2.2)	▲
Turkey	39 (2.2)	▲
Italy	39 (2.4)	▲
Ghana	37 (2.2)	▲
Oman	37 (2.2)	▲
Hungary	36 (2.4)	▲
<sup>1</sup> Lithuania	36 (2.3)	▲
Lebanon	35 (3.0)	▲
Colombia	35 (2.2)	▼
Tunisia	35 (2.6)	▼
Ukraine	34 (2.1)	▼
Czech Republic	34 (2.1)	▼
Australia	33 (2.0)	▼
† Scotland	33 (2.2)	▼
Qatar	32 (1.3)	▼
Romania	31 (1.9)	▼
Saudi Arabia	31 (2.3)	▼
Botswana	30 (2.1)	▼
<sup>1</sup> Georgia	30 (3.5)	▼
Norway	30 (2.2)	▼
<sup>3</sup> Bulgaria	30 (2.9)	▼
Thailand	29 (2.2)	▼
Syrian Arab Republic	29 (2.2)	▼
El Salvador	27 (2.1)	▼
Malta	25 (1.4)	▼
<sup>3</sup> Israel	24 (2.1)	▼
Algeria	23 (1.7)	▼
Iran, Islamic Rep. of	14 (1.8)	▼
‡ Morocco	8 (1.4)	▼
<b>Benchmarking Participants</b>		
♦♦ ‡ Dubai, UAE	61 (2.3)	▲
<sup>2</sup> Massachusetts, US	54 (2.9)	▲
<sup>2</sup> † Minnesota, US	54 (2.8)	▲
<sup>2</sup> Ontario, Canada	46 (3.0)	▲
Basque Country, Spain	43 (3.5)	▲
<sup>3</sup> British Columbia, Canada	43 (2.5)	▲
<sup>3</sup> Quebec, Canada	38 (2.6)	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

▲ Percent significantly higher than international average  
 ▼ Percent significantly lower than international average  
<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).  
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

### **Eighth Grade: Achievement at the Intermediate International Benchmark**

Exhibit 2.22 describes students' performance at the Intermediate International Benchmark. Students reaching this benchmark were able to recognize and communicate basic scientific knowledge across a range of topics. They demonstrated some understanding of characteristics of animals, and are acquainted with some aspects of sound, force, and chemical change. They demonstrated elementary knowledge of the solar system, Earth's processes, and resources and the environment. Students reaching this benchmark showed that they could extract information from tables and diagrams, apply knowledge to practical situations, and communicate their knowledge through brief descriptive responses.

Exhibit 2.23 presents Example Item 5 from the biology domain. This multiple-choice item requires students to identify an animal characteristic found only in mammals. On average internationally, 63 percent of the eighth grade students recognized *glands that make milk* as the correct answer. More than 80 percent of students in Chinese Taipei (91%), Hong Kong SAR (86%), Thailand (84%), and Turkey (82%) answered correctly.

Example Item 6 presented in Exhibit 2.24 also illustrates a type of item from the physics domain likely to be answered correctly by students reaching the intermediate benchmark. Students were required to recognize the reason that a sound can cause an echo on Earth but not on the Moon. Almost two-thirds (65%) of students, on average internationally, recognized that there would be no echo on the Moon because there is no air for the sound to travel through. Korea (90%), Chinese Taipei (89%), Hong Kong SAR (84%), Lithuania (83%), Japan (82%), Sweden (81%), and Hungary (80%) had at least 80 percent of students answer correctly.

## Exhibit 2.22 Description of the TIMSS 2007 Intermediate International Benchmark (475) of Science Achievement

TIMSS2007  
Science **8**<sup>th</sup>  
Grade

### Intermediate International Benchmark – 475

#### Summary

*Students can recognize and communicate basic scientific knowledge across a range of topics. They demonstrate some understanding of characteristics of animals, food webs, and the effect of population changes in ecosystems. They are acquainted with some aspects of sound and force and have elementary knowledge of chemical change. They demonstrate elementary knowledge of the solar system, Earth's processes, and resources and the environment. Students extract information from tables and interpret pictorial diagrams. They can apply knowledge to practical situations and communicate their knowledge through brief descriptive responses.*

In biology, students demonstrate some understanding of the characteristics of animals and human health. For example, they recognize a characteristic that is found only in mammals and identify an organ of the digestive system. They recognize a disease caused by a virus and demonstrate some understanding of the immune system by recognizing that bacteria can be destroyed by white blood cells. Students understand how vaccination helps prevent illness, and can explain why exposure of a person to influenza does not necessarily lead to infection. They also state why exercise is important for good health. Students demonstrate some understanding of food webs and the effect of population changes in ecosystems. They recognize an organism that is an energy producer and use a completed food web to predict and explain what is most likely to happen to a predator population when its prey population is reduced.

Students have some knowledge of chemistry in everyday life. For example, they identify vinegar as an acidic solution and, in the context of an investigation, the condition under which nails would rust. Students also have elementary knowledge of chemical change. For example, they recognize from a description of indicator color changes that neutralization has occurred, and identify photosynthesis as a chemical process involving energy absorption.

In physics, students are acquainted with some aspects of sound and force. They recognize that sound needs a medium through which to travel. Given a diagram showing a ball being thrown upward, they state the force that causes the ball to fall.

In Earth science, students demonstrate some familiarity with the solar system and Earth's processes. They recognize that gravity draws objects toward the center of Earth and that night and day are caused by Earth rotating on its axis. Students demonstrate some understanding of the water cycle by ordering the processes involved and matching each process with its description. Students demonstrate elementary knowledge of Earth's resources and the environment. They recognize examples of fossil fuels, state how volcanic eruptions impact the environment, and predict a long-term effect of cutting down trees. From a list of common waste materials, students recognize that paper will break down most quickly.

Students extract information from a table to draw conclusions and interpret pictorial diagrams. Students can apply knowledge to practical situations and communicate their knowledge through brief descriptive responses.

Exhibit 2.23 **TIMSS 2007 Intermediate International Benchmark (475) of Science Achievement – Example Item 5**

TIMSS2007  
Science 8<sup>th</sup> Grade

**Content Domain: Biology**

**Description: Recognizes a characteristic that is found only in mammals.**

Which characteristic is found **ONLY** in mammals?

- (A) eyes that detect color
- glands that make milk
- (C) skin that absorbs oxygen
- (D) bodies that are protected by scales

Country	Percent Correct	
Chinese Taipei	91 (1.3)	▲
† Hong Kong SAR	86 (1.8)	▲
Thailand	84 (1.5)	▲
Turkey	82 (1.6)	▲
Syrian Arab Republic	79 (1.9)	▲
Hungary	78 (1.9)	▲
<sup>1</sup> Lithuania	76 (1.9)	▲
Slovenia	76 (1.9)	▲
Japan	75 (1.8)	▲
Czech Republic	74 (1.7)	▲
Armenia	73 (2.0)	▲
Cyprus	72 (1.8)	▲
Jordan	72 (2.0)	▲
Saudi Arabia	72 (1.8)	▲
♣ Kuwait	70 (2.1)	▲
<sup>3</sup> Bulgaria	70 (2.7)	▲
Korea, Rep. of	70 (1.8)	▲
<sup>1</sup> Georgia	69 (2.6)	▲
<sup>3</sup> Israel	68 (2.4)	▲
<sup>1 2</sup> Serbia	67 (2.5)	▲
Bosnia and Herzegovina	67 (2.5)	▲
Bahrain	66 (2.1)	▲
Romania	66 (2.4)	▲
Italy	65 (2.2)	▲
Russian Federation	63 (2.0)	▲
<b>International Avg.</b>	<b>63 (0.3)</b>	
Iran, Islamic Rep. of	60 (2.4)	▼
Singapore	60 (1.9)	▼
Lebanon	60 (3.0)	▼
Algeria	58 (1.9)	▼
Australia	56 (2.7)	▼
Palestinian Nat'l Auth.	55 (1.9)	▼
Indonesia	55 (2.5)	▼
Malaysia	55 (2.6)	▼
Colombia	54 (1.9)	▼
Ukraine	54 (2.3)	▼
Botswana	53 (2.4)	▼
<sup>2 †</sup> United States	53 (1.8)	▼
El Salvador	53 (2.2)	▼
Sweden	53 (1.9)	▼
† England	53 (2.4)	▼
Norway	51 (2.3)	▼
Qatar	49 (1.5)	▼
Oman	49 (2.0)	▼
Tunisia	48 (2.3)	▼
Malta	44 (1.7)	▼
† Scotland	41 (2.2)	▼
Egypt	40 (1.9)	▼
Ghana	31 (2.1)	▼
‡ Morocco	66 (2.8)	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> Massachusetts, US	62 (3.4)	▼
<sup>2 †</sup> Minnesota, US	61 (3.0)	▼
Basque Country, Spain	60 (3.7)	▼
♣ ‡ Dubai, UAE	57 (2.5)	▼
<sup>3</sup> Quebec, Canada	56 (2.5)	▼
<sup>3</sup> British Columbia, Canada	50 (2.5)	▼
<sup>2</sup> Ontario, Canada	42 (2.6)	▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

♣ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Percent significantly higher than international average ▲  
Percent significantly lower than international average ▼



Exhibit 2.24 **TIMSS 2007 Intermediate International Benchmark (475) of Science Achievement – Example Item 6**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**Content Domain: Physics**

**Description: Applies knowledge that sound requires a medium to travel through by contrasting a situation on Earth to a situation on the Moon.**

In a deep valley on Earth, a person shouting will hear an echo as the sound is reflected back off the surrounding mountains. In a similar valley on the Moon, no echo will be heard. This is because

- (A) the gravitational pull on the Moon is too low
- (B) the temperature on the Moon is too low
- there is no air on the Moon for the sound to travel through
- (D) the mountains on the Moon cannot reflect sound

Country	Percent Correct	
Korea, Rep. of	90 (1.3)	▲
Chinese Taipei	89 (1.3)	▲
† Hong Kong SAR	84 (1.9)	▲
<sup>1</sup> Lithuania	83 (1.8)	▲
Japan	82 (1.7)	▲
Sweden	81 (1.7)	▲
Hungary	80 (2.0)	▲
Slovenia	78 (2.1)	▲
Singapore	77 (2.0)	▲
† England	77 (2.3)	▲
Czech Republic	74 (1.9)	▲
Jordan	73 (2.1)	▲
Australia	73 (2.4)	▲
Russian Federation	73 (2.0)	▲
Bahrain	72 (2.2)	▲
Bosnia and Herzegovina	71 (2.4)	▲
<sup>2</sup> † United States	71 (1.7)	▲
<sup>1</sup> <sup>2</sup> Serbia	71 (2.6)	▲
Malta	71 (1.5)	▲
† Scotland	71 (1.9)	▲
Armenia	69 (2.5)	▲
♦ Kuwait	69 (2.1)	▲
Romania	68 (2.6)	▲
Italy	67 (2.3)	▲
Indonesia	67 (2.2)	▲
<b>International Avg.</b>	<b>65 (0.3)</b>	
Oman	64 (2.5)	▲
Malaysia	63 (2.0)	▲
<sup>3</sup> Israel	63 (2.3)	▲
Syrian Arab Republic	62 (2.1)	▲
Norway	62 (2.1)	▲
Egypt	60 (2.3)	▼
Palestinian Nat'l Auth.	60 (2.4)	▼
Ukraine	59 (2.5)	▼
Saudi Arabia	58 (2.5)	▼
<sup>3</sup> Bulgaria	57 (3.1)	▼
Turkey	57 (2.4)	▼
Iran, Islamic Rep. of	55 (2.4)	▼
Thailand	54 (2.3)	▼
Lebanon	52 (2.8)	▼
Tunisia	52 (2.1)	▼
Botswana	50 (2.6)	▼
El Salvador	50 (2.4)	▼
<sup>1</sup> Georgia	49 (2.8)	▼
Cyprus	48 (2.1)	▼
Colombia	46 (2.0)	▼
Algeria	46 (1.9)	▼
Qatar	44 (1.5)	▼
Ghana	34 (1.9)	▼
‡ Morocco	44 (3.3)	▼
<b>Benchmarking Participants</b>		
♦ ‡ Dubai, UAE	78 (2.4)	▲
<sup>2</sup> Ontario, Canada	75 (2.7)	▲
<sup>3</sup> Quebec, Canada	73 (2.1)	▲
<sup>2</sup> Massachusetts, US	71 (3.3)	▲
<sup>3</sup> British Columbia, Canada	70 (2.1)	▲
Basque Country, Spain	65 (2.9)	▲
<sup>2</sup> † Minnesota, US	64 (3.6)	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Percent significantly higher than international average ▲  
Percent significantly lower than international average ▼



### **Eighth Grade: Achievement at the Low International Benchmark**

Exhibit 2.25 describes performance at the Low International Benchmark. Students performing at this level recognized some basic facts from the life and physical sciences. They have some knowledge of the human body and demonstrate some familiarity with everyday physical phenomena. They can interpret diagrams and apply knowledge of simple physical concepts to practical situations.

Example Items 7 and 8 are presented in Exhibits 2.26 and 2.27, respectively. These multiple-choice items illustrate the types of items likely to be answered correctly by students reaching the low benchmark. In Example Item 7 from the physics domain, students were given a definition of work (work is done when an object is moved in the direction of an applied force) and asked to identify a diagram depicting a person doing work. On average internationally, this item was answered correctly by 78 percent of the students, who recognized that a person pushing a cart up a ramp was doing work. Every country except Tunisia had more than half their students answer correctly.

Example Item 8 in the biology domain required students to recognize that the cells that conduct messages are known as nerve cells. Seventy-five percent answered correctly, on average internationally. Nine countries, including Chinese Taipei, Korea, Hong Kong SAR, the Russian Federation, the Ukraine, the United States, Hungary, Thailand, and England, had 90 percent or more of students answer correctly, as well as four benchmarking participants—the U.S. states of Massachusetts and Minnesota and the Canadian provinces of Ontario and British Columbia.

Exhibit 2.25 **Description of the TIMSS 2007 Low International Benchmark (400) of Science Achievement**

TIMSS2007  
Science **8**<sup>th</sup>  
Grade

Low International Benchmark – 400

**Summary**

*Students can recognize some basic facts from the life and physical sciences. They have some knowledge of the human body, and demonstrate some familiarity with everyday physical phenomena. Students can interpret pictorial diagrams and apply knowledge of simple physical concepts to practical situations.*

Students demonstrate some basic knowledge of human biology. They identify the circulatory system from a list of its parts, and recognize that nerves carry sensory messages to the brain.

Students recognize some basic information about the physical properties of materials and phenomena. They recognize the material that best

conducts heat and electricity, the form of energy in a compressed spring, and identify a situation where work is being done. Also, they can recognize the chemical formula for carbon dioxide.

Students interpret some pictorial diagrams and apply knowledge of simple physical concepts to practical situations.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

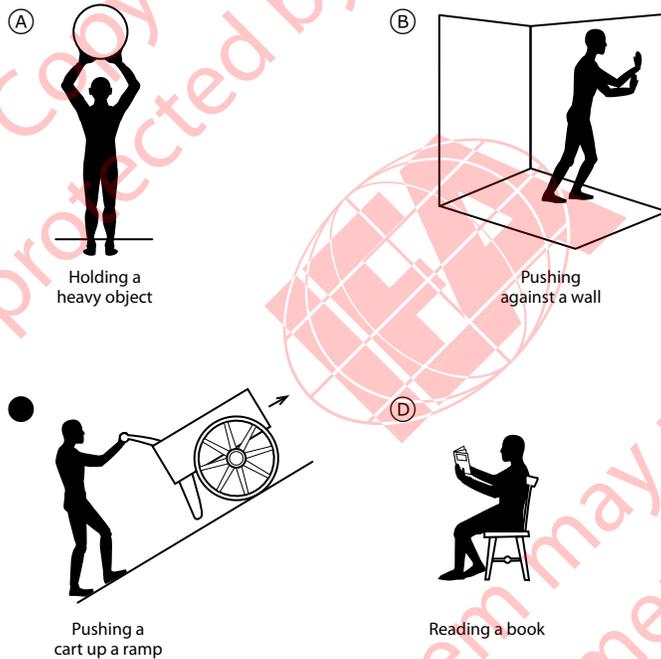


**Exhibit 2.26 TIMSS 2007 Low International Benchmark (400) of Science Achievement – Example Item 7**

**TIMSS 2007**  
Science **8<sup>th</sup>** Grade

**Content Domain: Physics**  
**Description: Given the definition of work, identifies a diagram that shows that work is being done.**

Work is done when an object is moved in the direction of an applied force. A person performed different tasks as shown in the diagrams below. In which diagram is the person doing work?



Country	Percent Correct	
Singapore	96 (0.9)	▲
<sup>2</sup> † United States	91 (1.0)	▲
<sup>3</sup> Bulgaria	91 (2.1)	▲
Russian Federation	91 (1.3)	▲
Korea, Rep. of	91 (1.1)	▲
Hungary	90 (1.6)	▲
Ukraine	90 (1.4)	▲
<sup>1</sup> Lithuania	89 (1.2)	▲
Slovenia	88 (1.6)	▲
Turkey	88 (1.8)	▲
<sup>1</sup> <sup>2</sup> Serbia	87 (1.8)	▲
Italy	87 (1.5)	▲
Indonesia	86 (1.3)	▲
Iran, Islamic Rep. of	86 (2.0)	▲
Czech Republic	86 (1.4)	▲
Australia	86 (1.6)	▲
Lebanon	86 (1.9)	▲
Malta	86 (1.2)	▲
† England	85 (1.7)	▲
Malaysia	84 (1.6)	▲
† Scotland	83 (1.7)	▲
<sup>1</sup> Georgia	82 (1.8)	▲
Sweden	82 (1.6)	▲
Japan	82 (1.6)	▲
Chinese Taipei	81 (1.9)	▲
Armenia	80 (1.9)	▲
Romania	79 (2.4)	▲
Syrian Arab Republic	79 (1.8)	▲
Jordan	79 (1.7)	▲
<b>International Avg.</b>	<b>78 (0.3)</b>	
Bosnia and Herzegovina	78 (2.0)	▲
Norway	76 (1.8)	▲
† Hong Kong SAR	75 (1.7)	▲
Thailand	74 (1.7)	▼
Cyprus	72 (1.7)	▼
Algeria	71 (1.9)	▼
<sup>3</sup> Israel	71 (2.2)	▼
Bahrain	70 (1.8)	▼
Egypt	70 (1.9)	▼
Colombia	70 (2.7)	▼
El Salvador	68 (2.3)	▼
♣ Kuwait	67 (2.1)	▼
Palestinian Nat'l Auth.	65 (2.2)	▼
Botswana	64 (1.9)	▼
Ghana	63 (2.1)	▼
Saudi Arabia	61 (2.8)	▼
Oman	58 (2.1)	▼
Qatar	55 (1.7)	▼
Tunisia	49 (2.1)	▼
‡ Morocco	60 (3.5)	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> † Minnesota, US	93 (1.3)	▲
<sup>3</sup> Quebec, Canada	89 (1.8)	▲
<sup>2</sup> Ontario, Canada	87 (1.6)	▲
<sup>2</sup> Massachusetts, US	87 (2.2)	▲
<sup>3</sup> British Columbia, Canada	86 (1.4)	▲
♣ ‡ Dubai, UAE	84 (2.0)	▲
Basque Country, Spain	78 (2.4)	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).  
 ♣ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Percent significantly higher than international average ▲  
 Percent significantly lower than international average ▼

**Exhibit 2.27 TIMSS 2007 Low International Benchmark (400) of Science Achievement – Example Item 8**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**Content Domain: Biology**

**Description: Recognizes the cells that conduct messages.**

Cells that conduct messages are known as

- (A) skin cells
- nerve cells
- (C) blood cells
- (D) kidney cells

Country	Percent Correct	
Chinese Taipei	97 (0.9)	▲
Korea, Rep. of	95 (0.8)	▲
† Hong Kong SAR	94 (1.4)	▲
Russian Federation	94 (1.3)	▲
Ukraine	92 (1.4)	▲
<sup>2</sup> † United States	92 (1.0)	▲
Hungary	92 (1.3)	▲
Thailand	91 (1.0)	▲
† England	91 (1.5)	▲
Japan	89 (1.2)	▲
Sweden	89 (1.3)	▲
Singapore	88 (1.4)	▲
<sup>1</sup> Lithuania	88 (1.7)	▲
Iran, Islamic Rep. of	86 (1.7)	▲
Australia	86 (2.0)	▲
Jordan	85 (1.8)	▲
<sup>3</sup> Bulgaria	82 (2.9)	▲
† Scotland	81 (2.0)	▲
Italy	80 (1.7)	▲
Bahrain	78 (1.9)	▲
Czech Republic	78 (1.8)	▲
Norway	78 (2.1)	▲
Egypt	77 (2.0)	▲
Armenia	77 (2.0)	▲
Syrian Arab Republic	77 (1.9)	▲
Colombia	77 (2.0)	▲
Malaysia	75 (1.8)	▲
<b>International Avg.</b>	<b>75 (0.3)</b>	
<sup>1</sup> Georgia	74 (2.7)	▲
<sup>1 2</sup> Serbia	74 (2.3)	▲
Saudi Arabia	73 (2.0)	▲
Slovenia	72 (2.0)	▲
Palestinian Nat'l Auth.	71 (2.2)	▲
Tunisia	69 (2.1)	▼
Romania	68 (2.5)	▼
Turkey	67 (2.4)	▼
Malta	67 (1.5)	▼
Algeria	67 (1.9)	▼
<sup>3</sup> Israel	65 (2.5)	▼
Oman	64 (2.0)	▼
Lebanon	63 (2.4)	▼
Bosnia and Herzegovina	63 (2.5)	▼
♦♦ Kuwait	62 (2.3)	▼
El Salvador	61 (2.2)	▼
Cyprus	60 (2.2)	▼
Indonesia	59 (2.4)	▼
Botswana	59 (2.0)	▼
Qatar	40 (1.4)	▼
Ghana	24 (1.9)	▼
‡ Morocco	51 (2.5)	▼
<b>Benchmarking Participants</b>		
<sup>2</sup> Ontario, Canada	94 (1.4)	▲
<sup>2</sup> † Minnesota, US	93 (1.7)	▲
<sup>2</sup> Massachusetts, US	93 (1.3)	▲
<sup>3</sup> British Columbia, Canada	91 (1.4)	▲
♦† Dubai, UAE	84 (1.9)	▲
<sup>3</sup> Quebec, Canada	79 (1.8)	▲
Basque Country, Spain	79 (2.6)	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).  
 ♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

▲ Percent significantly higher than international average  
 ▼ Percent significantly lower than international average





# Chapter 3



## *Average Achievement in the Science Content and Cognitive Domains*

As described in the *TIMSS 2007 Assessment Frameworks*,<sup>1</sup> the science assessment is organized around two dimensions, a content dimension specifying the subject matter or content domains to be assessed in science and a cognitive dimension specifying the thinking processes that students are likely to use as they engage with the content. Each item in the science assessment is associated with one content domain and one cognitive domain, providing for both content-based and cognitive-oriented perspectives on student achievement in science.

Chapter 3 presents average student performance in three content domains at the fourth grade: life science, physical science, and earth science, and four domains at the eighth grade: biology, chemistry, physics, and earth science. Average performance also is presented for each of three cognitive domains—knowing, applying, and reasoning—at both grades. The same three cognitive domains were used at both fourth and eighth grades. Knowing refers to the student’s knowledge base of science facts, concepts, tools, and procedures. Applying focuses on the student’s ability to apply knowledge and conceptual understanding in a problem situation. Reasoning goes beyond the solution of routine problems to encompass unfamiliar situations, complex contexts, and multi-step problems. To describe each country’s relative strengths in the content and cognitive domains, relative performance in each content and cognitive domain is depicted graphically.

<sup>1</sup> Mullis, I.V.S., Martin, M.O., Ruddock, G.J., O’Sullivan, C.Y., Arora, A., & Erberber, E. (2005). *TIMSS 2007 assessment frameworks*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Gender differences in the content and cognitive domains also are shown. Trend results are not presented separately for the content and cognitive domains, because there are too few items in common with the previous assessments.

To simplify comparisons of student achievement across domains, the content and cognitive achievement scales at each grade were constructed to have the same average difficulty.<sup>2</sup> As a point of reference, however, Exhibit A.9 in Appendix A shows the average percentage of students correctly answering the items within each of the content and cognitive domains for each country and benchmarking participant. It can be seen that, across participants, the difficulty of the science items was similar among content domains but varied somewhat across cognitive domains. Most notably, the items in the reasoning domain at both grades were more difficult for students, on average, than those in the applying domain, which were in turn more difficult than the items in the knowing domain. In Yemen, the items were very difficult in all of the domains, making it difficult to obtain accurate domain scale estimates. Therefore, the content and cognitive domain scale results were not reported for Yemen in the exhibits in this chapter. Similarly, students at the eighth grade in Ghana and Qatar had particular difficulty with the science reasoning items, and because of concerns about reliability, results for the reasoning domain scale were not reported in this chapter for these countries.

### **How Does Achievement Differ Across the TIMSS 2007 Science Content and Cognitive Domains?**

Exhibit 3.1 presents average achievement in each of the content and cognitive domains for fourth and eighth grades. Countries and benchmarking participants are displayed in alphabetical order, and to provide a basis for comparison, symbols indicate whether a country's performance is statistically significantly above or below the TIMSS scale average of 500. Please note that this refers to the mid-point of the TIMSS achievement scale, and not the average of the country means presented in the exhibit.

At both grades, the countries scoring highest on the overall science assessment tended also to be the highest-scoring countries in each of the

<sup>2</sup> At both fourth and eighth grades, student achievement in each of the content and cognitive domains was placed on the same scale by aligning its achievement distribution with the achievement distribution of the overall science scale.

content and cognitive domains and the lowest-scoring countries overall tended to be those with lowest scores in the content and cognitive domains. In Appendix B, Exhibits B.1 through B.6 for fourth grade and B.7 through B.13 for eighth grade compare average achievement among individual countries and benchmarking participants for each of the content and cognitive domains. The exhibits show whether or not the differences in average achievement between pairs of countries are statistically significant.

It is noteworthy that the high overall science achievement of the high-scoring Asian countries appears to be based on a strong foundation in the physical sciences. At fourth grade, Singapore, Japan, Chinese Taipei, and Hong Kong SAR are the countries with the highest average achievement in physical science, with Singapore and Chinese Taipei maintaining this level in life science and in earth science also. Other high performers in physical science included the Russian Federation, Latvia, England, and the U.S. states of Massachusetts and Minnesota. Italy, Hungary, the benchmarking states of Massachusetts and Minnesota, and the Canadian province of Alberta followed Singapore in having the highest performance in life science. They were followed by Chinese Taipei, the United States, the Russian Federation, the Netherlands, Latvia, and the Canadian provinces of British Columbia and Ontario. In earth science, Hong Kong SAR, Singapore, and Chinese Taipei, along with the two U.S. states had the highest average achievement.

At the fourth grade, Singapore had the highest performance in the knowing and applying cognitive domains, and was joined by Chinese Taipei, Japan, Hong Kong SAR, and the benchmarking state of Massachusetts as top performers in the reasoning domain. Other high achievers in the knowing domain included Hong Kong SAR, England, the Russian Federation, the United States, Hungary, Latvia, Chinese Taipei, Kazakhstan, the two U.S. benchmarking states, and the provinces of Alberta, British Columbia, and Ontario. In the applying domain, Chinese Taipei, Hong Kong SAR, the Russian Federation, and the two U.S. states were among the top performers.

At the eighth grade, in addition to Singapore, the benchmarking states of Massachusetts and Minnesota had the highest average achievement in biology. They were followed by Japan, Chinese Taipei, and Korea, and

Exhibit 3.1 Average Achievement in the Science Content and Cognitive Domains

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Average Scale Scores for Science Content Domains			Average Scale Scores for Science Cognitive Domains		
	Life Science	Physical Science	Earth Science	Knowing	Applying	Reasoning
Algeria	351 (6.2) ▼	377 (5.3) ▼	365 (5.7) ▼	350 (5.8) ▼	379 (5.7) ▼	357 (5.8) ▼
Armenia	489 (5.9)	492 (5.1)	479 (5.5) ▼	486 (5.2) ▼	487 (5.6) ▼	484 (5.3) ▼
Australia	528 (3.4) ▲	522 (3.1) ▲	534 (3.2) ▲	529 (3.1) ▲	523 (3.3) ▲	530 (3.4) ▲
Austria	526 (2.0) ▲	514 (2.4) ▲	532 (1.9) ▲	529 (2.0) ▲	526 (2.2) ▲	513 (2.3) ▲
Chinese Taipei	541 (2.1) ▲	559 (2.5)	553 (1.9) ▲	536 (2.5) ▲	556 (2.1) ▲	571 (2.4) ▲
Colombia	408 (5.2) ▼	411 (4.9) ▼	401 (5.6) ▼	409 (5.5) ▼	404 (5.4) ▼	409 (5.1) ▼
Czech Republic	520 (2.9) ▲	511 (2.8) ▲	518 (2.6) ▲	520 (2.7) ▲	516 (3.1) ▲	510 (2.9) ▲
† Denmark	527 (2.4) ▲	502 (2.5)	522 (2.7) ▲	516 (2.9) ▲	515 (2.6) ▲	525 (3.8) ▲
El Salvador	410 (3.6) ▼	392 (3.8) ▼	393 (3.3) ▼	410 (3.9) ▼	393 (3.6) ▼	376 (4.0) ▼
England	532 (2.7) ▲	543 (2.7) ▲	538 (2.9) ▲	543 (2.9) ▲	536 (2.7) ▲	537 (2.7) ▲
<sup>1</sup> Georgia	427 (3.5) ▼	414 (4.0) ▼	432 (5.0) ▼	434 (3.8) ▼	424 (4.1) ▼	388 (4.9) ▼
Germany	529 (2.0) ▲	524 (2.5) ▲	524 (2.4) ▲	527 (2.2) ▲	526 (2.2) ▲	525 (2.3) ▲
Hong Kong SAR	532 (3.5) ▲	558 (3.5) ▲	560 (3.2) ▲	546 (3.2) ▲	549 (3.0) ▲	561 (4.4) ▲
Hungary	548 (2.8) ▲	529 (3.3) ▲	517 (3.5) ▲	540 (3.0) ▲	531 (3.2) ▲	529 (3.7) ▲
Iran, Islamic Rep. of	442 (4.4) ▼	454 (4.2) ▼	433 (4.1) ▼	437 (4.3) ▼	451 (4.3) ▼	436 (4.3) ▼
Italy	549 (3.0) ▲	521 (3.1) ▲	526 (3.0) ▲	530 (3.9) ▲	539 (3.1) ▲	526 (3.8) ▲
Japan	530 (2.0) ▲	564 (2.3) ▲	529 (2.7) ▲	528 (2.2) ▲	542 (2.7) ▲	567 (2.1) ▲
<sup>1</sup> Kazakhstan	528 (5.0) ▲	528 (5.8) ▲	534 (5.2) ▲	534 (5.8) ▲	536 (4.9) ▲	519 (5.3) ▲
♦♦ Kuwait	353 (4.9) ▼	345 (5.2) ▼	363 (3.8) ▼	360 (3.9) ▼	338 (4.3) ▼	331 (5.4) ▼
<sup>1</sup> Latvia	535 (2.1) ▲	544 (2.4) ▲	536 (2.2) ▲	540 (2.2) ▲	535 (2.4) ▲	551 (2.7) ▲
<sup>1</sup> Lithuania	516 (1.8) ▲	514 (1.4) ▲	511 (2.5) ▲	511 (1.7) ▲	515 (2.8) ▲	524 (2.4) ▲
Morocco	292 (6.8) ▼	324 (5.5) ▼	293 (6.2) ▼	291 (5.8) ▼	311 (6.3) ▼	318 (5.4) ▼
‡ Netherlands	536 (2.2) ▲	503 (2.3)	524 (2.5) ▲	518 (2.5) ▲	525 (2.2) ▲	525 (2.3) ▲
New Zealand	506 (2.5) ▲	498 (2.5)	515 (2.6) ▲	511 (2.5) ▲	500 (2.4)	505 (2.9)
Norway	487 (2.5) ▼	469 (2.7) ▼	497 (2.9)	485 (2.4) ▼	478 (2.8) ▼	480 (3.2) ▼
Qatar	291 (1.4) ▼	303 (2.1) ▼	305 (2.2) ▼	304 (2.3) ▼	283 (2.7) ▼	293 (2.9) ▼
Russian Federation	539 (4.1) ▲	547 (4.6) ▲	536 (4.3) ▲	542 (4.8) ▲	546 (4.7) ▲	542 (4.6) ▲
† Scotland	504 (2.2) ▲	499 (1.9)	508 (2.5) ▲	511 (2.0) ▲	494 (2.4) ▼	501 (2.2)
Singapore	582 (4.1) ▲	585 (3.9) ▲	554 (3.3) ▲	587 (4.1) ▲	579 (3.7) ▲	568 (3.7) ▲
Slovak Republic	532 (4.0) ▲	513 (4.6) ▲	530 (4.8) ▲	527 (4.4) ▲	527 (4.4) ▲	513 (4.9) ▲
Slovenia	511 (2.2) ▲	530 (1.6) ▲	517 (2.5) ▲	511 (1.6) ▲	525 (2.1) ▲	527 (1.8) ▲
Sweden	531 (2.5) ▲	508 (2.7) ▲	535 (2.7) ▲	526 (2.5) ▲	521 (2.9) ▲	527 (3.5) ▲
Tunisia	323 (5.6) ▼	340 (6.4) ▼	325 (5.8) ▼	316 (5.9) ▼	329 (6.3) ▼	349 (5.3) ▼
Ukraine	482 (2.5) ▼	475 (2.7) ▼	474 (3.1) ▼	476 (2.4) ▼	477 (3.2) ▼	478 (3.0) ▼
<sup>2</sup> † United States	540 (2.5) ▲	534 (2.3) ▲	533 (2.6) ▲	541 (2.3) ▲	533 (2.8) ▲	535 (2.6) ▲
Yemen	++	++	++	++	++	++
TIMSS Scale Avg.	500	500	500	500	500	500
<b>Benchmarking Participants</b>						
<sup>2</sup> Alberta, Canada	541 (3.7) ▲	535 (3.1) ▲	544 (3.3) ▲	549 (3.5) ▲	535 (3.7) ▲	537 (4.4) ▲
<sup>2</sup> British Columbia, Canada	538 (2.8) ▲	531 (2.6) ▲	537 (2.7) ▲	539 (2.5) ▲	533 (2.4) ▲	536 (2.7) ▲
♦♦ † Dubai, UAE	457 (2.8) ▼	467 (2.8) ▼	471 (2.6) ▼	463 (2.6) ▼	463 (2.6) ▼	462 (2.6) ▼
<sup>2</sup> Massachusetts, US	568 (3.5) ▲	560 (4.4) ▲	558 (4.4) ▲	566 (4.4) ▲	563 (4.4) ▲	569 (6.2) ▲
<sup>2</sup> † Minnesota, US	545 (6.1) ▲	545 (5.4) ▲	547 (5.8) ▲	550 (5.9) ▲	544 (5.9) ▲	549 (6.4) ▲
<sup>2</sup> Ontario, Canada	535 (3.7) ▲	535 (2.9) ▲	530 (3.2) ▲	538 (3.4) ▲	528 (3.4) ▲	541 (3.1) ▲
<sup>2</sup> Quebec, Canada	522 (2.7) ▲	513 (2.6) ▲	523 (2.6) ▲	516 (2.8) ▲	515 (2.7) ▲	528 (3.3) ▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Country average significantly higher than TIMSS scale average ▼ Country average significantly lower than TIMSS scale average

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A plus (+) sign indicates average achievement could not be accurately estimated.

**Exhibit 3.1 Average Achievement in the Science Content and Cognitive Domains (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Average Scale Scores for Science Content Domains				Average Scale Scores for Science Cognitive Domains		
	Biology	Chemistry	Physics	Earth Science	Knowing	Applying	Reasoning
Algeria	411 (1.9) ▼	414 (1.7) ▼	397 (2.2) ▼	413 (1.6) ▼	409 (1.9) ▼	410 (2.4) ▼	414 (1.9) ▼
Armenia	490 (5.9)	478 (6.3) ▼	503 (5.6)	475 (5.8) ▼	493 (6.4)	502 (5.4)	459 (6.5) ▼
Australia	518 (3.4) ▲	505 (3.6)	508 (4.2)	519 (3.8) ▲	501 (3.1)	510 (3.2) ▲	530 (3.6) ▲
Bahrain	473 (2.0) ▼	468 (2.4) ▼	466 (1.5) ▼	465 (2.4) ▼	469 (2.1) ▼	468 (2.1) ▼	469 (2.0) ▼
Bosnia and Herzegovina	464 (3.0) ▼	468 (2.9)	463 (3.1) ▼	469 (3.4) ▼	486 (3.7) ▼	463 (2.8) ▼	452 (3.1) ▼
Botswana	359 (2.9) ▼	371 (2.4) ▼	351 (3.2) ▼	361 (4.0) ▼	361 (2.9) ▼	358 (3.2) ▼	362 (2.7) ▼
<sup>3</sup> Bulgaria	467 (6.0) ▼	472 (6.1) ▼	466 (5.6) ▼	480 (5.5) ▼	489 (5.8)	471 (6.1) ▼	448 (6.1) ▼
Chinese Taipei	549 (3.4) ▲	573 (4.2) ▲	554 (3.7) ▲	545 (2.9) ▲	565 (3.5) ▲	560 (3.4) ▲	541 (3.5) ▲
Colombia	434 (3.7) ▼	420 (3.1) ▼	407 (3.5) ▼	407 (3.9) ▼	418 (4.0) ▼	417 (3.1) ▼	428 (2.7) ▼
Cyprus	447 (1.9) ▼	452 (2.5) ▼	458 (2.8) ▼	457 (2.3) ▼	438 (2.6) ▼	456 (2.0) ▼	460 (2.3) ▼
Czech Republic	531 (2.1) ▲	535 (2.7) ▲	537 (2.1) ▲	534 (2.0) ▲	533 (2.1) ▲	539 (1.9) ▲	534 (2.3) ▲
Egypt	406 (3.4) ▼	413 (4.0) ▼	413 (3.3) ▼	426 (3.8) ▼	434 (3.9) ▼	404 (3.6) ▼	395 (3.4) ▼
El Salvador	398 (3.0) ▼	377 (3.2) ▼	380 (3.5) ▼	400 (2.9) ▼	394 (3.2) ▼	388 (3.2) ▼	384 (3.4) ▼
† England	541 (4.4) ▲	534 (4.0) ▲	545 (4.0) ▲	529 (4.3) ▲	530 (4.9) ▲	538 (4.0) ▲	547 (4.0) ▲
<sup>1</sup> Georgia	423 (3.9) ▼	418 (4.6) ▼	416 (5.8) ▼	425 (4.1) ▼	440 (5.1)	422 (4.5) ▼	394 (4.6) ▼
Ghana	304 (4.9) ▼	342 (4.9) ▼	276 (5.8) ▼	294 (5.8) ▼	316 (5.7) ▼	291 (5.5) ▼	+ +
† Hong Kong SAR	527 (4.6) ▲	517 (4.6) ▲	528 (4.8) ▲	532 (4.5) ▲	532 (4.5) ▲	522 (4.9) ▲	533 (5.0) ▲
Hungary	534 (2.7) ▲	536 (3.5) ▲	541 (3.2) ▲	531 (2.9) ▲	524 (3.0) ▲	549 (3.0) ▲	530 (3.0) ▲
Indonesia	428 (3.1) ▼	421 (3.4) ▼	432 (3.1) ▼	442 (3.3) ▼	426 (3.6) ▼	425 (3.1) ▼	438 (3.2) ▼
Iran, Islamic Rep. of	449 (3.6) ▼	463 (3.5) ▼	470 (3.6) ▼	476 (3.7) ▼	468 (3.9) ▼	454 (3.8) ▼	462 (3.8) ▼
<sup>3</sup> Israel	472 (4.2) ▼	467 (4.6) ▼	472 (4.6) ▼	462 (4.1) ▼	456 (5.0) ▼	472 (4.2) ▼	481 (4.2) ▼
Italy	502 (3.0) ▼	481 (2.9) ▼	489 (3.1) ▼	503 (3.1)	494 (3.3)	498 (2.9)	493 (2.6) ▼
Japan	553 (1.9) ▲	551 (1.9) ▲	558 (1.9) ▲	533 (2.5) ▲	534 (2.2) ▲	555 (2.0) ▲	560 (2.0) ▲
Jordan	478 (3.8) ▼	491 (4.1) ▼	479 (4.2) ▼	484 (3.6) ▼	491 (4.5) ▼	485 (4.1) ▼	471 (4.1) ▼
Korea, Rep. of	548 (1.9) ▲	536 (2.4) ▲	571 (2.4) ▲	538 (2.2) ▲	543 (2.0) ▲	547 (2.0) ▲	558 (2.0) ▲
♣ Kuwait	419 (2.6) ▼	418 (3.8) ▼	438 (2.8) ▼	410 (3.0) ▼	430 (2.5) ▼	417 (2.9) ▼	411 (2.9) ▼
Lebanon	405 (6.2) ▼	447 (5.5) ▼	431 (5.1) ▼	389 (6.4) ▼	403 (5.9) ▼	422 (5.8) ▼	420 (5.6) ▼
<sup>1</sup> Lithuania	527 (2.3) ▲	507 (2.3) ▲	505 (2.9)	515 (2.5) ▲	513 (2.4) ▲	512 (2.2) ▲	527 (2.5) ▲
Malaysia	469 (5.8) ▼	479 (5.0) ▼	484 (5.7) ▼	463 (5.4) ▼	458 (6.5) ▼	473 (5.9) ▼	487 (4.9) ▼
Malta	453 (1.7) ▼	461 (2.1) ▼	470 (1.7) ▼	456 (1.5) ▼	436 (1.5) ▼	462 (1.6) ▼	473 (1.4) ▼
Norway	487 (2.3) ▼	483 (2.2) ▼	475 (3.0) ▼	502 (2.5) ▼	486 (2.0) ▼	486 (2.3) ▼	491 (2.8) ▼
Oman	414 (3.1) ▼	416 (3.6) ▼	443 (2.9) ▼	439 (2.5) ▼	428 (3.5) ▼	423 (3.2) ▼	428 (3.5) ▼
Palestinian Nat'l Auth.	402 (4.1) ▼	413 (4.2) ▼	414 (3.7) ▼	408 (3.7) ▼	407 (3.5) ▼	412 (4.0) ▼	396 (3.8) ▼
Qatar	318 (1.7) ▼	322 (1.8) ▼	347 (2.1) ▼	312 (1.9) ▼	325 (1.7) ▼	322 (1.5) ▼	+ +
Romania	459 (3.2) ▼	463 (4.0) ▼	458 (3.4) ▼	471 (3.3) ▼	451 (4.2) ▼	470 (3.5) ▼	460 (3.5) ▼
Russian Federation	525 (3.6) ▲	535 (3.7) ▲	519 (4.0) ▲	525 (3.4) ▲	534 (4.3) ▲	527 (3.8) ▲	520 (3.7) ▲
Saudi Arabia	407 (2.4) ▼	390 (2.5) ▼	408 (2.3) ▼	423 (2.3) ▼	417 (2.1) ▼	403 (2.7) ▼	395 (2.5) ▼
† Scotland	495 (3.2)	497 (3.2)	494 (3.7)	498 (3.2)	480 (3.9) ▼	495 (3.1)	511 (3.6) ▲
<sup>1 2</sup> Serbia	474 (3.2) ▼	467 (3.7) ▼	467 (3.0) ▼	466 (3.8) ▼	485 (2.8) ▼	469 (3.6) ▼	455 (3.5) ▼
Singapore	564 (4.2) ▲	560 (4.1) ▲	575 (3.9) ▲	541 (4.1) ▲	554 (4.5) ▲	567 (4.2) ▲	564 (4.1) ▲
Slovenia	530 (2.3) ▲	539 (2.5) ▲	524 (2.0) ▲	542 (2.2) ▲	533 (2.0) ▲	533 (2.2) ▲	538 (2.2) ▲
Sweden	515 (2.4) ▲	499 (2.4) ▼	506 (2.7) ▲	510 (3.0) ▲	505 (2.3) ▲	509 (2.7) ▲	517 (2.6) ▲
Syrian Arab Republic	459 (2.7) ▼	450 (2.9) ▼	447 (2.7) ▼	448 (3.2) ▼	474 (2.9) ▼	445 (3.0) ▼	440 (2.7) ▼
Thailand	478 (4.5) ▼	462 (4.1) ▼	458 (4.2) ▼	488 (3.8) ▼	473 (4.4) ▼	472 (4.1) ▼	473 (4.0) ▼
Tunisia	452 (2.2) ▼	458 (2.5) ▼	432 (2.5) ▼	447 (1.8) ▼	441 (2.0) ▼	445 (2.3) ▼	458 (2.9) ▼
Turkey	462 (3.4) ▼	435 (5.2) ▼	445 (4.3) ▼	466 (3.3) ▼	462 (3.6) ▼	450 (3.6) ▼	462 (3.4) ▼
Ukraine	477 (3.4) ▼	490 (3.3) ▼	492 (3.9) ▼	482 (4.0) ▼	477 (3.8) ▼	488 (3.7) ▼	488 (3.9) ▼
<sup>2 †</sup> United States	530 (2.8) ▲	510 (2.7) ▲	503 (2.7) ▲	525 (3.1) ▲	512 (2.9) ▲	516 (2.7) ▲	529 (2.9) ▲
‡ Morocco	395 (3.5) ▼	416 (3.0) ▼	405 (3.1) ▼	397 (3.8) ▼	396 (3.1) ▼	400 (3.3) ▼	413 (3.0) ▼
<b>TIMSS Scale Avg.</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>
<b>Benchmarking Participants</b>							
Basque Country, Spain	498 (2.9)	472 (3.5) ▼	493 (3.4)	514 (2.8) ▲	490 (3.0) ▼	499 (2.9)	499 (3.3)
<sup>3</sup> British Columbia, Canada	535 (3.2) ▲	505 (2.7)	517 (2.8) ▲	530 (2.7) ▲	516 (2.9) ▲	521 (2.8) ▲	535 (3.0) ▲
♣ † Dubai, UAE	485 (3.4) ▼	493 (3.5) ▼	489 (3.4) ▼	490 (3.2) ▼	495 (3.3)	489 (3.1) ▼	483 (3.3) ▼
<sup>2</sup> Massachusetts, US	563 (4.3) ▲	540 (4.6) ▲	535 (5.0) ▲	560 (4.0) ▲	545 (4.2) ▲	550 (4.0) ▲	564 (4.0) ▲
<sup>2 †</sup> Minnesota, US	555 (5.2) ▲	519 (4.9) ▲	514 (4.8) ▲	545 (5.5) ▲	526 (4.8) ▲	534 (4.8) ▲	545 (5.3) ▲
<sup>2</sup> Ontario, Canada	537 (3.8) ▲	505 (3.4)	520 (4.1) ▲	530 (4.3) ▲	510 (3.3) ▲	522 (3.6) ▲	542 (4.0) ▲
<sup>3</sup> Quebec, Canada	513 (2.9) ▲	497 (3.1) ▼	492 (3.4) ▼	513 (3.5) ▲	495 (2.9) ▼	500 (3.1)	523 (3.1) ▲

▲ Country average significantly higher than TIMSS scale average ▼ Country average significantly lower than TIMSS scale average

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

♣ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A plus (+) sign indicates average achievement could not be accurately estimated.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

then England. In chemistry, top-performing Chinese Taipei was followed by Singapore, then by Japan, and then by a group of countries including Slovenia, Hungary, Korea, the Czech Republic, the Russian Federation, England, and the benchmarking state of Massachusetts. Singapore and Korea were the highest achievers in physics, followed by Japan and Chinese Taipei, and then by England. In earth science, the top performer was the U.S. state of Massachusetts. Other high performers included Chinese Taipei, Slovenia, Singapore, Korea, and the state of Minnesota, followed by the Czech Republic, Japan, Hong Kong SAR, Hungary, England, and the provinces of British Columbia and Ontario.

At the eighth grade, Chinese Taipei had the highest achievement in the knowing domain. It was followed by Singapore and the state of Massachusetts, which in turn were followed by Korea and the Russian Federation, and then by Japan, Slovenia, the Czech Republic, Hong Kong SAR, England, and the state of Minnesota. In the applying domain, the top performers were Singapore and Chinese Taipei. They were followed by Japan, and then by Hungary and the state of Massachusetts. Singapore, Japan, Korea, and the state of Massachusetts were the top performers in the reasoning domain.

### **In Which Science Content and Cognitive Domains Are Countries Relatively Strong or Weak?**

To highlight relative strengths and weaknesses in the science content and cognitive domains within each country, Exhibit 3.2 profiles average achievement in these domains relative to the overall level of performance in the country. For each TIMSS 2007 participant, Exhibit 3.2 displays the difference between average performance in each science content domain and the average across content domains for that participant, and similarly the difference between average performance in each science cognitive domain and the average across cognitive domains. This relative performance is presented in two panels for each country, one for content domains and one for cognitive domains. Average relative performance is represented by a small circle, with a bar extending above and below the circle to denote a 95 percent confidence interval for this average.

The profiles reveal that many countries performed relatively better in one content domain or in one cognitive domain than on average. At fourth grade, Denmark, El Salvador, Hungary, Italy, and the Netherlands performed relatively better in life science than in science overall, while Chinese Taipei, Hong Kong SAR, Japan, Qatar, and Slovenia performed relatively less well. Iran, Japan, Morocco, Qatar, Singapore, and Slovenia performed relatively better in physical science, while Austria, Denmark, Georgia, Italy, the Netherlands, New Zealand, Norway, Sweden, and the province of Quebec relatively less well. In earth science, Austria, Hong Kong SAR, New Zealand, Norway, Sweden, and Dubai performed relatively better and Hungary, Japan, and Singapore less well.

Differences at fourth grade in relative performance in the cognitive domains were mainly in the areas of knowing and reasoning. Austria, El Salvador, Georgia, Kuwait, Qatar, Scotland, and Singapore performed relatively better in knowing while Chinese Taipei, Japan, Morocco, and Slovenia relatively less well. Chinese Taipei, Japan, Latvia, Lithuania, Slovenia, and Tunisia performed relatively better in reasoning while Austria, El Salvador, and Georgia performed relatively less well. Algeria had higher relative performance in applying than in mathematics overall.

At eighth grade, many participants showed a relative strength or weakness in one or other of the content domains. Colombia, El Salvador, Italy, Lithuania, Syria, Turkey, the United States, and, among benchmarking participants, British Columbia, Massachusetts, Minnesota, and Ontario, performed relatively better in biology than in science overall while Cyprus, Iran, Malta, Oman, and Qatar performed relatively less well. In chemistry, countries that performed relatively better included Botswana, Chinese Taipei, Ghana, Lebanon, Tunisia, and Morocco, while participants that performed relatively less well included El Salvador, Italy, Korea, Lithuania, Oman, Saudi Arabia, Sweden, Turkey, the United States, and the benchmarking entities of the Basque Country, British Columbia, Minnesota, Ontario, and Quebec. In physics, Armenia, Japan, Korea, Kuwait, Malta, Oman, Qatar, and Singapore performed relatively better while Algeria, Colombia, Ghana, Lithuania, Norway, Slovenia, Thailand, Tunisia, the United States, the two U.S. states, and the province of Quebec relatively less well. Participants with

Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains

TIMSS2007  
Science 4<sup>th</sup> Grade



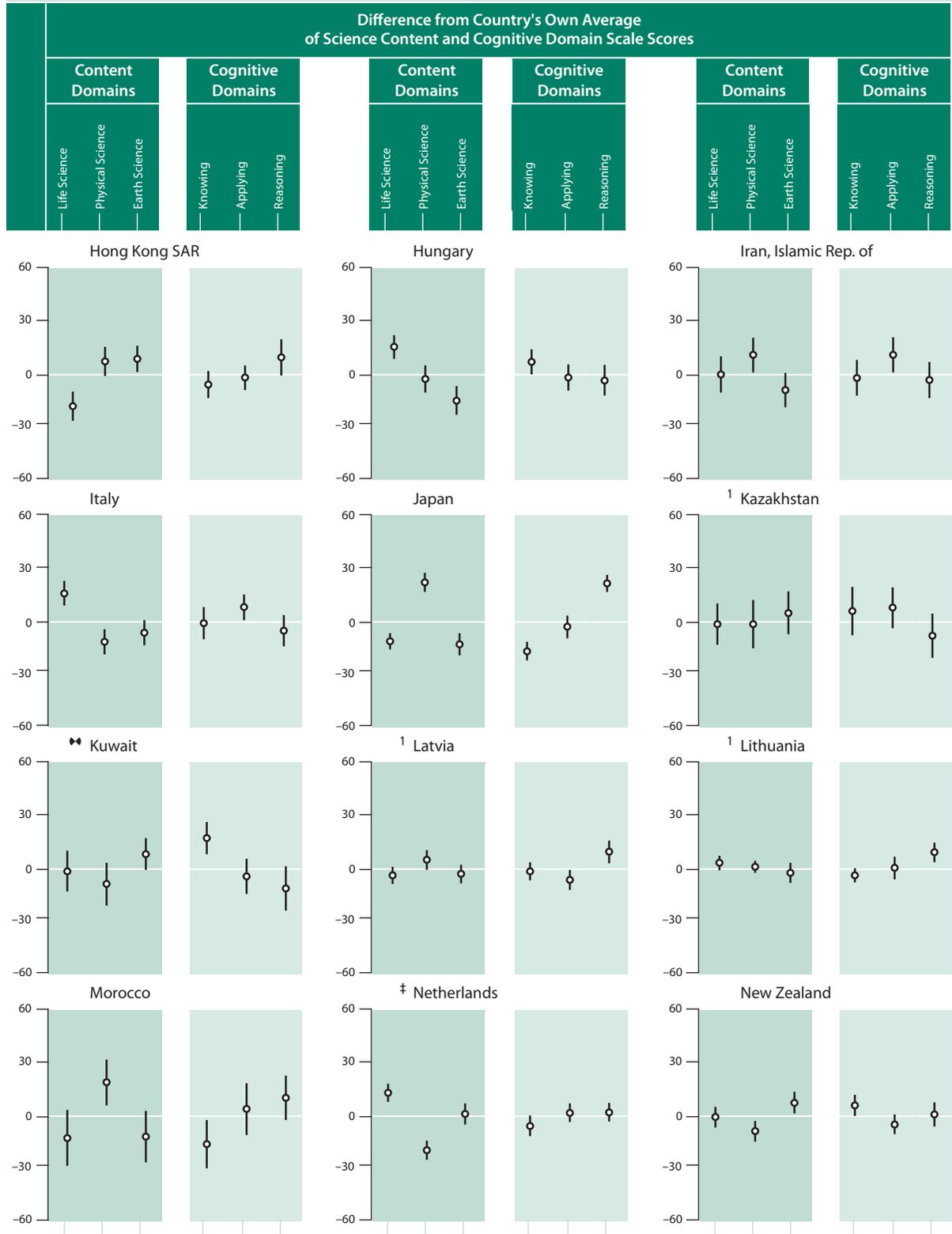
SOURCE: IEA's Trends in International Science and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
 \*\* Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.  
 Note: Average achievement could not be accurately estimated on all subscales for Yemen.

Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)

TIMSS 2007  
Science 4<sup>th</sup> Grade



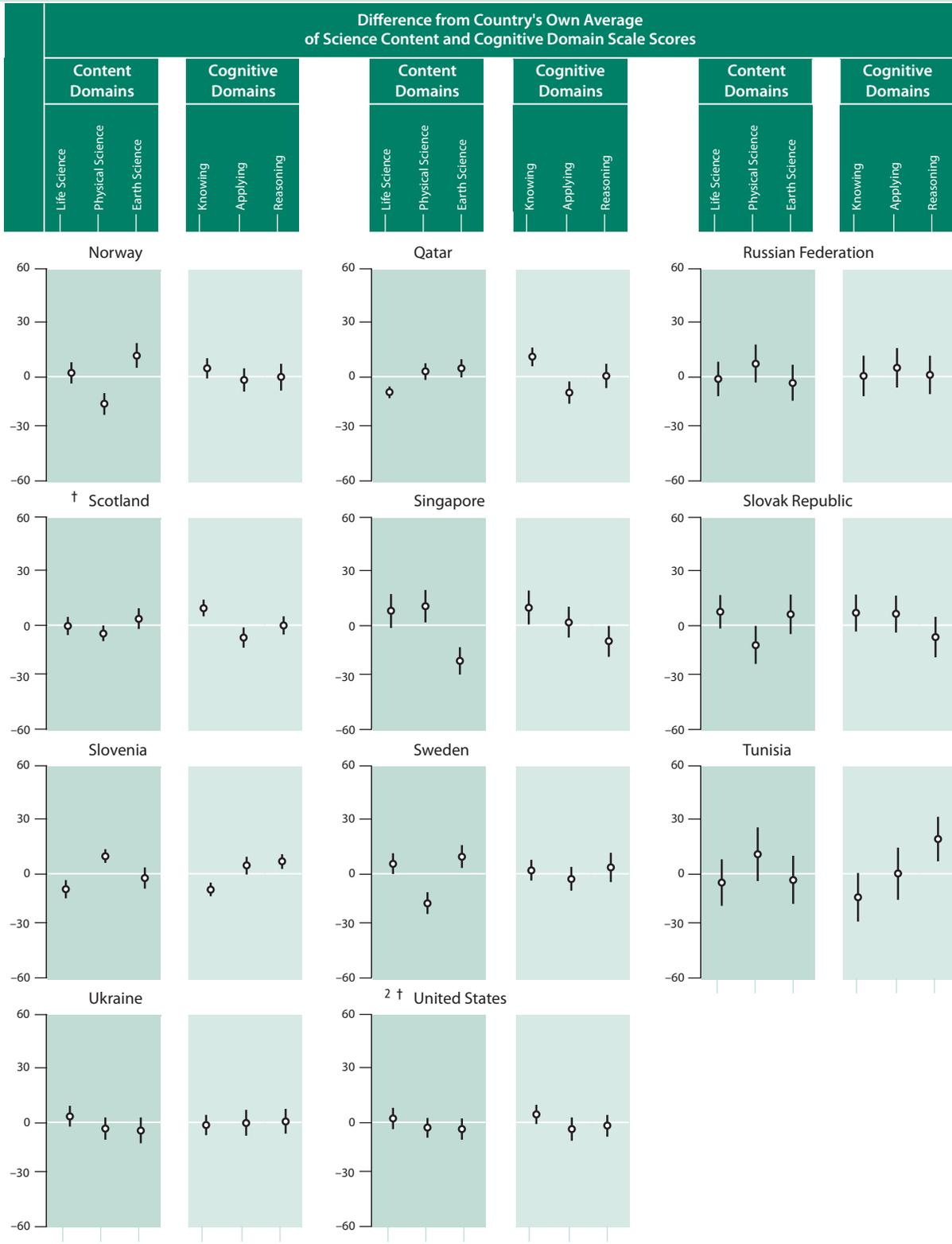
SOURCE: IEA's Trends in International Science and Science Study (TIMSS) 2007

Average and 95% confidence interval ( $\pm 2SE$ )  
Country's average of science content domain scale scores (set to 0)

Average and 95% confidence interval ( $\pm 2SE$ )  
Country's average of science cognitive domain scale scores (set to 0)

Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)

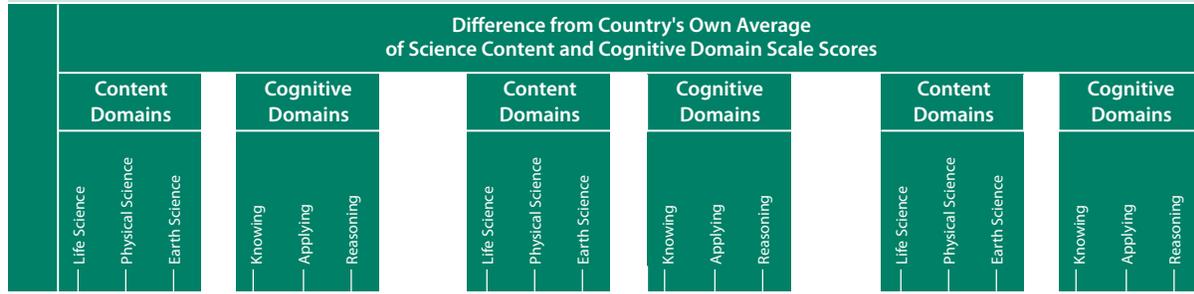
TIMSS2007  
Science 4<sup>th</sup> Grade



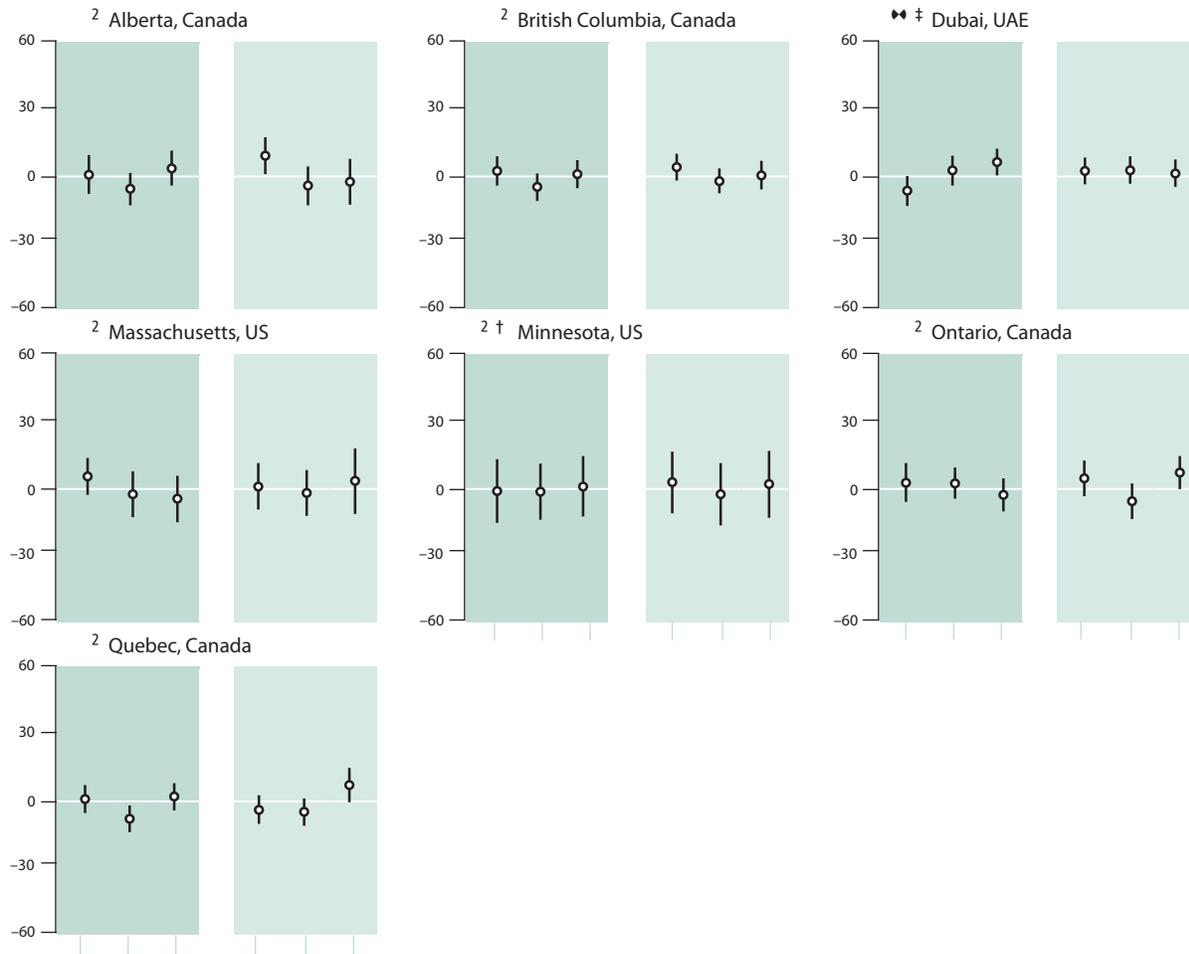
Average and 95% confidence interval ( $\pm 2SE$ )  
 Country's average of science content domain scale scores (set to 0)

**Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade



**Benchmarking Participants**



SOURCE: IEA's Trends in International Science and Science Study (TIMSS) 2007

Average and 95% confidence interval ( $\pm 2SE$ )  
 Country's average of science content domain scale scores (set to 0)

Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade



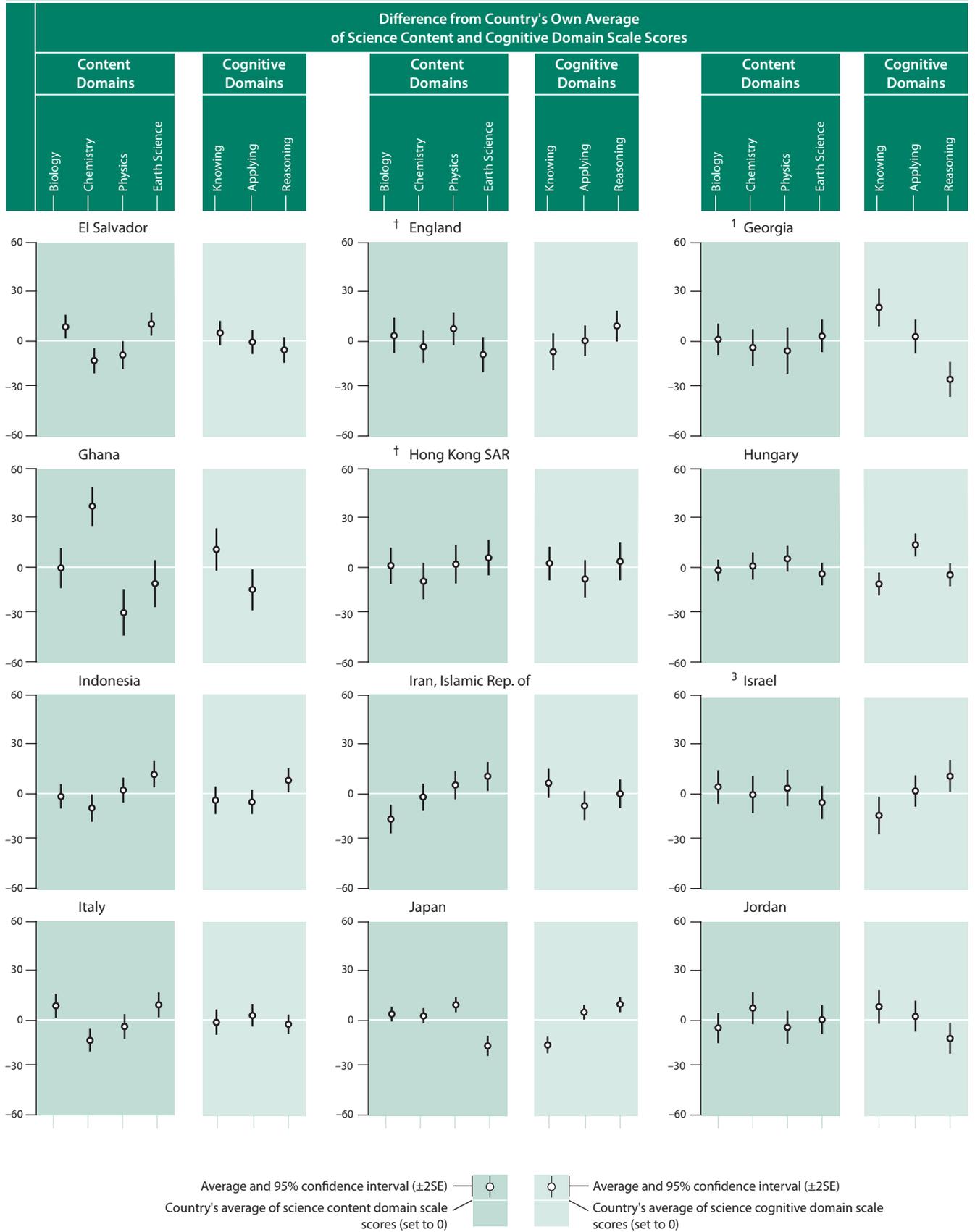
SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 ‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).  
 § Did not satisfy guidelines for sample participation rates (see Appendix A).

1 National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).  
 2 National Defined Population covers 90% to 95% of National Target Population (see Appendix A).  
 3 National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

Note: Average achievement could not be accurately estimated on the reasoning scale for Ghana and Qatar.

Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)

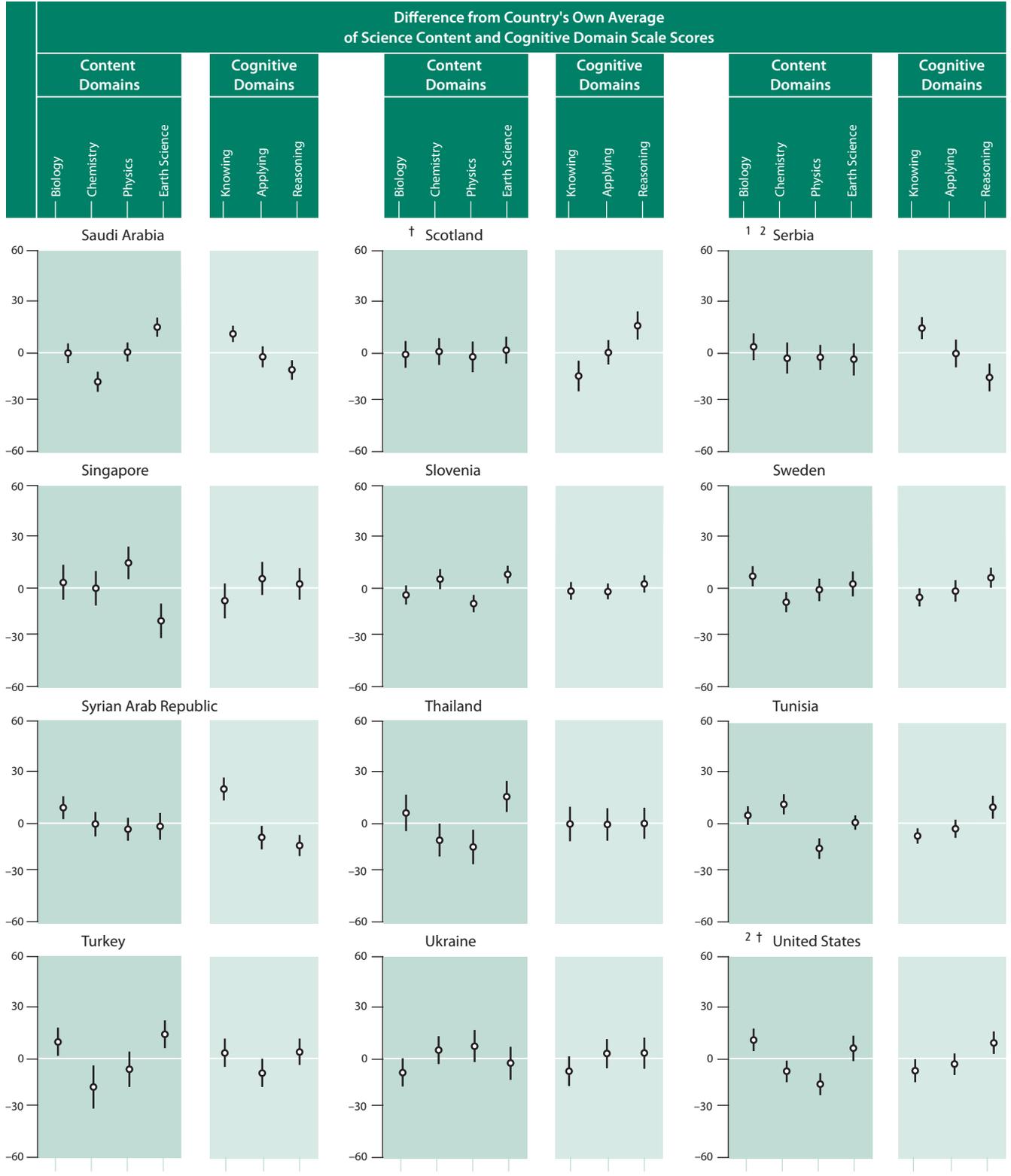
TIMSS2007  
Science 8<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

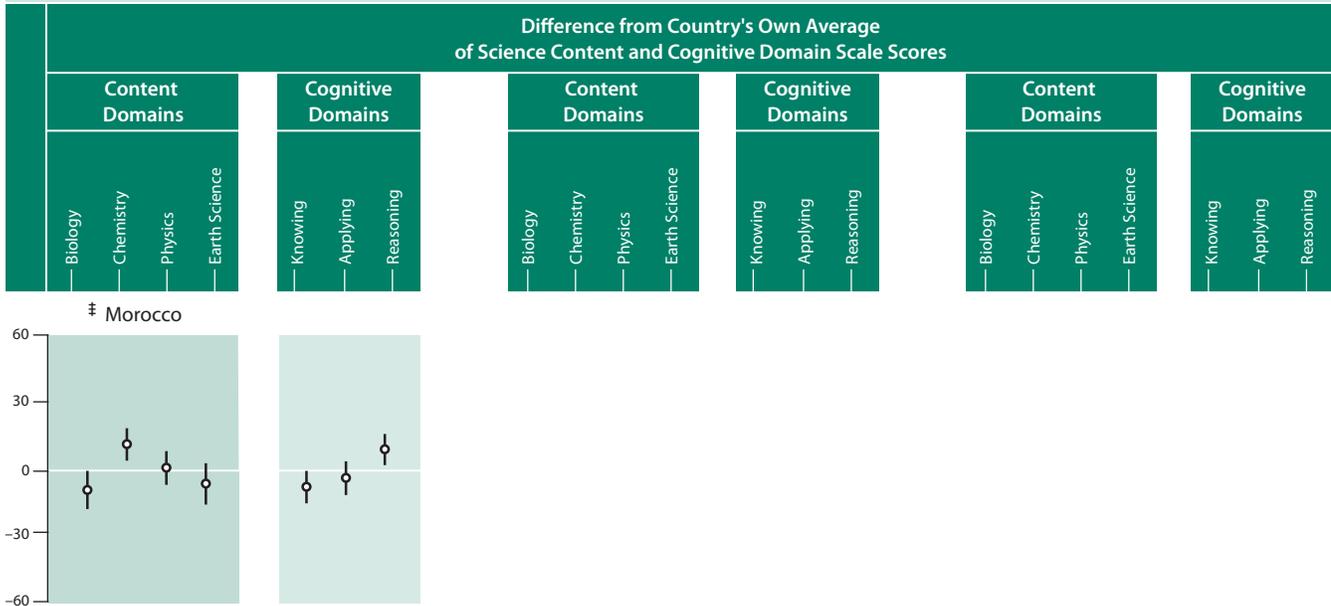


Average and 95% confidence interval ( $\pm 2SE$ )  
 Country's average of science content domain scale scores (set to 0)

Average and 95% confidence interval ( $\pm 2SE$ )  
 Country's average of science cognitive domain scale scores (set to 0)

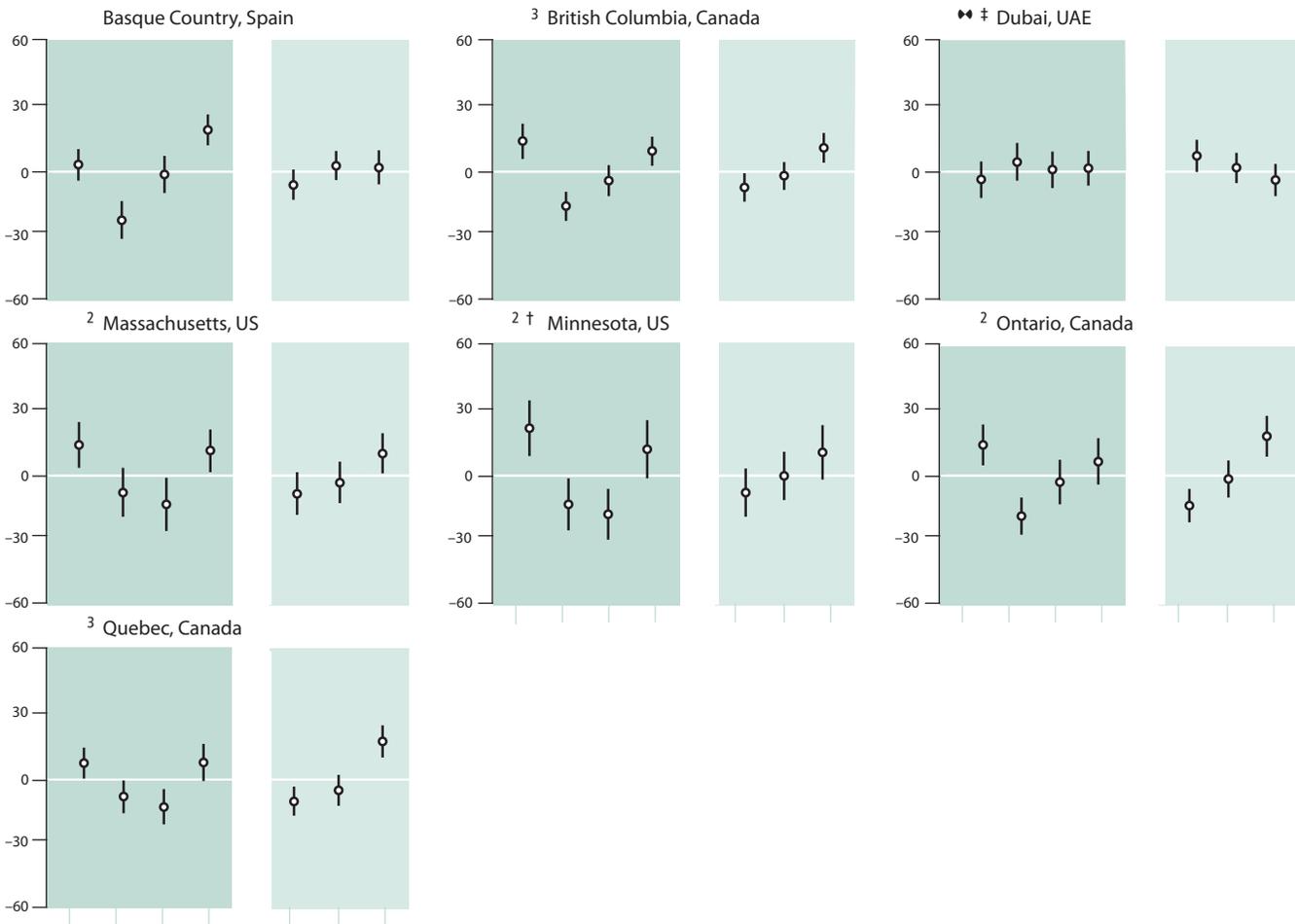
Exhibit 3.2 Profiles of Within-country Relative Performance in the Science Content and Cognitive Domains (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**



Average and 95% confidence interval ( $\pm 2SE$ )  
 Country's average of science content domain scale scores (set to 0)

relatively better performance in earth science included Egypt, El Salvador, Indonesia, Iran, Italy, Norway, Oman, Saudi Arabia, Slovenia, Thailand, Turkey, the Basque Country, the province of British Columbia, and the state of Massachusetts, while those performing relatively less well included Chinese Taipei, Colombia, Japan, Korea, Kuwait, Lebanon, Qatar, and Singapore.

As at fourth grade, differences in relative performance in the cognitive domains at the eighth grade were almost all in the domains of knowing and reasoning. Armenia and Hungary were exceptions, with relatively better performance in the applying domain than in science overall. Participants performing relatively better in knowing included Bosnia and Herzegovina, Bulgaria, Egypt, Georgia, Kuwait, Saudi Arabia, Serbia, and Syria, while those performing relatively less well included Australia, Cyprus, Hungary, Israel, Japan, Korea, Malta, Scotland, Tunisia, and the provinces of Ontario and Quebec. Australia, Israel, Japan, Korea, Lithuania, Malaysia, Malta, Scotland, Sweden, Tunisia, the United States, Morocco, and the benchmarking entities of British Columbia, Massachusetts, Ontario, and Quebec performed relatively better in the reasoning domain than in science overall, while Armenia, Bosnia and Herzegovina, Bulgaria, Chinese Taipei, Egypt, Georgia, the Palestinian National Authority, Saudi Arabia, Serbia, and the Syrian Arab Republic performed relatively less well.

### **What Are the Gender Differences in Achievement for the Science Content and Cognitive Domains?**

To elaborate on the gender differences in overall science achievement presented earlier in Exhibit 1.5, Exhibit 3.3 presents average achievement for boys and girls in each of the content and cognitive domains for fourth and eighth grades. As an additional basis for comparison, the international average for boys and girls (the average across all of the TIMSS 2007 countries) also is shown.

In both life science and physical science at the fourth grade, girls had significantly higher achievement than boys on average across countries. In life science, girls performed better in 10 countries and 2 benchmarking entities, whereas boys performed better in 5 countries. In physical science, girls performed better in 6 countries and 1 benchmarking entity, and boys performed better in 4 countries and 1 benchmarking entity. In earth science, however, the pattern was reversed, with boys performing better than girls in 16 countries and 4 benchmarking entities and girls performing better in 5 countries and 1 benchmarking entity.

Among cognitive domains at the fourth grade, girls performed better in reasoning than boys by an average of 12 points. Girls performed better on the reasoning scale in 19 countries and 4 benchmarking entities, while boys outperformed girls in just 2 countries. Although the average gender differences internationally in knowing and applying were not statistically significant, there were gender differences in many countries, more in favor of boys than girls. In the knowing domain, boys performed better than girls in 13 countries and 3 benchmarking entities and girls performed better in 4 countries and 1 benchmarking entity. In applying, boys performed better in 10 countries and 3 benchmarking entities, and girls performed better in 5 countries and 1 benchmarking entity.

At eighth grade, girls had higher achievement, on average across countries, in biology (11 points) and chemistry (11 points), while boys had higher achievement in physics (4 points). Girls performed better than boys in 26 countries in biology and in 21 countries in chemistry. In contrast, boys performed better than girls in biology in 5 countries and 1 benchmarking entity and in chemistry in 6 countries. In physics, boys performed better than girls in 27 countries and 5 benchmarking entities, whereas girls performed better than boys in 8 countries. Although there was no gender difference in earth science on average across countries, boys performed better than girls in 20 countries and 4 benchmarking entities, while girls performed better than boys in 11 countries.

At the eighth grade, girls performed better than boys, on average internationally, in all three cognitive domains—knowing, applying, and reasoning. As in the fourth grade, the girls' greatest advantage was in reasoning (10 points, on average), with girls outperforming boys in 19 countries and boys outperforming girls in just 5 countries. Although girls outperformed boys on average in both knowing (4 points) and applying (5 points), in each domain there were more participants with a difference favoring boys (in knowing, boys had higher average achievement in 15 countries and 5 benchmarking participants and girls in 13 countries; in applying, boys had higher achievement in 13 countries and 3 benchmarking entities and girls in 13 countries).

**Exhibit 3.3 Average Achievement in the Science Content and Cognitive Domains by Gender**
**TIMSS2007**  
**Science 4<sup>th</sup> Grade**

Country	Average Scale Scores for Science Content Domains					
	Life Science		Physical Science		Earth Science	
	Girls	Boys	Girls	Boys	Girls	Boys
Algeria	354 (7.3)	348 (6.5)	385 (5.7) ▲	370 (6.2)	370 (6.4)	360 (6.3)
Armenia	497 (7.3) ▲	482 (5.5)	499 (6.4) ▲	486 (4.4)	490 (6.3) ▲	468 (6.0)
Australia	528 (3.7)	529 (4.0)	520 (3.4)	525 (3.6)	531 (4.3)	538 (3.6)
Austria	522 (2.1)	529 (2.7) ▲	508 (2.8)	519 (2.9) ▲	524 (2.6)	540 (2.8) ▲
Chinese Taipei	541 (2.4)	541 (2.7)	560 (2.8)	559 (3.4)	548 (2.2)	558 (2.6) ▲
Colombia	400 (5.7)	417 (5.8) ▲	407 (5.4)	416 (5.5)	392 (5.9)	410 (6.8) ▲
Czech Republic	520 (3.1)	519 (3.4)	508 (3.4)	513 (3.1)	511 (3.0)	524 (2.7) ▲
† Denmark	527 (2.5)	527 (3.7)	500 (3.2)	505 (3.4)	515 (3.1)	529 (3.3) ▲
El Salvador	404 (4.8)	415 (4.3)	387 (5.0)	396 (4.7)	384 (4.4)	402 (4.7) ▲
England	536 (3.0) ▲	529 (3.4)	544 (2.8)	541 (3.5)	533 (3.2)	543 (3.5) ▲
<sup>1</sup> Georgia	430 (4.1)	424 (3.9)	422 (4.3) ▲	406 (4.9)	438 (6.0) ▲	426 (5.5)
Germany	527 (2.2)	531 (2.3) ▲	517 (2.8)	530 (3.0) ▲	512 (2.8)	535 (3.1) ▲
Hong Kong SAR	531 (3.3)	534 (4.2)	557 (3.3)	559 (4.4)	557 (2.7)	562 (4.1) ▲
Hungary	549 (3.8)	546 (3.3)	527 (4.2)	531 (3.7)	513 (4.4)	521 (4.6)
Iran, Islamic Rep. of	449 (5.9)	436 (6.4)	462 (5.7)	446 (6.1)	439 (5.8)	428 (5.2)
Italy	544 (3.5)	554 (3.6) ▲	516 (3.2)	525 (3.6) ▲	518 (3.4)	533 (3.5) ▲
Japan	532 (2.1)	528 (2.9)	565 (2.6)	564 (2.7)	528 (4.2)	529 (2.9)
<sup>1</sup> Kazakhstan	527 (4.6)	528 (6.0)	529 (5.4)	526 (6.9)	534 (5.0)	534 (6.5)
♦♦ Kuwait	384 (5.3) ▲	319 (8.7)	378 (5.9) ▲	311 (7.5)	391 (4.9) ▲	332 (7.2)
<sup>1</sup> Latvia	542 (2.5) ▲	529 (2.8)	546 (3.2)	542 (2.8)	534 (2.9)	537 (3.1)
<sup>1</sup> Lithuania	519 (2.1)	514 (2.4)	515 (1.9)	513 (2.1)	512 (3.4)	509 (3.2)
Morocco	300 (8.4) ▲	284 (7.0)	330 (6.8)	318 (7.3)	296 (7.5)	289 (7.8)
‡ Netherlands	532 (2.7)	539 (2.8) ▲	499 (2.9)	506 (2.7) ▲	513 (3.8)	533 (3.0) ▲
New Zealand	512 (3.0) ▲	501 (3.8)	500 (3.2)	497 (3.2)	512 (2.9)	518 (3.0) ▲
Norway	487 (3.6)	486 (3.0)	468 (3.5)	469 (3.0)	492 (3.6)	501 (3.4) ▲
Qatar	302 (2.1) ▲	279 (2.2)	319 (3.7) ▲	287 (3.7)	316 (1.9) ▲	293 (3.3)
Russian Federation	541 (5.0)	536 (4.5)	549 (5.1)	545 (4.8)	536 (4.9)	537 (4.5)
† Scotland	505 (2.9)	502 (2.7)	498 (2.4)	501 (2.5)	505 (2.8)	510 (3.6)
Singapore	583 (4.1)	581 (4.7)	587 (4.5)	583 (4.0)	550 (3.7)	557 (3.7) ▲
Slovak Republic	530 (4.3)	533 (4.6)	509 (5.0)	516 (5.1)	525 (5.2)	536 (4.9) ▲
Slovenia	513 (2.5) ▲	508 (2.6)	530 (2.1)	530 (2.2)	514 (2.5)	520 (3.8)
Sweden	535 (2.7) ▲	527 (3.2)	508 (2.5)	509 (4.0)	533 (3.3)	537 (3.5)
Tunisia	338 (5.8) ▲	310 (6.2)	361 (6.8) ▲	321 (7.1)	339 (7.1) ▲	313 (6.8)
Ukraine	483 (3.1)	481 (2.8)	476 (3.9)	474 (3.0)	474 (4.0)	474 (3.5)
<sup>2</sup> † United States	538 (3.0)	541 (2.9)	532 (2.5)	536 (2.7)	531 (2.9)	536 (2.7) ▲
Yemen	++	++	++	++	++	++
International Avg.	487 (0.7) ▲	483 (0.8)	486 (0.7) ▲	482 (0.7)	483 (0.7)	485 (0.7)
<b>Benchmarking Participants</b>						
<sup>2</sup> Alberta, Canada	538 (4.0)	544 (4.0)	533 (3.9)	536 (3.4)	537 (3.9)	551 (3.3) ▲
<sup>2</sup> British Columbia, Canada	543 (3.8) ▲	534 (3.2)	530 (2.9)	531 (2.9)	534 (3.1)	540 (2.9) ▲
♦† Dubai, UAE	471 (4.2) ▲	446 (5.5)	480 (4.6) ▲	455 (5.8)	481 (4.4) ▲	462 (5.3)
<sup>2</sup> Massachusetts, US	567 (3.8)	570 (4.6)	555 (5.0)	566 (5.4) ▲	549 (4.9)	567 (5.0) ▲
<sup>2</sup> † Minnesota, US	543 (6.7)	547 (6.4)	545 (5.6)	545 (6.0)	545 (6.0)	549 (6.3)
<sup>2</sup> † Ontario, Canada	534 (4.1)	536 (4.3)	532 (4.5)	538 (3.4)	528 (3.8)	531 (3.5)
<sup>2</sup> Quebec, Canada	524 (3.3)	520 (2.9)	512 (2.9)	515 (3.2)	516 (3.4)	530 (3.0) ▲

▲ Average significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

♦♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A plus (+) sign indicates average achievement could not be accurately estimated.

**Exhibit 3.3 Average Achievement in the Science Content and Cognitive Domains by Gender (Continued)**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Average Scale Scores for Science Cognitive Domains					
	Knowing		Applying		Reasoning	
	Girls	Boys	Girls	Boys	Girls	Boys
Algeria	354 (6.6)	346 (5.7)	383 (6.4)	375 (6.3)	368 (6.5)	▲ 347 (6.2)
Armenia	494 (6.5) ▲	479 (4.8)	496 (7.3) ▲	478 (5.4)	491 (6.7) ▲	478 (5.0)
Australia	527 (3.3)	531 (3.9)	517 (4.2)	529 (4.0) ▲	534 (4.2)	526 (4.0)
Austria	521 (2.3)	537 (2.8) ▲	519 (2.4)	532 (2.7) ▲	514 (2.9)	513 (3.0)
Chinese Taipei	531 (3.1)	542 (2.6) ▲	554 (3.2)	558 (2.1)	578 (3.2) ▲	564 (2.9)
Colombia	399 (5.8)	419 (5.9) ▲	395 (5.5)	412 (6.0) ▲	405 (5.5)	413 (5.5) ▲
Czech Republic	514 (3.2)	525 (2.8) ▲	509 (3.8)	522 (3.4) ▲	517 (3.5) ▲	504 (3.9)
† Denmark	511 (3.3)	521 (3.7) ▲	512 (3.1)	519 (3.0) ▲	528 (5.4)	523 (3.9)
El Salvador	401 (5.0)	419 (4.6) ▲	384 (4.8)	402 (4.8) ▲	377 (5.7)	376 (5.9)
England	542 (3.5)	544 (3.3)	537 (3.0)	536 (3.1)	541 (3.0) ▲	534 (3.2)
<sup>1</sup> Georgia	435 (3.8)	434 (4.6)	432 (4.5) ▲	416 (5.4)	400 (6.4) ▲	378 (5.4)
Germany	519 (2.8)	536 (2.6) ▲	518 (2.6)	534 (2.5) ▲	524 (2.5)	526 (2.6)
Hong Kong SAR	542 (3.3)	549 (3.8) ▲	547 (3.4)	552 (3.5)	564 (4.3)	558 (5.2)
Hungary	536 (3.8)	544 (3.6)	528 (4.1)	534 (3.5)	534 (5.0)	524 (4.3)
Iran, Islamic Rep. of	442 (5.4)	433 (6.5)	455 (5.7)	446 (5.8)	450 (5.4) ▲	423 (6.6)
Italy	523 (4.0)	537 (4.3) ▲	533 (3.1)	545 (3.6) ▲	523 (3.7)	528 (4.1) ▲
Japan	527 (2.7)	530 (2.8)	544 (3.6)	541 (2.6)	571 (3.1)	564 (2.9)
<sup>1</sup> Kazakhstan	535 (5.5)	532 (6.9)	537 (5.1)	534 (5.8)	519 (5.7)	520 (6.3)
♦♦ Kuwait	388 (4.4) ▲	330 (6.4)	370 (5.2) ▲	304 (6.8)	367 (6.9) ▲	293 (8.2)
<sup>1</sup> Latvia	541 (2.6)	538 (2.8)	537 (2.9)	533 (2.8)	560 (3.3) ▲	542 (4.4)
<sup>1</sup> Lithuania	511 (2.2)	510 (2.3)	515 (2.8)	515 (3.7)	531 (2.5) ▲	518 (3.3)
Morocco	295 (6.6)	286 (7.1)	316 (7.6)	306 (6.9)	323 (6.3)	312 (8.0)
‡ Netherlands	511 (3.0)	524 (3.0) ▲	520 (2.5)	530 (2.8) ▲	526 (3.0)	525 (3.4)
New Zealand	513 (3.1)	508 (3.1)	498 (2.7)	501 (3.2)	514 (3.1) ▲	497 (4.0)
Norway	481 (3.1)	489 (2.9) ▲	476 (3.3)	481 (3.3)	485 (3.8) ▲	475 (3.8)
Qatar	314 (2.9) ▲	293 (2.7)	296 (3.1) ▲	269 (3.4)	308 (3.9) ▲	276 (2.8)
Russian Federation	543 (5.7)	540 (4.7)	547 (5.6)	546 (4.8)	548 (5.4)	537 (4.9)
† Scotland	510 (2.8)	512 (2.5)	491 (2.7)	496 (3.2)	505 (2.6) ▲	496 (3.3)
Singapore	583 (4.6)	591 (4.5) ▲	577 (3.7)	580 (4.2)	575 (4.3) ▲	561 (4.4)
Slovak Republic	522 (4.4)	532 (4.7) ▲	520 (4.8)	533 (4.5) ▲	516 (5.3)	511 (4.9)
Slovenia	512 (2.2)	511 (2.1)	524 (2.7)	526 (2.7)	530 (2.9)	525 (2.4)
Sweden	526 (2.6)	525 (3.6)	521 (3.0)	521 (3.5)	532 (4.0) ▲	523 (3.9)
Tunisia	331 (7.0) ▲	302 (6.2)	344 (6.4) ▲	316 (7.0)	366 (5.9) ▲	334 (5.6)
Ukraine	476 (3.0)	476 (2.8)	475 (3.8)	479 (4.0)	483 (3.7) ▲	474 (3.5)
<sup>2</sup> † United States	539 (2.6)	544 (2.8)	531 (3.1)	536 (3.2)	536 (3.0)	533 (2.8)
Yemen	++	++	++	++	++	++
International Avg.	484 (0.7)	485 (0.7)	485 (0.7)	484 (0.7)	490 (0.7) ▲	478 (0.7)
<b>Benchmarking Participants</b>						
<sup>2</sup> Alberta, Canada	543 (3.8)	554 (3.9) ▲	529 (3.8)	540 (4.4) ▲	542 (4.5) ▲	532 (5.0)
<sup>2</sup> British Columbia, Canada	539 (3.4)	540 (3.0)	532 (3.1)	534 (3.0)	541 (3.9) ▲	531 (3.6)
♦♦ ‡ Dubai, UAE	475 (5.0) ▲	452 (5.3)	473 (5.2) ▲	454 (4.8)	481 (5.4) ▲	445 (5.5)
<sup>2</sup> Massachusetts, US	560 (4.4)	573 (6.1) ▲	554 (4.8)	573 (5.6) ▲	570 (7.0)	567 (7.9)
<sup>2</sup> † Minnesota, US	548 (6.8)	552 (6.2)	540 (6.7)	549 (6.0)	551 (6.3)	547 (7.3)
<sup>2</sup> Ontario, Canada	533 (4.2)	543 (4.1) ▲	527 (4.1)	529 (3.9)	543 (3.9)	539 (3.8)
<sup>2</sup> Quebec, Canada	514 (3.4)	518 (3.3)	511 (3.1)	520 (3.3) ▲	533 (3.7) ▲	522 (3.7)

▲ Average significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



**Exhibit 3.3 Average Achievement in the Science Content and Cognitive Domains by Gender (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>** Grade

Country	Average Scale Scores for Science Content Domains											
	Biology		Chemistry		Physics		Earth Science					
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys				
Algeria	414 (2.3)	409 (2.7)	415 (2.9)	413 (2.1)	392 (2.6)	402 (2.9)	▲	413 (2.4)	413 (2.0)			
Armenia	494 (7.4)	487 (5.2)	484 (7.9)	473 (5.7)	504 (7.1)	502 (5.2)	▲	477 (7.3)	472 (5.4)			
Australia	515 (5.0)	522 (5.1)	497 (4.3)	512 (5.6)	▲	492 (5.5)	522 (5.6)	▲	505 (5.6)	532 (5.2)	▲	
Bahrain	507 (2.0)	▲	441 (2.8)	502 (3.5)	▲	436 (2.6)	488 (2.8)	▲	444 (3.5)	488 (2.8)	▲	443 (3.0)
Bosnia and Herzegovina	466 (3.3)	463 (3.6)	470 (2.9)	466 (3.7)	458 (3.7)	468 (3.7)	▲	466 (3.7)	472 (3.8)			
Botswana	374 (3.2)	▲	342 (4.0)	379 (4.2)	▲	363 (4.0)	352 (4.3)	350 (5.2)	371 (4.9)	▲	349 (4.4)	
Bulgaria	475 (6.1)	▲	459 (7.1)	482 (6.5)	▲	464 (7.1)	467 (6.0)	465 (6.9)	483 (6.0)	476 (6.1)		
Chinese Taipei	549 (3.3)	548 (4.1)	575 (4.4)	572 (5.1)	548 (3.6)	561 (4.5)	▲	541 (4.2)	549 (3.4)			
Colombia	420 (4.6)	449 (4.0)	▲	408 (3.7)	432 (3.5)	▲	388 (4.6)	427 (3.8)	▲	388 (5.0)	427 (4.5)	▲
Cyprus	455 (3.5)	▲	438 (2.7)	463 (3.1)	▲	442 (3.3)	462 (3.9)	453 (3.5)	463 (2.5)	▲	452 (3.4)	
Czech Republic	530 (2.2)	532 (3.4)	534 (3.4)	536 (2.8)	528 (2.8)	546 (2.4)	▲	525 (2.4)	542 (2.7)	▲		
Egypt	417 (4.9)	▲	397 (4.4)	426 (5.3)	▲	401 (5.4)	415 (4.9)	412 (4.2)	432 (5.6)	421 (4.8)		
El Salvador	392 (4.1)	405 (4.2)	▲	370 (4.7)	384 (4.2)	▲	363 (5.3)	399 (3.4)	▲	384 (4.5)	418 (3.7)	▲
† England	539 (4.6)	543 (5.4)	534 (4.3)	534 (5.2)	538 (4.2)	553 (5.4)	▲	523 (5.0)	536 (5.0)	▲		
<sup>1</sup> Georgia	434 (3.6)	▲	412 (5.2)	428 (4.8)	▲	407 (5.9)	425 (5.9)	▲	407 (6.4)	437 (4.5)	▲	413 (5.0)
Ghana	291 (6.0)	315 (5.0)	▲	327 (5.6)	355 (5.1)	▲	259 (7.6)	290 (6.2)	▲	279 (7.0)	307 (5.9)	▲
† Hong Kong SAR	531 (4.1)	523 (6.2)	522 (4.4)	513 (6.6)	525 (4.7)	532 (6.7)	532 (4.0)	532 (6.2)				
Hungary	533 (3.2)	535 (3.0)	534 (3.9)	538 (4.1)	529 (4.2)	553 (3.6)	▲	523 (3.6)	540 (3.3)	▲		
Indonesia	432 (3.6)	424 (3.8)	423 (4.3)	418 (3.9)	425 (3.5)	440 (4.2)	▲	439 (4.3)	444 (3.3)			
Iran, Islamic Rep. of	456 (4.9)	443 (5.3)	474 (4.9)	▲	453 (5.7)	472 (4.8)	469 (5.3)	479 (6.0)	473 (5.1)			
<sup>3</sup> Israel	479 (4.7)	▲	465 (5.2)	475 (5.8)	▲	459 (5.3)	472 (5.3)	471 (5.7)	461 (5.0)	464 (4.8)		
Italy	501 (3.3)	504 (3.3)	477 (3.0)	484 (3.5)	▲	481 (3.6)	497 (3.6)	▲	496 (3.6)	509 (3.8)	▲	
Japan	554 (2.6)	551 (2.5)	554 (2.7)	549 (2.9)	552 (3.2)	565 (2.6)	▲	527 (4.3)	538 (2.6)	▲		
Jordan	493 (5.4)	▲	464 (5.2)	514 (5.6)	▲	470 (5.8)	492 (5.9)	▲	467 (5.9)	496 (5.4)	▲	473 (4.9)
Korea, Rep. of	546 (2.8)	549 (2.2)	536 (2.9)	536 (2.7)	564 (2.9)	578 (2.9)	▲	530 (2.6)	546 (2.8)	▲		
♣ Kuwait	442 (3.3)	▲	393 (4.2)	445 (4.5)	▲	386 (5.2)	455 (3.7)	▲	418 (4.3)	427 (3.9)	▲	390 (4.3)
Lebanon	404 (6.1)	407 (7.4)	449 (5.7)	444 (7.0)	424 (5.2)	439 (6.0)	▲	384 (6.0)	395 (8.3)			
<sup>1</sup> Lithuania	532 (3.9)	▲	522 (2.8)	512 (3.8)	▲	501 (2.6)	497 (3.6)	514 (3.4)	▲	508 (3.4)	522 (2.8)	▲
Malaysia	476 (6.2)	▲	462 (6.4)	485 (5.6)	▲	472 (5.7)	484 (6.4)	483 (6.3)	463 (5.7)	462 (6.1)		
Malta	457 (1.9)	▲	448 (2.7)	462 (2.9)	460 (2.8)	461 (2.3)	479 (2.2)	▲	450 (2.2)	462 (2.3)	▲	
Norway	492 (3.0)	▲	482 (2.6)	484 (2.2)	482 (3.7)	468 (2.7)	482 (4.4)	▲	499 (2.8)	505 (3.1)	▲	
Oman	442 (4.1)	▲	383 (5.2)	450 (5.2)	▲	380 (4.8)	469 (4.5)	▲	416 (3.8)	461 (3.5)	▲	415 (4.0)
Palestinian Nat'l Auth.	419 (4.9)	▲	384 (6.1)	435 (5.0)	▲	391 (6.4)	428 (5.1)	▲	400 (5.7)	422 (4.5)	▲	395 (5.4)
Qatar	352 (2.1)	▲	284 (2.1)	355 (2.5)	▲	289 (3.0)	379 (1.7)	▲	314 (3.6)	342 (2.2)	▲	282 (2.3)
Romania	468 (3.9)	▲	451 (3.7)	470 (4.6)	▲	457 (4.4)	455 (4.3)	461 (4.6)	469 (3.8)	472 (4.1)		
Russian Federation	526 (3.9)	524 (4.5)	533 (3.7)	536 (4.5)	509 (5.0)	530 (4.0)	▲	520 (3.5)	530 (4.0)	▲		
Saudi Arabia	433 (3.6)	▲	384 (3.9)	411 (4.3)	▲	371 (3.8)	424 (2.8)	▲	393 (3.7)	442 (3.2)	▲	406 (3.4)
† Scotland	495 (3.4)	496 (4.1)	498 (4.0)	496 (4.0)	487 (4.4)	501 (4.7)	▲	491 (4.1)	505 (4.2)	▲		
<sup>1</sup> <sup>2</sup> Serbia	479 (3.5)	▲	469 (4.1)	471 (4.3)	▲	463 (4.0)	465 (3.8)	470 (3.8)	463 (4.9)	469 (4.0)		
Singapore	570 (4.4)	▲	558 (5.1)	567 (4.2)	▲	554 (5.0)	574 (4.4)	577 (4.6)	543 (4.2)	538 (5.2)		
Slovenia	534 (2.9)	▲	526 (3.1)	539 (3.0)	539 (2.8)	520 (2.7)	529 (2.6)	▲	537 (2.5)	547 (3.1)	▲	
Sweden	521 (2.8)	▲	509 (2.7)	502 (2.8)	497 (3.0)	501 (3.0)	511 (2.9)	▲	510 (3.5)	510 (3.6)		
Syrian Arab Republic	456 (3.8)	463 (3.9)	447 (3.9)	452 (4.1)	441 (3.3)	453 (4.1)	▲	445 (3.6)	452 (5.2)			
Thailand	489 (5.1)	▲	468 (4.8)	473 (4.6)	▲	451 (4.5)	460 (4.8)	455 (4.9)	493 (4.2)	▲	484 (4.4)	
Tunisia	446 (3.1)	458 (2.8)	▲	450 (2.8)	467 (2.6)	▲	418 (3.2)	447 (3.4)	▲	440 (2.9)	456 (3.2)	▲
Turkey	467 (3.9)	▲	458 (3.7)	443 (5.2)	▲	428 (6.5)	446 (4.5)	445 (4.7)	463 (3.7)	470 (4.5)		
Ukraine	481 (3.8)	▲	472 (4.0)	493 (4.1)	487 (3.3)	485 (4.4)	500 (5.1)	▲	476 (5.4)	489 (3.6)	▲	
<sup>2</sup> † United States	527 (3.2)	533 (2.9)	▲	508 (3.2)	512 (2.9)	491 (3.2)	514 (3.1)	▲	516 (3.5)	534 (3.7)	▲	
‡ Morocco	400 (4.0)	▲	388 (4.3)	418 (4.4)	413 (4.1)	398 (4.2)	412 (3.8)	▲	392 (4.8)	404 (4.8)	▲	
International Avg.	471 (0.6)	▲	460 (0.6)	471 (0.6)	▲	460 (0.6)	464 (0.6)	▲	468 (0.6)	▲	466 (0.5)	466 (0.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Basque Country, Spain	493 (3.5)	503 (3.8)	▲	470 (3.8)	475 (5.4)	484 (4.7)	502 (4.5)	▲	501 (4.5)	526 (4.4)	▲
<sup>3</sup> British Columbia, Canada	536 (3.7)	533 (3.5)	501 (3.5)	508 (3.4)	509 (2.8)	525 (3.8)	▲	527 (3.1)	533 (3.8)		
♣ Dubai, UAE	493 (5.3)	477 (6.7)	501 (5.3)	485 (6.0)	491 (4.5)	488 (6.0)	495 (5.4)	485 (6.2)			
<sup>2</sup> Massachusetts, US	562 (5.6)	563 (4.3)	539 (4.7)	542 (6.7)	525 (5.6)	544 (5.8)	▲	551 (4.4)	568 (4.5)	▲	
<sup>2</sup> † Minnesota, US	558 (4.8)	551 (6.9)	516 (5.5)	522 (5.9)	504 (5.2)	525 (5.7)	▲	542 (6.2)	547 (6.2)		
<sup>2</sup> Ontario, Canada	535 (4.1)	540 (4.5)	504 (3.7)	505 (4.0)	511 (5.1)	530 (4.6)	▲	523 (5.4)	536 (4.4)	▲	
<sup>3</sup> Quebec, Canada	512 (2.9)	513 (4.1)	494 (4.1)	499 (4.5)	486 (4.5)	497 (4.5)	506 (3.3)	520 (4.6)			

▲ Average significantly higher than other gender

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Appendix A).

† Did not satisfy guidelines for sample participation rates (see Appendix A).

<sup>1</sup> National Target Population does not include all of the International Target Population defined by TIMSS (see Appendix A).

<sup>2</sup> National Defined Population covers 90% to 95% of National Target Population (see Appendix A).

Exhibit 3.3 Average Achievement in the Science Content and Cognitive Domains by Gender (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Average Scale Scores for Science Cognitive Domains					
	Knowing		Applying		Reasoning	
	Girls	Boys	Girls	Boys	Girls	Boys
Algeria	409 (2.7)	410 (2.8)	410 (2.7)	411 (3.0)	416 (3.2)	411 (2.9)
Armenia	498 (8.3)	489 (5.6)	505 (6.7)	499 (5.2)	463 (8.5)	456 (5.4)
Australia	488 (4.6)	512 (4.9) ▲	501 (4.3)	519 (4.9) ▲	525 (5.2)	535 (5.2)
Bahrain	499 (2.6) ▲	440 (3.2)	498 (2.4) ▲	440 (2.7)	500 (1.9) ▲	438 (3.3)
Bosnia and Herzegovina	484 (3.9)	488 (4.2)	461 (3.4)	464 (3.1)	449 (3.8)	454 (3.4)
Botswana	376 (3.5) ▲	344 (3.7)	364 (4.0) ▲	351 (3.4)	377 (3.3) ▲	346 (4.0)
<sup>3</sup> Bulgaria	493 (6.2)	487 (6.7)	480 (6.6) ▲	463 (7.1)	455 (6.9) ▲	441 (7.0)
Chinese Taipei	560 (3.4)	570 (4.4) ▲	559 (3.8)	562 (3.9)	540 (3.6)	542 (4.0)
Colombia	401 (4.8)	437 (4.2) ▲	400 (3.5)	434 (3.5) ▲	416 (3.8)	440 (3.8) ▲
Cyprus	443 (3.6) ▲	434 (3.1)	465 (2.4) ▲	446 (3.1)	469 (2.9) ▲	450 (2.9)
Czech Republic	526 (2.4)	539 (2.8) ▲	534 (2.5)	544 (2.3) ▲	533 (3.0)	535 (2.8)
Egypt	443 (4.5) ▲	425 (5.3)	411 (4.6) ▲	397 (5.0)	403 (4.0) ▲	388 (4.7)
El Salvador	382 (4.2)	408 (4.3) ▲	377 (4.2)	401 (3.5) ▲	378 (3.9)	390 (5.4) ▲
† England	525 (5.1)	537 (6.2) ▲	532 (4.0)	544 (5.3) ▲	547 (4.3)	547 (5.1)
<sup>1</sup> Georgia	453 (4.8) ▲	427 (6.3)	433 (4.9) ▲	410 (5.1)	404 (4.9) ▲	385 (5.7)
Ghana	300 (7.1)	330 (5.9) ▲	271 (6.2)	307 (5.5) ▲	++	++
† Hong Kong SAR	528 (3.8)	536 (6.2)	524 (4.6)	520 (6.6)	541 (4.7) ▲	525 (7.0)
Hungary	516 (3.4)	532 (3.6) ▲	543 (3.4)	555 (3.4) ▲	526 (3.7)	534 (3.2) ▲
Indonesia	426 (4.3)	425 (4.2)	423 (3.3)	426 (3.9)	437 (3.7)	440 (3.7)
Iran, Islamic Rep. of	474 (5.0)	464 (5.8)	459 (5.4)	450 (5.4)	471 (4.6) ▲	454 (5.6)
<sup>3</sup> Israel	458 (5.4)	455 (6.0)	476 (4.5)	467 (5.5)	487 (5.0) ▲	475 (5.0)
Italy	489 (4.1)	499 (3.6) ▲	493 (3.2)	503 (3.3) ▲	488 (3.4)	497 (2.9) ▲
Japan	530 (3.5)	539 (3.2)	553 (2.8)	557 (2.5)	562 (2.8)	557 (2.7)
Jordan	506 (6.7) ▲	477 (6.2)	501 (5.8) ▲	470 (5.7)	489 (5.3) ▲	454 (5.7)
Korea, Rep. of	535 (2.3)	550 (2.7) ▲	544 (2.8)	550 (2.3) ▲	557 (2.5)	560 (2.6)
♦ Kuwait	447 (3.1) ▲	409 (4.0)	440 (3.5) ▲	389 (4.6)	437 (3.9) ▲	380 (5.2)
Lebanon	402 (6.0)	404 (7.2)	419 (6.1)	427 (6.8)	418 (5.5)	423 (7.2)
<sup>1</sup> Lithuania	510 (3.0)	516 (2.8)	514 (2.9)	510 (2.4)	527 (3.4)	527 (2.5)
Malaysia	461 (7.0)	454 (7.5)	477 (6.4)	469 (6.6)	492 (5.4)	482 (5.8)
Malta	434 (2.3)	439 (2.1)	461 (2.3)	464 (2.7)	475 (2.4)	472 (2.1)
Norway	486 (3.1)	485 (2.6)	486 (2.5)	486 (2.9)	492 (2.7)	490 (3.6)
Oman	455 (4.3) ▲	399 (5.4)	452 (3.8)	392 (4.7)	457 (4.3) ▲	397 (4.5)
Palestinian Nat'l Auth.	422 (4.6) ▲	391 (5.2)	430 (5.1) ▲	394 (5.4)	415 (5.1) ▲	375 (5.3)
Qatar	361 (3.7) ▲	289 (2.6)	358 (1.9) ▲	285 (2.5)	++	++
Romania	455 (4.7) ▲	447 (4.6)	473 (3.8)	468 (4.1)	466 (4.1) ▲	453 (4.2)
Russian Federation	530 (4.7)	539 (4.4) ▲	523 (4.1)	531 (4.1) ▲	520 (3.7)	521 (4.1)
Saudi Arabia	432 (2.9) ▲	404 (3.7)	426 (3.6) ▲	383 (4.3)	422 (3.5) ▲	371 (3.7)
† Scotland	474 (4.4)	487 (4.7) ▲	492 (3.3)	498 (3.8)	511 (3.6)	510 (4.5)
<sup>1 2</sup> Serbia	487 (3.3)	483 (3.7)	471 (3.6)	468 (4.7)	458 (4.4)	451 (4.3)
Singapore	556 (4.8)	552 (5.2)	570 (4.4)	565 (4.9)	572 (4.2) ▲	556 (4.7)
Slovenia	529 (2.4)	537 (2.8) ▲	532 (3.2)	535 (2.7)	540 (2.7)	536 (3.2)
Sweden	504 (2.8)	505 (3.1)	510 (3.3)	507 (2.9)	521 (3.1) ▲	513 (3.1)
Syrian Arab Republic	471 (3.4)	478 (4.5)	439 (3.6)	451 (4.0) ▲	439 (3.3)	441 (4.0)
Thailand	479 (4.8) ▲	466 (4.9)	480 (4.3) ▲	465 (4.7)	484 (4.1) ▲	462 (4.6)
Tunisia	432 (2.2)	450 (2.8) ▲	435 (2.7)	456 (2.5) ▲	452 (3.5)	465 (2.9) ▲
Turkey	463 (4.0)	461 (3.9)	450 (4.2)	449 (4.1)	469 (3.9) ▲	457 (4.0)
Ukraine	475 (4.5)	479 (4.0)	485 (4.3)	490 (4.3)	488 (4.5)	487 (4.2)
<sup>2</sup> † United States	503 (3.4)	521 (3.1) ▲	510 (3.0)	522 (2.9) ▲	528 (3.1)	530 (3.0)
‡ Morocco	397 (5.2)	394 (4.7)	400 (4.7)	400 (3.9)	415 (3.8)	410 (4.1)
International Avg.	468 (0.6) ▲	464 (0.6)	468 (0.6) ▲	463 (0.6)	477 (0.6) ▲	467 (0.7)
<b>Benchmarking Participants</b>						
Basque Country, Spain	481 (4.0)	499 (3.9) ▲	490 (3.4)	508 (3.8) ▲	495 (4.1)	502 (4.5)
<sup>3</sup> British Columbia, Canada	509 (3.1)	523 (3.5) ▲	518 (3.0)	524 (3.2)	536 (3.5)	533 (3.4)
♦ † Dubai, UAE	500 (5.7)	489 (5.8)	493 (5.4)	484 (5.5)	491 (5.1)	475 (6.6)
<sup>2</sup> Massachusetts, US	538 (4.8)	551 (5.4) ▲	545 (4.2)	555 (5.1) ▲	562 (4.7)	566 (4.3)
<sup>2</sup> † Minnesota, US	522 (4.5)	531 (6.5)	531 (5.0)	538 (5.8)	548 (5.2)	542 (6.2)
<sup>2</sup> Ontario, Canada	500 (3.6)	520 (3.8) ▲	519 (4.2)	526 (4.3)	541 (4.9)	544 (5.2)
<sup>3</sup> Quebec, Canada	489 (2.8)	502 (4.2) ▲	497 (3.3)	504 (4.1)	523 (3.1)	523 (4.8)

▲ Average significantly higher than other gender

<sup>3</sup> National Defined Population covers less than 90% of National Target Population (but at least 77%, see Appendix A).

♦ Kuwait and Dubai, UAE tested the same cohort of students as other countries, but later in 2007, at the beginning of the next school year.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A plus (+) sign indicates average achievement could not be accurately estimated.





# Chapter 4



## *Students' Backgrounds and Attitudes Toward Science*

In describing the educational context in which learning takes place, TIMSS focuses primarily on curricular, instructional, and school resource factors that are expected to have an impact on mathematics and science learning and that may be modified through policy initiatives. However, there is ample evidence from previous IEA studies of science achievement<sup>1</sup> and other studies that student achievement is related to home background factors, and to student activities and attitudes. Since information on such factors is very important in interpreting the achievement results, this chapter presents detailed information about students' home backgrounds and resources for learning, homework, their attitude toward science, the value they place on science, and their self-confidence in learning science. As a point of reference, an average across the participating countries (not including the benchmarking participants) is provided at the bottom of the table for each of the response categories for each background factor and attitude index (labeled the international average (avg.)).

### **What Educational Resources Do Students Have in Their Homes?**

For the 2007 data presented in this report, TIMSS has focused on just a few central variables: level of parents' education; speaking the language of the test at home; students having their parents born in the country; having books, computers, and Internet connections at home; and computer use at home and elsewhere.

<sup>1</sup> For example, for results from TIMSS 2003, see Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., & Chrostowski, S.J. (2004). *TIMSS 2003 international science report: Findings from IEA's Trends in International Mathematics and Science Study at the fourth and eighth grades*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Exhibit 4.1 summarizes eighth grade students' reports of the highest level of education attained by their parents. Ordered alphabetically by country, this two-page display shows the percentage of students in each of five categories of parents' educational level, together with the average science achievement of students in each category. Because students sometimes were in doubt as to their parents' educational attainment, a sixth category for students reporting "I do not know" also was included. Standard errors for percentages and averages are shown. The education level of the parent with more education was used in assigning students to categories.

As shown in the exhibit, and in line with the diversity in economic development described in the introduction, the level of parents' education varied widely both across and within the TIMSS 2007 countries and benchmarking participants. On average across countries,<sup>2</sup> 23 percent of students had at least one parent with a university degree, 14 percent had a parent who had completed post-secondary education but not university, 26 percent a parent who completed upper-secondary school, 15 percent a parent who completed lower-secondary school, 9 percent had neither parent completing secondary school, and 13 percent did not know. Countries with the highest percentages of students (40% or more) with university-educated parents included Armenia, Georgia, Korea, Kuwait, Qatar, the Ukraine, and the United States, as well as Dubai, Massachusetts, and Minnesota among benchmarking participants. In contrast, countries where students reported the greatest percentages (30% or more) of parents with less than lower secondary education included Iran, Oman, and Morocco.

Differences in educational approaches, organizations, and structures across the TIMSS participants make comparisons of educational levels difficult, and this is exacerbated by high levels of "Do Not Know" responses in some countries. Ten countries had 20 percent or more of students in this response category, most notably Norway (46%) and Sweden (50%) but also including Australia (28%), Botswana (20%), Israel (26%), Japan (21%), Lithuania (24%), Malta (27%), Singapore (21%), and Slovenia (22%), as well as four benchmarking participants: British Columbia, Dubai, Minnesota, and Ontario. Nonetheless, Exhibit 4.1 makes it clear that higher levels of

2 The international average is based on all participating countries, but does not include the benchmarking participants.

parents' education are associated with higher average science achievement in almost all countries. At 499 score points, the average science achievement of eighth grade students with university-educated parents was 85 points greater than the average of students whose parents had less than lower secondary schooling. It can be noted, however, that in some high performing countries, students whose parents have little education have relatively high achievement (higher than students with university educated parents in many countries).

TIMSS has shown previously that, with some exceptions, countries with large proportions of students from homes where the language of the test (and consequently the language of instruction) is not often spoken had lower average science achievement than those who spoke it more often. Exhibit 4.2, which presents students' reports of how frequently they spoke the language of the TIMSS test at home, together with average science achievement and changes since TIMSS 2003, shows that this pattern continued in 2007. At both fourth and eighth grades, on average across countries, a large majority of students reported always or almost always speaking the language of the test at home (84% at fourth grade and 78% at eighth grade), and these students had higher average science achievement than those who reported speaking it less frequently—483 points on average compared with 438 for those fourth grade students who sometimes speak the language of the test at home and 386 for those who never do so, and, at the eighth grade, 471 compared to 438 and 409, respectively.

The overall pattern notwithstanding, there were several countries where students who only sometimes or never speak the language of the test at home did have the highest average science achievement. At the fourth grade, these included Kazakhstan, Kuwait, Morocco, Tunisia, and the Ukraine and at the eighth grade, Egypt, Kuwait, Morocco, and Tunisia. Compared with 2003, a number of countries had increased percentages of students reporting that they frequently spoke the language of the test at home, including, at the fourth grade, Chinese Taipei, Hong Kong SAR, Italy, Scotland, and Singapore, and at the eighth grade, Australia, Botswana, Egypt, Italy, Jordan, Lebanon, Romania, Singapore, and, among benchmarking participants, the Basque Country.

Exhibit 4.1 Highest Level of Education of Either Parent\*

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	University Degree**		Completed Post-secondary Education but Not University		Completed Upper-secondary School	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Algeria	15 (0.9)	418 (3.2)	12 (0.6)	418 (4.0)	22 (0.7)	409 (2.7)
Armenia	52 (1.7)	493 (6.4)	23 (0.9)	489 (5.9)	16 (1.0)	478 (7.6)
Australia	19 (1.1)	569 (5.2)	23 (0.9)	524 (4.8)	16 (0.7)	504 (3.7)
Bahrain	21 (0.6)	494 (2.9)	8 (0.5)	482 (5.9)	33 (0.9)	476 (2.3)
Bosnia and Herzegovina	15 (1.0)	510 (4.9)	16 (0.6)	480 (4.7)	54 (1.1)	464 (2.8)
Botswana	15 (0.6)	376 (5.3)	17 (0.8)	339 (6.5)	17 (0.7)	348 (4.6)
Bulgaria	22 (1.7)	496 (8.3)	31 (1.4)	489 (5.9)	28 (1.5)	451 (9.0)
Chinese Taipei	20 (1.4)	608 (3.9)	12 (0.7)	589 (4.3)	42 (1.0)	557 (3.4)
Colombia	20 (1.1)	455 (4.6)	9 (0.6)	444 (5.2)	20 (0.7)	418 (4.6)
Cyprus	30 (0.8)	481 (2.6)	12 (0.5)	473 (4.6)	37 (0.7)	446 (2.7)
Czech Republic	17 (0.9)	582 (3.5)	11 (0.5)	550 (3.7)	57 (0.9)	534 (1.9)
Egypt	15 (0.7)	406 (5.3)	19 (1.0)	448 (5.1)	14 (0.6)	425 (5.8)
El Salvador	13 (1.1)	433 (5.6)	9 (0.7)	413 (5.7)	19 (0.9)	397 (4.2)
England	--	--	--	--	--	--
Georgia	47 (2.1)	438 (5.4)	0 (0.0)	~ ~	33 (2.1)	415 (5.9)
Ghana	11 (0.8)	349 (11.2)	20 (0.9)	317 (7.2)	24 (0.9)	306 (5.2)
Hong Kong SAR	13 (1.0)	557 (6.1)	12 (0.6)	542 (6.7)	28 (0.8)	532 (5.1)
Hungary	29 (1.3)	577 (4.2)	13 (0.7)	549 (3.8)	45 (1.2)	531 (2.6)
Indonesia	9 (0.8)	477 (6.3)	6 (0.5)	460 (6.9)	25 (1.2)	442 (4.5)
Iran, Islamic Rep. of	10 (1.0)	523 (9.1)	10 (1.0)	496 (5.5)	18 (1.0)	480 (4.8)
Israel	38 (1.2)	507 (4.7)	10 (0.6)	469 (7.0)	17 (0.8)	448 (8.8)
Italy	21 (1.2)	523 (3.4)	5 (0.4)	509 (7.1)	37 (1.1)	506 (2.9)
Japan	34 (1.0)	582 (3.1)	16 (0.6)	558 (3.6)	27 (1.0)	535 (2.9)
Jordan	29 (1.1)	514 (4.6)	18 (0.9)	508 (4.3)	28 (0.9)	474 (4.2)
Korea, Rep. of	44 (1.4)	576 (2.4)	3 (0.3)	571 (6.0)	39 (1.2)	541 (2.2)
Kuwait	43 (1.4)	433 (3.9)	15 (0.8)	429 (4.5)	26 (0.9)	403 (3.7)
Lebanon	20 (1.3)	476 (7.2)	19 (1.2)	439 (6.9)	16 (1.1)	419 (6.1)
Lithuania	14 (0.8)	558 (4.3)	34 (0.9)	530 (3.0)	23 (1.1)	509 (3.1)
Malaysia	13 (1.0)	515 (8.0)	17 (0.8)	494 (6.5)	34 (0.9)	475 (5.5)
Malta	11 (0.4)	525 (4.0)	11 (0.4)	498 (4.5)	13 (0.5)	483 (4.2)
Norway	39 (1.0)	513 (2.1)	6 (0.4)	491 (5.2)	6 (0.5)	468 (6.6)
Oman	16 (0.9)	440 (5.0)	4 (0.4)	446 (10.5)	18 (0.8)	435 (4.2)
Palestinian Nat'l Auth.	24 (0.9)	437 (5.8)	13 (0.6)	427 (6.0)	35 (0.9)	404 (4.4)
Qatar	48 (0.6)	343 (2.7)	4 (0.2)	335 (9.0)	19 (0.5)	306 (4.1)
Romania	13 (1.0)	510 (6.0)	14 (0.9)	491 (4.6)	44 (1.4)	463 (4.3)
Russian Federation	38 (1.3)	555 (4.1)	34 (1.3)	528 (5.0)	12 (1.0)	499 (6.6)
Saudi Arabia	31 (1.2)	426 (3.4)	5 (0.5)	416 (9.1)	20 (0.9)	406 (3.3)
Scotland	--	--	--	--	--	--
Serbia	20 (1.2)	510 (4.7)	16 (0.8)	479 (4.1)	51 (1.3)	465 (3.6)
Singapore	20 (0.7)	634 (4.2)	19 (0.6)	580 (5.2)	28 (0.7)	563 (4.8)
Slovenia	24 (0.9)	570 (3.3)	35 (1.0)	540 (2.9)	15 (0.7)	525 (5.1)
Sweden	19 (0.8)	538 (3.5)	13 (0.6)	537 (3.4)	13 (0.6)	510 (4.4)
Syrian Arab Republic	15 (0.9)	469 (4.0)	22 (0.9)	467 (4.0)	23 (0.8)	447 (3.8)
Thailand	12 (1.1)	539 (9.6)	5 (0.3)	502 (9.2)	14 (0.6)	488 (5.6)
Tunisia	13 (1.1)	469 (3.9)	17 (0.9)	460 (3.5)	25 (1.0)	439 (2.7)
Turkey	7 (0.8)	554 (7.0)	3 (0.3)	513 (8.0)	20 (1.2)	485 (4.0)
Ukraine	40 (1.4)	512 (3.7)	34 (0.9)	491 (3.7)	12 (0.8)	444 (5.9)
United States	44 (1.2)	545 (3.3)	7 (0.4)	514 (4.6)	21 (0.6)	509 (2.5)
‡ Morocco	20 (1.3)	426 (4.5)	0 (0.0)	~ ~	18 (1.0)	405 (5.0)
International Avg.	23 (0.2)	499 (0.9)	14 (0.1)	483 (1.0)	26 (0.1)	461 (0.8)
<b>Benchmarking Participants</b>						
Basque Country, Spain	--	--	--	--	--	--
British Columbia, Canada	39 (1.6)	544 (3.3)	15 (0.7)	521 (4.4)	15 (0.8)	519 (4.7)
Dubai, UAE	41 (1.0)	527 (2.6)	15 (0.9)	486 (5.4)	14 (0.6)	452 (4.9)
Massachusetts, US	56 (1.6)	580 (4.5)	6 (0.6)	524 (9.0)	16 (1.2)	525 (7.7)
Minnesota, US	46 (1.7)	557 (5.6)	9 (0.7)	545 (6.3)	18 (1.3)	525 (4.7)
Ontario, Canada	37 (1.9)	550 (3.6)	19 (0.9)	522 (4.4)	11 (0.8)	522 (5.5)
Quebec, Canada	39 (1.4)	529 (4.6)	18 (0.9)	510 (3.5)	21 (1.1)	489 (4.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

\* Based on countries' categorizations to UNESCO's International Standard Classification of Education (Operational Manual for ISCED-1997).

\*\* Includes postgraduate degrees (e.g., doctorate, master's, other postgraduate degree or diploma).

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

Note: The distribution of students' reports on parents' educational levels may not match the distribution from national population statistics, particularly where large percentages of students report that they "Do not know" (e.g., Sweden).



Exhibit 4.1 Highest Level of Education of Either Parent\* (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Completed Lower-secondary School		Less than Lower-secondary School		Do Not Know	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Algeria	26 (0.8)	403 (2.9)	19 (1.2)	405 (2.9)	6 (0.3)	398 (3.8)
Armenia	2 (0.4)	~ ~	1 (0.2)	~ ~	6 (0.5)	457 (7.6)
Australia	14 (0.9)	492 (5.5)	1 (0.2)	~ ~	28 (0.9)	501 (5.1)
Bahrain	15 (0.6)	442 (3.8)	6 (0.5)	455 (7.2)	18 (0.6)	452 (3.5)
Bosnia and Herzegovina	12 (0.9)	418 (6.1)	1 (0.3)	~ ~	3 (0.3)	429 (9.7)
Botswana	18 (0.6)	350 (4.4)	14 (0.7)	361 (6.2)	20 (0.8)	382 (4.3)
Bulgaria	10 (1.3)	438 (14.9)	1 (0.3)	~ ~	9 (0.9)	451 (10.0)
Chinese Taipei	14 (0.9)	521 (5.0)	3 (0.4)	516 (10.6)	9 (0.5)	518 (8.7)
Colombia	23 (0.9)	403 (5.0)	23 (1.2)	394 (4.2)	6 (0.5)	393 (7.4)
Cyprus	9 (0.4)	425 (4.8)	4 (0.3)	398 (7.0)	7 (0.6)	402 (6.4)
Czech Republic	2 (0.2)	~ ~	0 (0.0)	~ ~	13 (0.6)	500 (3.8)
Egypt	29 (1.1)	400 (4.2)	14 (0.8)	384 (5.8)	10 (0.7)	390 (6.5)
El Salvador	39 (1.3)	373 (2.8)	16 (1.1)	369 (4.4)	4 (0.4)	368 (7.9)
England	--	--	--	--	--	--
Georgia	2 (0.3)	~ ~	0 (0.1)	~ ~	18 (1.2)	402 (6.7)
Ghana	27 (1.2)	287 (6.0)	12 (0.8)	299 (10.1)	6 (0.6)	295 (10.5)
Hong Kong SAR	29 (0.9)	525 (6.3)	3 (0.3)	525 (9.7)	16 (0.8)	510 (5.7)
Hungary	7 (0.9)	464 (8.8)	1 (0.2)	~ ~	5 (0.6)	522 (6.9)
Indonesia	24 (0.9)	413 (4.2)	28 (1.4)	413 (3.9)	9 (0.6)	397 (5.3)
Iran, Islamic Rep. of	28 (1.0)	446 (4.1)	31 (1.5)	432 (3.5)	3 (0.3)	413 (10.3)
Israel	7 (0.6)	416 (9.5)	3 (0.4)	409 (15.4)	26 (1.0)	457 (6.0)
Italy	24 (1.1)	472 (4.5)	3 (0.3)	432 (11.0)	10 (0.7)	458 (5.6)
Japan	2 (0.2)	~ ~	0 (0.1)	~ ~	21 (0.8)	537 (3.2)
Jordan	9 (0.5)	444 (7.4)	9 (0.8)	443 (7.6)	7 (0.6)	443 (10.5)
Korea, Rep. of	3 (0.3)	517 (7.1)	1 (0.1)	~ ~	10 (0.6)	509 (4.2)
Kuwait	0 (0.0)	~ ~	16 (0.9)	401 (4.4)	0 (0.0)	~ ~
Lebanon	13 (1.0)	382 (8.7)	19 (1.6)	366 (9.2)	13 (0.9)	403 (8.7)
Lithuania	4 (0.5)	453 (6.7)	0 (0.1)	~ ~	24 (1.0)	504 (4.2)
Malaysia	19 (0.9)	450 (5.4)	7 (0.6)	445 (10.2)	11 (1.0)	425 (11.8)
Malta	34 (0.7)	435 (3.1)	3 (0.3)	408 (10.9)	27 (0.6)	436 (3.4)
Norway	2 (0.2)	~ ~	1 (0.1)	~ ~	46 (0.9)	473 (2.7)
Oman	17 (0.7)	429 (4.2)	31 (1.1)	422 (3.5)	14 (0.9)	389 (5.7)
Palestinian Nat'l Auth.	11 (0.6)	385 (6.2)	9 (0.7)	378 (8.3)	8 (0.6)	353 (9.5)
Qatar	13 (0.4)	279 (4.1)	7 (0.3)	303 (4.6)	9 (0.4)	294 (4.9)
Romania	9 (1.0)	437 (9.9)	2 (0.4)	~ ~	17 (1.0)	434 (5.0)
Russian Federation	5 (0.5)	489 (7.8)	0 (0.1)	~ ~	10 (0.8)	502 (6.4)
Saudi Arabia	17 (0.9)	387 (4.8)	23 (1.2)	388 (4.5)	5 (0.5)	396 (8.0)
Scotland	--	--	--	--	--	--
Serbia	7 (0.9)	407 (9.7)	0 (0.1)	~ ~	5 (0.4)	440 (6.8)
Singapore	6 (0.4)	529 (9.0)	6 (0.4)	510 (8.8)	21 (0.7)	530 (7.2)
Slovenia	4 (0.4)	491 (7.6)	1 (0.1)	~ ~	22 (0.9)	531 (3.0)
Sweden	4 (0.3)	491 (5.6)	1 (0.2)	~ ~	50 (1.1)	500 (3.1)
Syrian Arab Republic	25 (1.0)	445 (3.5)	11 (0.8)	447 (5.4)	4 (0.4)	425 (8.0)
Thailand	26 (0.9)	453 (4.1)	26 (1.6)	457 (6.3)	18 (1.1)	451 (4.5)
Tunisia	25 (1.0)	433 (3.0)	12 (0.9)	438 (4.0)	8 (0.5)	443 (4.2)
Turkey	52 (1.3)	439 (3.9)	16 (1.0)	419 (4.8)	1 (0.2)	~ ~
Ukraine	5 (0.4)	430 (5.9)	0 (0.1)	~ ~	8 (0.6)	451 (6.7)
United States	7 (0.5)	469 (4.9)	2 (0.2)	~ ~	18 (0.5)	504 (3.6)
‡ Morocco	16 (1.0)	390 (6.4)	36 (1.7)	396 (4.1)	10 (0.9)	384 (6.9)
International Avg.	15 (0.1)	433 (1.3)	9 (0.1)	414 (1.6)	13 (0.1)	441 (1.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Benchmarking Participants

Basque Country, Spain	--	--	--	--	--	--
British Columbia, Canada	3 (0.3)	486 (11.0)	0 (0.1)	~ ~	28 (0.9)	513 (3.8)
Dubai, UAE	6 (0.4)	420 (6.7)	3 (0.4)	423 (12.0)	21 (1.1)	481 (5.9)
Massachusetts, US	3 (0.4)	499 (9.8)	1 (0.2)	~ ~	18 (0.9)	537 (8.6)
Minnesota, US	3 (0.6)	463 (12.6)	1 (0.3)	~ ~	23 (1.4)	523 (5.9)
Ontario, Canada	2 (0.3)	~ ~	0 (0.1)	~ ~	31 (1.6)	508 (5.6)
Quebec, Canada	3 (0.3)	485 (6.5)	0 (0.1)	~ ~	19 (0.9)	487 (4.1)



Exhibit 4.2 Students Speak the Language of the Test at Home with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Always or Almost Always			Sometimes			Never		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	56 (2.4)	360 (6.5)	0 0	32 (1.9)	358 (9.3)	0 0	12 (1.0)	339 (9.0)	0 0
Armenia	95 (0.6)	486 (5.9)	0 (0.8)	4 (0.4)	458 (12.0)	0 (0.6)	1 (0.4)	~ ~	1 (0.4)
Australia	90 (1.0)	533 (3.0)	-1 (1.5)	8 (1.0)	487 (8.7)	1 (1.4)	1 (0.2)	~ ~	0 (0.3)
Austria	88 (0.7)	534 (2.5)	0 0	10 (0.6)	458 (4.0)	0 0	2 (0.3)	~ ~	0 0
Chinese Taipei	84 (0.8)	564 (1.9)	12 (1.4) ▲	15 (0.8)	527 (3.9)	-11 (1.4) ▼	1 (0.2)	~ ~	0 (0.2)
Colombia	89 (0.9)	408 (5.5)	0 0	8 (0.8)	371 (7.4)	0 0	3 (0.3)	346 (12.8)	0 0
Czech Republic	97 (0.3)	516 (3.2)	0 0	2 (0.3)	~ ~	0 0	0 (0.1)	~ ~	0 0
Denmark	94 (0.9)	522 (2.7)	0 0	6 (0.9)	450 (11.6)	0 0	1 (0.2)	~ ~	0 0
El Salvador	93 (0.8)	396 (3.2)	0 0	5 (0.6)	351 (10.4)	0 0	2 (0.3)	~ ~	0 0
England	93 (0.6)	546 (2.9)	-2 (1.0)	6 (0.6)	487 (8.4)	2 (0.9) ▲	1 (0.1)	~ ~	0 (0.2)
Georgia	92 (0.7)	422 (4.5)	0 0	8 (0.6)	393 (9.3)	0 0	0 (0.1)	~ ~	0 0
Germany	92 (0.6)	537 (2.4)	0 0	7 (0.6)	456 (5.4)	0 0	1 (0.1)	~ ~	0 0
Hong Kong SAR	82 (0.9)	561 (3.3)	7 (1.5) ▲	15 (0.9)	529 (5.4)	-5 (1.3) ▼	3 (0.3)	486 (10.1)	-2 (0.5) ▼
Hungary	98 (0.4)	538 (3.3)	-1 (0.5)	2 (0.4)	~ ~	1 (0.5)	0 (0.1)	~ ~	0 (0.1)
Iran, Islamic Rep. of	62 (2.1)	459 (4.9)	4 (4.0)	21 (1.9)	408 (6.3)	0 (2.7)	16 (1.6)	388 (6.4)	-4 (3.0)
Italy	96 (0.2)	537 (3.2)	5 (0.6) ▲	3 (0.2)	488 (9.0)	-3 (0.5) ▼	0 (0.1)	~ ~	-2 (0.3) ▼
Japan	99 (0.2)	549 (2.1)	0 (0.3)	1 (0.1)	~ ~	0 (0.2)	0 (0.1)	~ ~	0 (0.1)
Kazakhstan	93 (1.3)	532 (5.5)	0 0	7 (1.3)	551 (9.9)	0 0	0 (0.1)	~ ~	0 0
Kuwait	74 (1.8)	356 (5.0)	0 0	18 (1.3)	361 (6.4)	0 0	8 (1.2)	351 (11.1)	0 0
Latvia	88 (1.5)	546 (2.0)	-2 (2.1)	9 (1.1)	504 (6.0)	2 (1.5)	3 (0.6)	524 (11.6)	0 (0.8)
Lithuania	98 (0.4)	515 (2.3)	1 (0.8)	2 (0.3)	~ ~	-1 (0.7)	0 (0.1)	~ ~	0 (0.2)
Morocco	50 (2.6)	299 (7.9)	4 (3.5)	29 (2.1)	325 (10.9)	1 (2.7)	21 (2.4)	276 (15.5)	-6 (3.4)
Netherlands	89 (1.2)	527 (2.8)	-3 (1.4) ▼	8 (0.8)	487 (7.8)	1 (1.2)	3 (0.6)	519 (12.4)	2 (0.6) ▲
New Zealand	87 (0.8)	512 (2.4)	-2 (1.1) ▼	12 (0.7)	454 (6.3)	2 (1.0) ▲	1 (0.2)	~ ~	0 (0.2)
Norway	94 (0.5)	480 (3.5)	1 (0.7)	5 (0.4)	426 (8.0)	-1 (0.6)	1 (0.2)	~ ~	0 (0.3)
Qatar	71 (0.6)	325 (2.5)	0 0	20 (0.6)	242 (4.4)	0 0	9 (0.3)	207 (7.7)	0 0
Russian Federation	92 (1.4)	549 (4.6)	2 (2.5)	7 (1.2)	524 (17.4)	-2 (2.1)	2 (0.6)	~ ~	0 (0.8)
Scotland	91 (0.8)	504 (2.3)	4 (1.2) ▲	6 (0.5)	468 (6.1)	-3 (0.9) ▼	3 (0.6)	446 (10.9)	0 (0.7)
Singapore	50 (0.9)	620 (4.1)	4 (2.0) ▲	45 (0.9)	559 (4.4)	-2 (1.8)	5 (0.4)	508 (8.2)	-2 (0.7) ▼
Slovak Republic	87 (1.5)	536 (3.2)	0 0	11 (1.3)	465 (13.0)	0 0	3 (0.7)	473 (25.4)	0 0
Slovenia	90 (0.8)	523 (2.0)	0 (1.3)	8 (0.7)	477 (5.8)	0 (1.2)	2 (0.4)	~ ~	0 (0.5)
Sweden	92 (1.0)	530 (2.6)	0 0	8 (1.0)	466 (5.6)	0 0	1 (0.1)	~ ~	0 0
Tunisia	26 (1.7)	325 (8.9)	--	49 (2.0)	338 (6.4)	--	25 (1.8)	303 (8.8)	--
Ukraine	74 (2.1)	471 (3.4)	0 0	21 (1.7)	488 (5.2)	0 0	5 (0.6)	476 (8.5)	0 0
United States	87 (0.8)	548 (2.4)	0 (1.2)	12 (0.8)	482 (4.4)	0 (1.1)	2 (0.1)	~ ~	0 (0.2)
Yemen	85 (1.7)	208 (7.8)	0 0	11 (1.3)	176 (9.4)	0 0	4 (0.9)	153 (14.7)	0 0
International Avg.	84 (0.2)	483 (0.7)		12 (0.2)	438 (1.5)		4 (0.1)	386 (3.2)	
<b>Benchmarking Participants</b>									
Alberta, Canada	87 (1.4)	548 (3.7)	0 0	11 (1.2)	511 (5.8)	0 0	2 (0.3)	~ ~	0 0
British Columbia, Canada	87 (1.2)	543 (2.5)	0 0	12 (1.1)	505 (7.0)	0 0	1 (0.3)	~ ~	0 0
Dubai, UAE	55 (2.4)	486 (4.2)	0 0	39 (2.1)	452 (5.4)	0 0	6 (0.8)	404 (14.1)	0 0
Massachusetts, US	93 (1.0)	575 (3.8)	0 0	6 (1.0)	519 (13.0)	0 0	1 (0.2)	~ ~	0 0
Minnesota, US	89 (2.5)	560 (4.7)	0 0	10 (2.3)	481 (17.5)	0 0	1 (0.4)	~ ~	0 0
Ontario, Canada	85 (1.0)	541 (3.2)	-1 (1.5)	13 (0.9)	517 (6.3)	0 (1.4)	2 (0.4)	~ ~	1 (0.5)
Quebec, Canada	90 (0.9)	519 (2.6)	-1 (1.3)	8 (0.8)	498 (5.6)	1 (1.1)	1 (0.2)	~ ~	0 (0.3)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by students.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

A diamond (0) indicates the country did not participate in the assessment.


**TIMSS & PIRLS**  
 International Study Center  
 Lynch School of Education, Boston College

Exhibit 4.2 Students Speak the Language of the Test at Home with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Always or Almost Always			Sometimes			Never		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	57 (1.7)	410 (2.1)	∅ ∅	31 (1.2)	409 (2.1)	∅ ∅	11 (1.1)	399 (4.8)	∅ ∅
Armenia	97 (0.5)	489 (5.8)	1 (0.8)	3 (0.4)	441 (10.6)	-1 (0.7)	0 (0.1)	~ ~	0 (0.2)
Australia	96 (0.5)	517 (3.5)	4 (1.6) ▲	4 (0.5)	471 (13.1)	-3 (1.4) ▼	1 (0.1)	~ ~	-1 (0.4)
Bahrain	81 (0.8)	468 (1.9)	0 (1.3)	14 (0.6)	469 (4.8)	-1 (0.9)	5 (0.5)	474 (6.9)	1 (0.7)
Bosnia and Herzegovina	98 (0.4)	466 (2.8)	∅ ∅	2 (0.3)	~ ~	∅ ∅	0 (0.1)	~ ~	∅ ∅
Botswana	34 (1.0)	360 (4.5)	23 (1.2) ▲	62 (1.0)	361 (3.0)	-18 (1.2) ▼	5 (0.4)	271 (8.8)	-4 (0.7) ▼
Bulgaria	87 (2.1)	480 (5.7)	--	12 (1.9)	414 (12.4)	--	1 (0.3)	~ ~	--
Chinese Taipei	83 (1.2)	570 (3.5)	3 (1.8)	16 (1.1)	517 (6.0)	-3 (1.7)	1 (0.2)	~ ~	0 (0.3)
Colombia	96 (0.3)	419 (3.5)	∅ ∅	4 (0.3)	374 (5.7)	∅ ∅	0 (0.1)	~ ~	∅ ∅
Cyprus	91 (0.5)	455 (2.1)	-1 (0.8)	6 (0.4)	425 (6.6)	0 (0.6)	2 (0.3)	~ ~	0 (0.4)
Czech Republic	98 (0.3)	539 (1.9)	∅ ∅	2 (0.3)	~ ~	∅ ∅	0 (0.1)	~ ~	∅ ∅
Egypt	82 (1.2)	408 (3.6)	7 (1.6) ▲	15 (1.0)	420 (6.0)	-7 (1.4) ▼	3 (0.4)	401 (12.1)	0 (0.5)
El Salvador	97 (0.3)	389 (2.9)	∅ ∅	2 (0.3)	~ ~	∅ ∅	1 (0.2)	~ ~	∅ ∅
England	97 (0.4)	543 (4.5)	0 (0.7)	2 (0.3)	~ ~	0 (0.6)	0 (0.1)	~ ~	0 (0.2)
Georgia	95 (0.9)	423 (4.7)	∅ ∅	5 (0.9)	407 (17.4)	∅ ∅	0 (0.1)	~ ~	∅ ∅
Ghana	31 (1.2)	308 (7.4)	-2 (1.8)	66 (1.3)	307 (5.0)	3 (1.8)	3 (0.5)	225 (13.5)	-2 (1.0)
Hong Kong SAR	91 (1.0)	537 (4.4)	-2 (1.2)	8 (0.7)	477 (10.2)	1 (0.9)	2 (0.4)	~ ~	0 (0.4)
Hungary	99 (0.3)	540 (2.8)	-1 (0.4)	1 (0.2)	~ ~	0 (0.3)	1 (0.2)	~ ~	0 (0.2)
Indonesia	35 (2.8)	428 (5.3)	2 (3.6)	58 (2.5)	426 (4.2)	0 (3.2)	7 (0.6)	436 (6.9)	-3 (1.0) ▼
Iran, Islamic Rep. of	63 (2.2)	479 (4.1)	-2 (3.9)	22 (1.7)	426 (4.6)	1 (2.5)	15 (1.3)	423 (4.6)	0 (2.3)
Israel	92 (0.7)	471 (4.3)	-1 (0.9)	6 (0.6)	462 (10.5)	1 (0.8)	1 (0.3)	~ ~	0 (0.3)
Italy	99 (0.1)	496 (2.8)	3 (0.4) ▲	1 (0.1)	~ ~	-2 (0.3) ▼	0 (0.1)	~ ~	-1 (0.2)
Japan	98 (0.2)	555 (1.9)	0 (0.3)	1 (0.2)	~ ~	0 (0.3)	0 (0.1)	~ ~	0 (0.1)
Jordan	89 (0.9)	484 (4.0)	4 (1.4) ▲	8 (0.7)	471 (9.0)	-3 (1.0) ▼	3 (0.4)	469 (12.2)	-1 (0.7)
Korea, Rep. of	95 (0.4)	556 (2.1)	-4 (0.5) ▼	5 (0.4)	512 (7.4)	4 (0.4) ▲	0 (0.1)	~ ~	0 (0.1)
Kuwait	67 (1.2)	417 (3.0)	∅ ∅	19 (0.8)	428 (4.5)	∅ ∅	14 (0.9)	414 (6.5)	∅ ∅
Lebanon	20 (1.2)	435 (8.6)	4 (1.5) ▲	64 (1.7)	416 (5.5)	-5 (2.0) ▼	16 (1.2)	391 (9.2)	1 (1.5)
Lithuania	98 (0.4)	519 (2.6)	0 (0.8)	2 (0.4)	~ ~	0 (0.6)	0 (0.1)	~ ~	0 (0.3)
Malaysia	64 (2.1)	474 (6.2)	-2 (3.2)	28 (1.6)	469 (8.7)	0 (2.5)	9 (0.9)	457 (15.5)	2 (1.2)
Malta	17 (0.4)	509 (4.7)	∅ ∅	46 (0.7)	456 (2.3)	∅ ∅	38 (0.7)	436 (2.3)	∅ ∅
Norway	96 (0.4)	490 (2.2)	0 (0.6)	3 (0.3)	428 (7.8)	0 (0.5)	1 (0.2)	~ ~	0 (0.3)
Oman	76 (1.9)	422 (3.1)	∅ ∅	19 (1.6)	429 (5.3)	∅ ∅	5 (0.6)	436 (9.4)	∅ ∅
Palestinian Nat'l Auth.	87 (1.4)	406 (3.8)	3 (1.8)	10 (1.1)	406 (8.8)	-3 (1.4) ▼	3 (0.5)	396 (15.7)	1 (0.6)
Qatar	72 (0.4)	350 (2.1)	∅ ∅	20 (0.4)	255 (4.1)	∅ ∅	8 (0.3)	201 (5.6)	∅ ∅
Romania	98 (0.3)	463 (3.9)	5 (1.7) ▲	1 (0.3)	~ ~	-3 (1.0) ▼	0 (0.0)	~ ~	-2 (1.0) ▼
Russian Federation	93 (1.8)	531 (3.7)	-2 (2.2)	6 (1.6)	504 (13.1)	2 (1.9)	1 (0.3)	~ ~	0 (0.4)
Saudi Arabia	72 (2.2)	404 (2.7)	--	18 (1.5)	409 (3.9)	--	11 (1.1)	398 (4.9)	--
Scotland	96 (0.5)	498 (3.3)	-1 (0.6)	3 (0.4)	464 (10.8)	0 (0.5)	1 (0.2)	~ ~	0 (0.3)
Serbia	97 (0.8)	472 (3.1)	-1 (0.9)	2 (0.6)	~ ~	0 (0.7)	1 (0.2)	~ ~	0 (0.2)
Singapore	47 (0.9)	603 (4.1)	4 (1.3) ▲	46 (0.8)	540 (5.3)	-3 (1.1) ▼	7 (0.4)	515 (10.0)	-1 (0.6)
Slovenia	90 (1.1)	543 (2.1)	-1 (1.5)	7 (0.7)	490 (6.5)	0 (1.0)	3 (0.6)	488 (9.9)	1 (0.8)
Sweden	94 (0.6)	514 (2.4)	1 (1.0)	4 (0.5)	467 (9.3)	-1 (0.8)	1 (0.2)	~ ~	0 (0.3)
Syrian Arab Republic	86 (1.0)	454 (3.0)	∅ ∅	11 (0.8)	452 (5.4)	∅ ∅	3 (0.4)	417 (9.8)	∅ ∅
Thailand	67 (1.9)	484 (5.1)	∅ ∅	30 (1.6)	446 (6.4)	∅ ∅	3 (0.6)	417 (15.0)	∅ ∅
Tunisia	22 (0.9)	429 (3.7)	--	49 (1.0)	451 (2.2)	--	29 (1.1)	447 (3.6)	--
Turkey	89 (1.2)	461 (3.8)	∅ ∅	10 (1.2)	399 (5.3)	∅ ∅	1 (0.2)	~ ~	∅ ∅
Ukraine	69 (2.6)	484 (4.0)	∅ ∅	23 (1.9)	493 (4.7)	∅ ∅	8 (1.0)	474 (6.7)	∅ ∅
United States	91 (0.7)	525 (2.8)	-3 (0.9) ▼	8 (0.7)	476 (5.3)	3 (0.8) ▲	1 (0.1)	~ ~	0 (0.2)
‡ Morocco	52 (1.7)	396 (3.2)	--	37 (1.5)	406 (3.9)	--	11 (0.8)	415 (7.9)	--
International Avg.	78 (0.2)	471 (0.6)		17 (0.1)	438 (1.2)		5 (0.1)	409 (2.0)	
<b>Benchmarking Participants</b>									
Basque Country, Spain	93 (0.5)	500 (3.0)	4 (1.2) ▲	6 (0.5)	506 (6.9)	-2 (0.9) ▼	1 (0.3)	~ ~	-1 (0.6)
British Columbia, Canada	85 (1.8)	528 (2.7)	∅ ∅	10 (0.9)	518 (6.8)	∅ ∅	5 (1.2)	509 (7.3)	∅ ∅
Dubai, UAE	58 (1.2)	498 (3.0)	∅ ∅	37 (1.1)	485 (4.8)	∅ ∅	5 (0.7)	476 (13.1)	∅ ∅
Massachusetts, US	92 (0.9)	562 (4.3)	∅ ∅	7 (0.8)	487 (10.3)	∅ ∅	1 (0.3)	~ ~	∅ ∅
Minnesota, US	95 (1.2)	542 (4.2)	∅ ∅	4 (1.1)	467 (18.7)	∅ ∅	1 (0.2)	~ ~	∅ ∅
Ontario, Canada	90 (1.3)	529 (3.2)	1 (1.7)	9 (1.1)	505 (13.2)	0 (1.4)	1 (0.3)	~ ~	-1 (0.4)
Quebec, Canada	91 (1.2)	509 (2.8)	0 (1.7)	7 (0.9)	495 (9.9)	0 (1.3)	2 (0.4)	~ ~	0 (0.6)

▲ 2007 percent significantly higher  
▼ 2007 percent significantly lower

Background data provided by students.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

A diamond (∅) indicates the country did not participate in the assessment.

A contributing factor in some countries to not all students speaking the language of the test at home may be the presence of an immigrant population. Exhibit 4.3 presents students' reports on whether their parents were born in the country. The exhibit presents for each participant the percentage of students with both parents, one parent, or neither parent born in the country, together with average science achievement and changes in percentages since 2003. (For clarification, as denoted by the data label, the benchmarking participants, except Dubai, asked about the entire country, that is, Spain, Canada, and the United States, respectively.)

Although response rates to questions in the TIMSS questionnaires generally were high, students in some countries had difficulties in answering specific questions, particularly about their parents' level of education. The exhibits in this chapter have special notation on this point. For a country where responses were available for at least 70 but less than 85 percent of the students, an "r" is included next to its data. Where responses were available for at least 50 but less than 70 percent of the students, an "s" is included. Where responses were available for less than 50 percent, an "x" replaces the data.

At fourth grade, more than three-quarters (77%) of students, on average internationally, reported that both parents were born in the country, whereas 13 percent reported that only one parent and 10 percent that neither parent was born in the country. In the Czech Republic, Hungary, Iran, Japan, and Lithuania, 90 percent or more of students reported that both parents were born in the country, as well as 80 percent or more (but less than 90%) in Chinese Taipei, Denmark, Georgia, Italy, Kazakhstan, Latvia, Norway, the Russian Federation, Scotland, and the Slovak Republic. Countries with an increase since 2003 included Hungary, Iran, Japan, and Lithuania, as well as the Canadian province of Quebec. The largest percentages of students (20% or more) reporting that neither parent was born in the country were in Australia, Hong Kong SAR, New Zealand, Qatar, and among the benchmarking participants the Canadian provinces of Alberta, British Columbia, and Ontario as well as Dubai. The high percentage of students

in Dubai (72%) is a result of high immigration, but also because Dubai did not ask about the country, the United Arab Emirates, but only Dubai in particular. Australia, Hong Kong SAR, New Zealand, and Qatar also had relatively large percentages of students (20% or more) with only one parent born in the country, as did Algeria, Kuwait, Singapore, and Yemen. Countries with a decrease since 2003 in the percentage of students with neither parent born in the country included Armenia, Chinese Taipei, Hong Kong SAR, Hungary, Iran, and Scotland, while two countries, Slovenia and Tunisia, showed an increase.

Although on average across countries, fourth grade science achievement was highest among students with both parents born in the country (482 points, on average), next highest among students with one parent born in the country (462 points), and lowest among those with neither parent born in the country (452 points), this was not the case in all countries. In a number of countries (for example, Australia, Kuwait, Qatar, and Dubai among benchmarking participants), students with neither parent born in the country had average science achievement higher than those with both parents born in the country.

At the eighth grade, the situation was similar, although a greater percentage of students (85% on average internationally) reported that both parents were born in the country, and a smaller percentage that one parent (9%) or neither parent (7%) was born in the country. Eighteen countries had 90 percent or more of students with both parents born in the country. Countries showing an increase in percentage of students in this category included Australia, Ghana, Indonesia, Jordan, and Lithuania, and those showing a decrease included Botswana, Cyprus, Hungary, Italy, Lebanon, Malaysia, Scotland, Tunisia, and the United States. The Basque Country of Spain also showed a decrease. More than 20 percent of students reported that neither parent was born in the country in Hong Kong SAR, Israel, Qatar, and the provinces of British Columbia and Ontario as well as Dubai (where the results were only for Dubai per se and not the country). Increased percentages in this category since 2003 were found in Tunisia, the United

Exhibit 4.3 Students' Parents Born in the Country with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Both Parents Born in Country			Only One Parent Born in Country			Neither Parent Born in Country		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	67 (1.9)	363 (7.1)	0 0	20 (1.1)	332 (7.6)	0 0	13 (1.1)	349 (8.4)	0 0
Armenia	77 (1.5)	485 (4.4)	1 (1.9)	19 (1.3)	509 (19.7)	9 (1.4) ▲	5 (0.4)	468 (14.4)	-10 (1.1) ▼
Australia	57 (1.7)	527 (2.8)	0 (2.7)	21 (0.9)	526 (4.9)	1 (1.3)	21 (1.4)	533 (5.9)	-1 (2.3)
Austria	73 (1.0)	541 (2.6)	0 0	11 (0.6)	514 (4.7)	0 0	16 (0.8)	467 (4.0)	0 0
Chinese Taipei	88 (0.6)	564 (1.9)	0 (0.9)	7 (0.5)	520 (5.4)	2 (0.6) ▲	5 (0.4)	496 (6.2)	-3 (0.6) ▼
Colombia	73 (1.3)	410 (5.3)	0 0	13 (0.8)	379 (8.5)	0 0	14 (0.8)	398 (5.5)	0 0
Czech Republic	90 (0.6)	517 (3.1)	0 0	7 (0.5)	507 (6.0)	0 0	3 (0.3)	477 (11.4)	0 0
Denmark	82 (1.3)	525 (2.8)	0 0	8 (0.6)	513 (5.0)	0 0	10 (1.2)	463 (8.2)	0 0
El Salvador	78 (0.9)	398 (3.6)	0 0	14 (0.7)	363 (5.8)	0 0	8 (0.6)	382 (7.7)	0 0
England	74 (1.5)	548 (2.9)	-4 (2.4)	16 (0.9)	540 (4.6)	4 (1.2) ▲	11 (1.0)	505 (6.2)	0 (1.8)
Georgia	84 (1.1)	428 (4.4)	0 0	8 (0.6)	383 (8.5)	0 0	8 (0.7)	384 (8.6)	0 0
Germany	70 (1.4)	548 (2.2)	0 0	12 (0.7)	505 (4.9)	0 0	17 (1.0)	476 (3.9)	0 0
Hong Kong SAR	48 (1.8)	554 (4.2)	1 (2.6)	24 (0.9)	548 (3.9)	4 (1.1) ▲	28 (1.4)	562 (4.5)	-5 (2.3) ▼
Hungary	91 (0.6)	541 (3.2)	2 (0.9) ▲	6 (0.5)	499 (11.7)	1 (0.8)	3 (0.3)	514 (11.3)	-2 (0.5) ▼
Iran, Islamic Rep. of	92 (1.0)	437 (4.3)	4 (1.6) ▲	4 (0.5)	421 (9.4)	-1 (0.7)	4 (0.8)	442 (10.0)	-3 (1.3) ▼
Italy	87 (0.6)	538 (3.4)	0 (0.9)	8 (0.5)	516 (5.7)	0 (0.7)	5 (0.4)	512 (7.2)	0 (0.6)
Japan	96 (0.4)	550 (2.0)	2 (0.5) ▲	3 (0.3)	517 (9.0)	-2 (0.4) ▼	1 (0.2)	~ ~	0 (0.2)
Kazakhstan	84 (1.4)	533 (6.2)	0 0	8 (0.6)	535 (7.5)	0 0	9 (1.3)	531 (9.5)	0 0
Kuwait	65 (1.6)	358 (4.6)	0 0	22 (1.1)	320 (6.5)	0 0	13 (1.0)	390 (11.2)	0 0
Latvia	85 (0.9)	546 (2.1)	1 (1.5)	12 (0.7)	528 (4.9)	-1 (1.2)	3 (0.4)	504 (10.3)	0 (0.7)
Lithuania	91 (0.7)	516 (2.3)	2 (1.0) ▲	7 (0.6)	499 (6.4)	-1 (0.8)	1 (0.3)	~ ~	-1 (0.4)
Morocco	76 (1.6)	305 (6.9)	4 (2.6)	17 (1.1)	281 (9.2)	-2 (1.9)	7 (0.8)	306 (9.2)	-2 (1.2)
Netherlands	77 (1.4)	533 (2.8)	3 (2.2)	11 (0.8)	515 (5.0)	-1 (1.1)	12 (1.1)	478 (6.9)	-2 (1.8)
New Zealand	r 60 (1.2)	507 (2.4)	-2 (1.7)	20 (0.7)	506 (5.2)	-1 (1.0)	21 (1.0)	499 (4.7)	3 (1.5)
Norway	85 (0.8)	484 (3.4)	1 (1.1)	10 (0.7)	466 (6.6)	0 (0.9)	5 (0.5)	434 (8.4)	0 (0.8)
Qatar	49 (0.6)	287 (3.3)	0 0	26 (0.6)	279 (3.9)	0 0	25 (0.5)	347 (3.3)	0 0
Russian Federation	81 (1.1)	551 (4.8)	2 (1.6)	10 (0.6)	542 (6.9)	-1 (0.9)	8 (0.8)	509 (7.6)	-1 (1.1)
Scotland	84 (0.7)	505 (2.4)	1 (1.1)	11 (0.6)	491 (4.4)	2 (0.8)	5 (0.4)	456 (8.7)	-2 (0.8) ▼
Singapore	63 (0.8)	587 (4.4)	-2 (1.2)	20 (0.7)	587 (4.7)	1 (0.9)	16 (0.6)	587 (6.2)	1 (0.9)
Slovak Republic	87 (0.9)	534 (3.9)	0 0	8 (0.7)	493 (11.0)	0 0	6 (0.5)	477 (8.7)	0 0
Slovenia	78 (1.1)	525 (2.2)	-3 (1.5)	10 (0.7)	503 (4.3)	-1 (1.0)	12 (0.8)	491 (4.7)	3 (1.1) ▲
Sweden	74 (1.8)	535 (2.7)	0 0	12 (0.5)	524 (3.6)	0 0	14 (1.7)	475 (5.0)	0 0
Tunisia	79 (1.4)	331 (6.2)	-21 (1.4) ▼	16 (1.2)	286 (9.9)	16 (1.2) ▲	6 (0.6)	323 (13.5)	6 (0.6) ▲
Ukraine	76 (1.1)	480 (3.4)	0 0	15 (0.7)	470 (4.5)	0 0	8 (0.9)	443 (6.1)	0 0
United States	70 (1.1)	551 (2.4)	-2 (1.7)	13 (0.5)	517 (4.9)	2 (0.6) ▲	17 (1.0)	509 (5.1)	0 (1.5)
Yemen	71 (1.8)	206 (8.0)	0 0	22 (1.4)	189 (8.0)	0 0	7 (0.9)	195 (17.1)	0 0
International Avg.	77 (0.2)	482 (0.7)		13 (0.1)	462 (1.2)		10 (0.1)	452 (1.5)	
<b>Benchmarking Participants</b>									
Alberta, Canada	62 (2.1)	551 (4.1)	0 0	15 (0.8)	538 (4.6)	0 0	23 (1.8)	526 (5.8)	0 0
British Columbia, Canada	51 (2.4)	542 (3.2)	0 0	18 (0.9)	542 (4.2)	0 0	31 (2.5)	529 (5.1)	0 0
Dubai, UAE	r 17 (0.6)	409 (6.0)	0 0	11 (0.8)	411 (10.3)	0 0	72 (1.0)	490 (3.4)	0 0
Massachusetts, US	73 (1.9)	579 (3.6)	0 0	13 (0.7)	564 (8.2)	0 0	14 (1.7)	541 (10.8)	0 0
Minnesota, US	75 (3.4)	566 (4.7)	0 0	9 (0.8)	526 (9.8)	0 0	15 (3.3)	503 (13.0)	0 0
Ontario, Canada	52 (2.0)	539 (4.7)	2 (3.4)	17 (0.8)	535 (5.8)	1 (1.3)	30 (2.1)	533 (5.1)	-3 (3.6)
Quebec, Canada	75 (2.0)	525 (2.6)	15 (2.8) ▲	10 (0.7)	503 (4.6)	-16 (1.7) ▼	15 (1.8)	493 (4.8)	1 (2.3)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by students.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

A diamond (0) indicates the country did not participate in the assessment.


**TIMSS & PIRLS**  
 International Study Center  
 Lynch School of Education, Boston College

Exhibit 4.3 Students' Parents Born in the Country with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Both Parents Born in Country			Only One Parent Born in Country			Neither Parent Born in Country		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	--	--	∅ ∅	--	--	∅ ∅	--	--	∅ ∅
Armenia	88 (1.0)	485 (5.2)	-2 (1.2)	9 (1.0)	522 (20.5)	3 (1.1) ▲	3 (0.3)	499 (17.4)	-1 (0.6)
Australia	61 (1.1)	517 (3.4)	7 (2.5) ▲	21 (0.8)	517 (6.3)	0 (1.2)	18 (1.4)	509 (7.9)	-7 (2.8) ▼
Bahrain	78 (0.6)	468 (1.8)	-1 (0.9)	10 (0.5)	457 (5.4)	1 (0.7)	11 (0.4)	485 (4.3)	0 (0.7)
Bosnia and Herzegovina	89 (0.6)	467 (2.8)	∅ ∅	7 (0.5)	478 (6.6)	∅ ∅	4 (0.4)	436 (7.5)	∅ ∅
Botswana	86 (0.6)	361 (3.1)	-3 (1.1) ▼	11 (0.6)	315 (6.4)	3 (0.7) ▲	3 (0.3)	372 (14.2)	0 (0.8)
Bulgaria	96 (0.5)	475 (5.8)	--	3 (0.4)	418 (17.0)	--	1 (0.2)	~ ~	--
Chinese Taipei	96 (0.3)	563 (3.7)	0 (0.5)	3 (0.3)	535 (11.4)	1 (0.4)	1 (0.2)	~ ~	-1 (0.3)
Colombia	96 (0.4)	419 (3.4)	∅ ∅	3 (0.3)	402 (11.7)	∅ ∅	1 (0.2)	~ ~	∅ ∅
Cyprus	82 (0.6)	454 (2.2)	-2 (0.8) ▼	13 (0.5)	451 (4.2)	2 (0.7) ▲	5 (0.3)	430 (7.5)	1 (0.4)
Czech Republic	91 (0.5)	540 (2.0)	∅ ∅	7 (0.4)	530 (5.5)	∅ ∅	2 (0.3)	~ ~	∅ ∅
Egypt	80 (1.8)	421 (3.5)	2 (2.0)	15 (1.7)	364 (8.2)	4 (1.8) ▲	5 (0.4)	361 (6.1)	-5 (0.8) ▼
El Salvador	94 (0.4)	390 (3.0)	∅ ∅	4 (0.4)	378 (8.0)	∅ ∅	2 (0.2)	~ ~	∅ ∅
England	80 (1.4)	544 (4.7)	-2 (2.5)	11 (0.7)	537 (7.1)	1 (1.1)	9 (0.9)	542 (8.4)	2 (1.9)
Georgia	93 (0.6)	429 (4.5)	∅ ∅	3 (0.4)	388 (18.3)	∅ ∅	3 (0.4)	343 (16.3)	∅ ∅
Ghana	89 (0.7)	311 (5.0)	6 (1.1) ▲	8 (0.6)	258 (10.4)	-4 (0.9) ▼	3 (0.3)	269 (9.6)	-2 (0.5) ▼
Hong Kong SAR	42 (1.4)	532 (5.3)	-1 (1.8)	19 (0.7)	527 (5.6)	3 (0.9) ▲	39 (1.3)	532 (6.3)	-1 (1.7)
Hungary	94 (0.4)	540 (2.8)	-2 (0.6) ▼	4 (0.4)	520 (12.0)	1 (0.5)	2 (0.3)	~ ~	0 (0.3)
Indonesia	97 (0.4)	430 (3.3)	2 (0.5) ▲	1 (0.2)	~ ~	-1 (0.3)	1 (0.2)	~ ~	-1 (0.3)
Iran, Islamic Rep. of	97 (0.3)	460 (3.6)	1 (0.6)	2 (0.3)	~ ~	0 (0.4)	1 (0.2)	~ ~	-1 (0.4)
Israel	63 (1.4)	473 (4.3)	2 (1.9)	16 (0.7)	473 (6.5)	-3 (1.0) ▼	21 (1.4)	472 (8.4)	1 (1.8)
Italy	89 (0.6)	496 (3.0)	-2 (0.8) ▼	7 (0.5)	501 (6.9)	0 (0.6)	5 (0.4)	468 (6.9)	1 (0.6)
Japan	98 (0.3)	555 (1.9)	1 (0.4)	2 (0.2)	~ ~	-1 (0.3)	1 (0.1)	~ ~	0 (0.2)
Jordan	70 (1.2)	480 (4.4)	6 (1.7) ▲	15 (0.7)	482 (5.7)	-2 (1.0) ▼	15 (0.9)	498 (5.5)	-4 (1.4) ▼
Korea, Rep. of	100 (0.1)	553 (2.0)	0 (0.1)	0 (0.1)	~ ~	0 (0.1)	0 (0.1)	~ ~	0 (0.1)
Kuwait	77 (1.0)	421 (2.9)	∅ ∅	13 (0.6)	410 (5.0)	∅ ∅	9 (0.8)	429 (7.5)	∅ ∅
Lebanon	87 (0.9)	419 (5.6)	-3 (1.2) ▼	10 (0.7)	399 (9.7)	2 (1.0) ▲	3 (0.4)	400 (15.2)	1 (0.5)
Lithuania	92 (0.5)	519 (2.7)	3 (0.9) ▲	7 (0.5)	518 (6.2)	-2 (0.8) ▼	1 (0.2)	~ ~	0 (0.3)
Malaysia	93 (0.5)	474 (5.8)	-2 (0.7) ▼	5 (0.4)	442 (11.8)	1 (0.5)	2 (0.3)	~ ~	0 (0.5)
Malta	84 (0.5)	459 (1.5)	∅ ∅	13 (0.5)	453 (4.7)	∅ ∅	3 (0.2)	449 (11.8)	∅ ∅
Norway	84 (1.0)	494 (2.4)	-2 (1.3)	9 (0.6)	482 (4.6)	1 (0.8)	7 (0.7)	431 (4.7)	1 (1.1)
Oman	84 (0.8)	429 (2.8)	∅ ∅	10 (0.6)	393 (6.1)	∅ ∅	6 (0.4)	408 (6.8)	∅ ∅
Palestinian Nat'l Auth.	85 (0.7)	412 (3.5)	0 (1.0)	12 (0.6)	379 (7.3)	-1 (0.8)	3 (0.3)	338 (12.8)	1 (0.4)
Qatar	57 (0.6)	303 (3.0)	∅ ∅	15 (0.4)	306 (4.1)	∅ ∅	28 (0.5)	366 (2.8)	∅ ∅
Romania	99 (0.2)	464 (3.8)	0 (0.3)	1 (0.2)	~ ~	0 (0.3)	0 (0.1)	~ ~	0 (0.2)
Russian Federation	83 (1.1)	532 (3.8)	0 (1.5)	11 (0.7)	530 (6.4)	0 (1.0)	6 (0.7)	506 (10.3)	0 (0.8)
Saudi Arabia	80 (1.3)	403 (2.8)	--	9 (0.6)	387 (7.0)	--	11 (1.0)	427 (5.7)	--
Scotland	89 (0.7)	497 (3.3)	-2 (0.9) ▼	7 (0.5)	507 (7.1)	1 (0.7)	3 (0.5)	478 (12.6)	0 (0.6)
Serbia	79 (1.0)	471 (3.4)	-2 (1.3)	12 (0.7)	478 (4.8)	1 (0.9)	9 (0.7)	465 (8.5)	1 (1.0)
Singapore	71 (0.7)	563 (4.7)	-1 (1.0)	16 (0.5)	570 (5.5)	0 (0.7)	13 (0.6)	590 (6.3)	1 (0.8)
Slovenia	82 (1.1)	543 (2.3)	2 (1.7)	9 (0.6)	537 (4.6)	1 (0.9)	9 (0.9)	494 (6.2)	-3 (1.3) ▼
Sweden	77 (1.3)	520 (2.4)	1 (2.2)	11 (0.5)	511 (4.1)	1 (0.8)	12 (1.2)	464 (6.3)	-2 (2.0)
Syrian Arab Republic	86 (0.8)	457 (2.6)	∅ ∅	9 (0.6)	432 (7.1)	∅ ∅	5 (0.4)	419 (6.9)	∅ ∅
Thailand	96 (0.5)	472 (4.3)	∅ ∅	3 (0.4)	432 (11.3)	∅ ∅	1 (0.2)	~ ~	∅ ∅
Tunisia	92 (0.4)	447 (2.2)	-7 (0.5) ▼	5 (0.3)	428 (6.1)	4 (0.3) ▲	3 (0.3)	402 (8.8)	3 (0.3) ▲
Turkey	97 (0.3)	456 (3.7)	∅ ∅	2 (0.3)	~ ~	∅ ∅	1 (0.2)	~ ~	∅ ∅
Ukraine	78 (1.1)	486 (3.5)	∅ ∅	17 (0.9)	492 (5.3)	∅ ∅	5 (0.6)	463 (9.5)	∅ ∅
United States	74 (1.4)	530 (2.9)	-7 (1.8) ▼	9 (0.6)	512 (4.3)	1 (0.7)	17 (1.2)	485 (5.1)	6 (1.5) ▲
‡ Morocco	90 (0.6)	406 (2.8)	--	6 (0.5)	374 (9.9)	--	3 (0.4)	346 (9.4)	--
International Avg.	85 (0.1)	470 (0.5)		9 (0.1)	453 (1.3)		7 (0.1)	442 (1.6)	
<b>Benchmarking Participants</b>									
Basque Country, Spain	89 (0.9)	503 (3.0)	-3 (1.1) ▼	6 (0.6)	475 (8.6)	1 (0.8)	5 (0.7)	460 (9.3)	2 (0.8) ▲
British Columbia, Canada	56 (1.8)	526 (2.6)	∅ ∅	16 (0.7)	527 (3.5)	∅ ∅	29 (1.9)	528 (6.2)	∅ ∅
Dubai, UAE	20 (1.1)	435 (4.9)	∅ ∅	10 (0.6)	448 (6.5)	∅ ∅	70 (1.0)	514 (3.0)	∅ ∅
Massachusetts, US	75 (2.0)	568 (4.2)	∅ ∅	9 (0.7)	550 (6.5)	∅ ∅	16 (1.8)	509 (8.9)	∅ ∅
Minnesota, US	84 (1.9)	547 (4.2)	∅ ∅	5 (0.4)	515 (10.5)	∅ ∅	10 (1.6)	483 (13.3)	∅ ∅
Ontario, Canada	57 (2.2)	525 (4.8)	2 (3.1)	15 (0.9)	532 (4.5)	-1 (1.2)	28 (2.3)	526 (5.4)	-2 (3.3)
Quebec, Canada	78 (2.1)	512 (3.0)	-3 (2.8)	8 (0.6)	517 (6.5)	0 (0.8)	14 (1.9)	482 (7.7)	2 (2.5)

▲ 2007 percent significantly higher  
▼ 2007 percent significantly lower

Background data provided by students.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

A diamond (∅) indicates the country did not participate in the assessment.

States, and the Basque Country, and decreased percentages in Australia, Egypt, Ghana, Jordan, and Slovenia. Similar to the fourth grade, average science achievement at the eighth grade was highest for students reporting both parents born in the country (470 points, on average), next for students with one parent born in the country (453 points), and lowest for students with neither parent born in the country (442 points).

Earlier cycles of TIMSS and PIRLS have shown that students from homes with abundant literacy resources have higher achievement, on average, in mathematics, science, and reading than students from less well-endowed homes.<sup>3</sup> Exhibit 4.4, which displays students' reports about the number of books in their homes, shows that this continues to be true for science achievement at both fourth and eighth grades. For each grade, the exhibit presents for each TIMSS 2007 participant the percentage of students in five categories of book ownership, *more than 200 books*, *101–200 books*, *26–100 books*, *11–25 books*, and *0–10 books*, together with average achievement in each category and changes in percentages since 2003.

As shown in the exhibit, there was a wide range of book ownership within countries at both grade levels. At fourth grade, 12 percent of students, on average across countries, reported having more than 200 books at home, 13 percent having between 101 and 200 books, 30 percent having between 26 and 100 books, 25 percent having between 11 and 25 books, and 20 percent with no more than 10 books. TIMSS participants with the highest percentages of students (at least 30%) reporting many books at home (more than 100—categories one and two combined) included Australia, Denmark, England, Georgia, Germany, Hungary, New Zealand, Norway, Qatar, Scotland, Singapore, Sweden, the United States, the U.S. states of Massachusetts and Minnesota, and the Canadian provinces of Alberta, British Columbia, and Ontario. In contrast, in Algeria, El Salvador, Iran, Morocco, and Yemen, more than half the students reported having no more than 10 books in their homes. In several countries, there was an increase since 2003 in the percentage of students from homes with many books. For example, Hong Kong SAR, Morocco, and the province of Quebec had increased percentages

3 See, for example, Mullis, I.V.S., Martin, M.O., Kennedy, A.M., & Foy, P. (2007). *PIRLS 2006 international report: IEA's Progress in International Reading Literacy Study in primary school in 40 countries*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

of students in the *more than 200* and in the *101–200* categories. In contrast, Latvia, the Netherlands, and Norway had decreased percentages in both of these categories.

Fourth grade students from homes with more than 100 books had higher average science achievement than those from homes with fewer books. Average achievement of those from homes with more than 200 books (502 points, on average) and from homes with 101–200 books (500 points) exceeded that for students from homes with 26–100 books (490 points), with 11–25 books (469 points), and with 0–10 books (437 points).

At the eighth grade also, there was an association between average science achievement and number of books in the home. Twelve percent of students reported having more than 200 books at home and 12 percent reported having 101–200 books, and these had average achievement of 500 and 496 points, respectively. These averages were higher than the 479–point average of the 27 percent of students with 26–100 books, the 452–point average of the 29 percent of students with 11–25 books, and the 426–point average of the 20 percent of students with 10 books or fewer. TIMSS participants with the highest percentages of students in the *more than 200* books category (20% or more) included Australia, Georgia, Hungary, Israel, Italy, Korea, Norway, Sweden, and among the benchmarking participants the Basque Country, Massachusetts, Minnesota, and the provinces of British Columbia and Ontario. Countries with the greatest percentages of students (30% or more) with no more than 10 books at home included Algeria, Botswana, Colombia, Egypt, El Salvador, Ghana, Iran, Thailand, and Tunisia. There were increased percentages since 2003 of students in the highest category of book ownership (more than 200 books) in Cyprus, Korea, and Lebanon, but decreases in Australia, Bahrain, England, Ghana, Hungary, Romania, the Russian Federation, Scotland, Sweden, the United States, and the Canadian province of Ontario.

In today's age of virtually instantaneous access to a vast repository of information on science and science-related topics, students from homes

Exhibit 4.4 Books in the Home with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	More than 200 Books			101–200 Books			26–100 Books		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	2 (0.3)	~ ~	∅ ∅	3 (0.3)	349 (11.6)	∅ ∅	12 (0.9)	384 (7.8)	∅ ∅
Armenia	r 17 (1.2)	489 (6.1)	-1 (1.6)	12 (0.7)	492 (10.0)	-2 (1.0) ▼	25 (1.0)	482 (6.1)	-5 (1.5) ▼
Australia	22 (1.0)	550 (5.6)	-2 (1.6)	22 (1.0)	551 (3.8)	-1 (1.5)	36 (0.9)	526 (3.1)	2 (1.4)
Austria	12 (0.7)	561 (5.8)	∅ ∅	13 (0.6)	556 (3.9)	∅ ∅	35 (1.0)	538 (3.0)	∅ ∅
Chinese Taipei	14 (0.6)	590 (3.3)	-1 (1.0)	13 (0.6)	587 (3.9)	-1 (0.9)	32 (0.9)	569 (2.6)	1 (1.1)
Colombia	5 (0.4)	384 (8.5)	∅ ∅	5 (0.4)	418 (12.3)	∅ ∅	19 (0.9)	419 (8.9)	∅ ∅
Czech Republic	11 (0.9)	535 (5.7)	∅ ∅	16 (0.8)	544 (4.5)	∅ ∅	40 (1.0)	525 (3.1)	∅ ∅
Denmark	12 (1.0)	546 (5.2)	∅ ∅	18 (0.8)	543 (4.5)	∅ ∅	38 (1.2)	520 (3.6)	∅ ∅
El Salvador	3 (0.4)	410 (10.5)	∅ ∅	4 (0.3)	388 (9.7)	∅ ∅	14 (0.7)	418 (5.2)	∅ ∅
England	19 (1.0)	579 (4.7)	0 (1.6)	22 (1.0)	563 (4.4)	2 (1.4)	33 (1.0)	542 (3.1)	-2 (1.6)
Georgia	17 (1.3)	434 (6.2)	∅ ∅	13 (1.0)	443 (7.0)	∅ ∅	29 (1.4)	431 (6.6)	∅ ∅
Germany	14 (0.8)	574 (4.7)	∅ ∅	17 (0.8)	561 (3.6)	∅ ∅	35 (1.0)	539 (2.1)	∅ ∅
Hong Kong SAR	12 (0.7)	568 (4.7)	5 (0.9) ▲	15 (0.9)	566 (5.5)	5 (1.2) ▲	34 (0.9)	558 (3.7)	6 (1.3) ▲
Hungary	16 (1.0)	579 (4.5)	-2 (1.5)	17 (0.7)	570 (4.1)	0 (1.1)	32 (1.2)	544 (3.8)	-3 (1.5)
Iran, Islamic Rep. of	5 (0.5)	500 (11.5)	-1 (0.8)	5 (0.5)	474 (8.3)	1 (0.7)	12 (1.0)	480 (5.7)	-1 (1.3)
Italy	12 (0.7)	555 (5.6)	2 (1.1)	12 (0.5)	551 (4.2)	1 (0.8)	31 (0.8)	546 (3.6)	4 (1.1) ▲
Japan	7 (0.4)	577 (5.8)	0 (0.6)	13 (0.6)	574 (3.1)	-1 (0.9)	38 (1.0)	556 (3.1)	-2 (1.3)
Kazakhstan	6 (0.6)	554 (8.7)	∅ ∅	9 (0.9)	549 (6.7)	∅ ∅	28 (2.9)	536 (6.6)	∅ ∅
Kuwait	r 14 (0.9)	337 (8.3)	∅ ∅	10 (0.5)	356 (9.3)	∅ ∅	24 (1.0)	381 (7.2)	∅ ∅
Latvia	13 (0.9)	559 (5.6)	-6 (1.4) ▼	16 (0.8)	562 (3.0)	-5 (1.4) ▼	41 (1.2)	549 (2.6)	3 (1.7)
Lithuania	6 (0.5)	520 (7.3)	-1 (0.7)	9 (0.6)	537 (5.1)	-2 (0.9) ▼	34 (1.0)	529 (2.3)	-2 (1.4)
Morocco	r 5 (1.2)	342 (33.5)	4 (1.2) ▲	5 (0.7)	345 (22.2)	2 (0.8) ▲	13 (1.0)	335 (10.6)	3 (1.4) ▲
Netherlands	11 (0.9)	550 (6.3)	-3 (1.4) ▼	15 (0.7)	542 (4.6)	-4 (1.2) ▼	40 (1.1)	528 (3.0)	3 (1.6)
New Zealand	17 (0.8)	541 (4.6)	0 (1.1)	22 (0.7)	533 (2.7)	0 (1.0)	34 (0.7)	510 (3.2)	-2 (1.3)
Norway	13 (0.7)	497 (5.4)	-4 (1.1) ▼	19 (0.8)	492 (4.1)	-2 (1.1) ▼	37 (1.2)	486 (5.0)	1 (1.5)
Qatar	22 (0.4)	293 (4.2)	∅ ∅	14 (0.4)	311 (5.3)	∅ ∅	25 (0.5)	318 (3.7)	∅ ∅
Russian Federation	11 (0.7)	555 (6.5)	-1 (1.0)	14 (0.7)	564 (5.3)	-1 (1.1)	39 (1.1)	553 (5.2)	4 (1.6) ▲
Scotland	17 (0.9)	528 (4.4)	-4 (1.4) ▼	19 (0.9)	528 (3.6)	1 (1.2)	33 (1.0)	504 (3.1)	2 (1.4)
Singapore	13 (0.5)	617 (6.5)	2 (0.8) ▲	18 (0.8)	624 (4.6)	1 (1.2)	37 (0.8)	596 (4.1)	-2 (1.2)
Slovak Republic	8 (0.5)	548 (7.1)	∅ ∅	12 (0.6)	561 (4.5)	∅ ∅	36 (1.0)	545 (3.5)	∅ ∅
Slovenia	10 (0.6)	541 (4.8)	-3 (1.1) ▼	13 (0.6)	539 (3.7)	-2 (1.1)	38 (1.0)	530 (2.7)	1 (1.4)
Sweden	17 (1.0)	561 (3.2)	∅ ∅	21 (0.8)	543 (3.6)	∅ ∅	35 (1.0)	524 (3.2)	∅ ∅
Tunisia	r 3 (0.4)	362 (14.4)	-1 (0.7)	5 (0.5)	402 (15.2)	-3 (0.9) ▼	18 (1.1)	382 (7.9)	1 (1.6)
Ukraine	9 (0.6)	494 (5.6)	∅ ∅	12 (0.7)	498 (5.8)	∅ ∅	37 (1.0)	488 (2.9)	∅ ∅
United States	15 (0.6)	564 (4.4)	1 (0.9)	16 (0.5)	565 (3.2)	-1 (0.7)	34 (0.6)	550 (2.6)	0 (0.9)
Yemen	r 4 (0.6)	181 (17.6)	∅ ∅	4 (0.4)	210 (14.3)	∅ ∅	10 (1.0)	227 (13.1)	∅ ∅
International Avg.	12 (0.1)	502 (1.5)		13 (0.1)	500 (1.3)		30 (0.2)	490 (0.9)	
<b>Benchmarking Participants</b>									
Alberta, Canada	18 (1.0)	560 (5.5)	∅ ∅	23 (1.0)	558 (4.6)	∅ ∅	36 (0.8)	546 (3.8)	∅ ∅
British Columbia, Canada	19 (0.8)	560 (4.0)	∅ ∅	21 (0.7)	555 (3.4)	∅ ∅	37 (0.9)	539 (3.3)	∅ ∅
Dubai, UAE	r 11 (0.6)	480 (8.0)	∅ ∅	12 (0.8)	505 (7.5)	∅ ∅	31 (0.9)	491 (4.1)	∅ ∅
Massachusetts, US	22 (1.8)	603 (6.1)	∅ ∅	23 (1.1)	581 (3.9)	∅ ∅	37 (1.4)	568 (4.9)	∅ ∅
Minnesota, US	17 (1.0)	578 (7.0)	∅ ∅	22 (1.2)	577 (7.1)	∅ ∅	36 (1.2)	557 (6.6)	∅ ∅
Ontario, Canada	18 (1.0)	560 (5.3)	-2 (1.8)	23 (1.2)	557 (4.1)	1 (1.6)	34 (1.2)	536 (4.1)	-2 (1.8)
Quebec, Canada	11 (0.8)	532 (4.8)	4 (1.0) ▲	15 (0.9)	532 (3.5)	4 (1.1) ▲	39 (1.1)	526 (2.5)	-4 (1.5) ▼

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by students.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

A diamond (∅) indicates the country did not participate in the assessment.

## Exhibit 4.4 Books in the Home with Trends (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	11–25 Books			0–10 Books				
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003		
Algeria	29 (1.4)	372 (7.4)	0 0	54 (1.9)	349 (7.9)	0 0		
Armenia	r 23 (1.6)	493 (13.1)	1 (1.8)	23 (1.5)	499 (9.8)	6 (1.9)	▲	
Australia	13 (0.8)	494 (5.7)	0 (1.2)	6 (0.6)	464 (7.7)	0 (1.0)		
Austria	29 (0.9)	508 (3.3)	0 0	11 (0.6)	464 (5.2)	0 0		
Chinese Taipei	25 (0.8)	540 (3.2)	1 (1.1)	16 (0.8)	511 (3.7)	-1 (1.1)		
Colombia	26 (0.9)	419 (6.4)	0 0	44 (1.4)	390 (5.4)	0 0		
Czech Republic	26 (1.2)	493 (3.0)	0 0	6 (0.7)	449 (5.7)	0 0		
Denmark	23 (1.1)	500 (3.9)	0 0	9 (0.7)	469 (7.0)	0 0		
El Salvador	26 (0.9)	411 (3.9)	0 0	52 (1.3)	376 (3.8)	0 0		
England	17 (0.8)	511 (3.5)	0 (1.3)	9 (0.7)	477 (4.4)	1 (1.1)		
Georgia	24 (1.4)	413 (4.7)	0 0	17 (1.2)	387 (8.3)	0 0		
Germany	25 (1.0)	502 (3.5)	0 0	8 (0.7)	454 (5.4)	0 0		
Hong Kong SAR	22 (0.9)	552 (4.5)	-8 (1.2)	▼	16 (1.0)	533 (5.7)	-9 (1.7)	▼
Hungary	25 (1.0)	516 (3.5)	3 (1.3)	▲	10 (0.9)	466 (8.2)	2 (1.1)	
Iran, Islamic Rep. of	25 (1.2)	458 (5.1)	3 (1.7)	▲	53 (1.9)	408 (5.0)	-2 (2.9)	
Italy	31 (0.8)	526 (4.1)	-2 (1.3)		14 (0.9)	508 (5.6)	-4 (1.3)	▼
Japan	28 (0.9)	538 (2.1)	1 (1.2)		14 (0.7)	511 (4.5)	2 (1.1)	▲
Kazakhstan	34 (2.9)	524 (8.5)	0 0	22 (2.7)	531 (8.9)	0 0		
Kuwait	r 30 (1.2)	367 (6.9)	0 0	22 (1.2)	339 (7.2)	0 0		
Latvia	22 (1.1)	523 (3.7)	5 (1.4)	▲	8 (0.7)	500 (6.1)	2 (1.0)	▲
Lithuania	36 (1.3)	506 (3.0)	2 (1.7)		15 (0.8)	489 (6.0)	3 (1.2)	▲
Morocco	r 23 (1.3)	323 (8.2)	-2 (2.0)		53 (2.2)	283 (8.3)	-7 (3.1)	▼
Netherlands	25 (1.1)	506 (3.3)	3 (1.5)	▲	9 (0.8)	488 (5.7)	0 (1.1)	
New Zealand	18 (0.6)	471 (3.8)	1 (0.9)		10 (0.6)	430 (5.9)	1 (0.9)	
Norway	23 (0.8)	462 (3.3)	6 (1.1)	▲	7 (0.6)	417 (6.9)	0 (0.8)	
Qatar	19 (0.5)	304 (4.0)	0 0	19 (0.5)	287 (5.0)	0 0		
Russian Federation	26 (1.0)	538 (5.0)	-1 (1.8)		10 (1.8)	508 (13.1)	0 (1.9)	
Scotland	20 (0.8)	481 (4.1)	0 (1.4)		12 (0.8)	445 (4.5)	1 (1.1)	
Singapore	21 (0.8)	560 (5.0)	-1 (1.2)		10 (0.6)	516 (5.8)	0 (1.0)	
Slovak Republic	32 (0.9)	519 (4.1)	0 0	11 (1.3)	455 (9.8)	0 0		
Slovenia	30 (1.0)	504 (2.6)	2 (1.5)		9 (0.6)	474 (5.6)	2 (0.8)	▲
Sweden	21 (0.9)	503 (4.7)	0 0	7 (0.7)	463 (7.0)	0 0		
Tunisia	r 29 (1.3)	355 (7.6)	0 (2.0)		44 (2.1)	284 (6.3)	3 (3.1)	
Ukraine	31 (1.1)	462 (4.0)	0 0	11 (0.8)	436 (7.5)	0 0		
United States	21 (0.5)	519 (3.3)	-1 (0.8)		14 (0.7)	485 (3.5)	1 (0.9)	
Yemen	r 22 (1.8)	215 (11.9)	0 0	60 (2.4)	199 (8.1)	0 0		
International Avg.	25 (0.2)	469 (0.9)		20 (0.2)	437 (1.1)			
<b>Benchmarking Participants</b>								
Alberta, Canada	18 (0.9)	513 (4.7)	0 0	6 (0.6)	504 (8.0)	0 0		
British Columbia, Canada	18 (0.8)	507 (4.6)	0 0	6 (0.5)	488 (6.4)	0 0		
Dubai, UAE	r 29 (1.2)	468 (4.6)	0 0	17 (1.2)	421 (7.2)	0 0		
Massachusetts, US	13 (1.2)	529 (8.4)	0 0	5 (0.8)	514 (8.5)	0 0		
Minnesota, US	17 (1.1)	516 (6.0)	0 0	9 (1.3)	482 (8.2)	0 0		
Ontario, Canada	19 (1.3)	516 (5.2)	3 (1.8)		6 (0.9)	468 (13.1)	-1 (1.3)	
Quebec, Canada	23 (0.9)	505 (4.1)	-4 (1.2)	▼	11 (0.9)	481 (5.7)	0 (1.1)	

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit 4.4 Books in the Home with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	More than 200 Books			101–200 Books			26–100 Books		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	2 (0.3)	~ ~	◊ ◊	4 (0.3)	427 (5.0)	◊ ◊	17 (0.8)	418 (2.9)	◊ ◊
Armenia	19 (0.9)	494 (6.8)	-1 (1.3)	13 (0.7)	496 (9.0)	0 (0.9)	28 (1.0)	487 (6.9)	0 (1.3)
Australia	22 (1.1)	553 (5.3)	-9 (1.8) ▼	22 (0.8)	541 (4.3)	-1 (1.2)	32 (1.1)	510 (3.6)	2 (1.4)
Bahrain	11 (0.5)	478 (4.1)	-6 (0.7) ▼	13 (0.6)	493 (4.7)	-1 (0.9)	32 (0.7)	481 (2.7)	1 (1.1)
Bosnia and Herzegovina	3 (0.3)	513 (11.1)	◊ ◊	4 (0.4)	504 (8.7)	◊ ◊	22 (0.8)	489 (3.9)	◊ ◊
Botswana	6 (0.4)	370 (8.8)	1 (0.6)	5 (0.4)	372 (11.2)	0 (0.5)	14 (0.7)	377 (4.9)	1 (0.9)
Bulgaria	19 (1.1)	504 (7.4)	--	12 (0.8)	496 (7.0)	--	24 (1.0)	491 (6.3)	--
Chinese Taipei	18 (1.2)	607 (4.0)	3 (1.5)	13 (0.7)	598 (4.1)	-1 (0.9)	31 (0.9)	572 (3.4)	1 (1.1)
Colombia	3 (0.3)	483 (9.3)	◊ ◊	4 (0.5)	470 (6.9)	◊ ◊	20 (1.2)	445 (3.6)	◊ ◊
Cyprus	13 (0.6)	479 (4.6)	2 (0.8) ●	17 (0.7)	484 (3.6)	2 (1.0)	34 (0.6)	457 (3.2)	-1 (1.1)
Czech Republic	12 (0.6)	575 (4.1)	◊ ◊	21 (0.8)	562 (2.9)	◊ ◊	40 (0.8)	542 (1.9)	◊ ◊
Egypt	5 (0.4)	404 (9.0)	-1 (0.6)	5 (0.4)	426 (9.7)	-1 (0.6)	21 (0.7)	429 (4.8)	4 (1.0) ●
El Salvador	3 (0.4)	405 (11.1)	◊ ◊	4 (0.5)	428 (9.2)	◊ ◊	16 (0.8)	413 (4.3)	◊ ◊
England	18 (1.0)	604 (6.0)	-7 (1.5) ▼	18 (0.9)	569 (5.4)	0 (1.4)	28 (0.9)	548 (4.3)	1 (1.3)
Georgia	20 (1.5)	447 (4.8)	◊ ◊	15 (0.9)	439 (7.2)	◊ ◊	27 (1.0)	427 (7.0)	◊ ◊
Ghana	6 (0.5)	296 (10.2)	-4 (0.8) ▼	4 (0.4)	325 (13.6)	-2 (0.6) ▼	13 (0.7)	330 (8.8)	-3 (1.0) ▼
Hong Kong SAR	10 (0.6)	564 (4.5)	1 (0.9)	9 (0.5)	557 (5.7)	1 (0.7)	26 (1.0)	545 (5.0)	-1 (1.1)
Hungary	26 (1.1)	579 (3.6)	-5 (1.6) ▼	21 (0.7)	553 (3.8)	-1 (1.0)	30 (0.9)	535 (3.0)	1 (1.3)
Indonesia	1 (0.2)	~ ~	0 (0.2)	2 (0.3)	~ ~	0 (0.4)	17 (0.8)	447 (5.3)	-3 (1.1) ▼
Iran, Islamic Rep. of	6 (0.5)	509 (8.7)	-1 (0.7)	5 (0.5)	509 (9.5)	0 (0.6)	16 (1.1)	490 (6.1)	-1 (1.3)
Israel	21 (1.1)	503 (5.7)	-1 (1.4)	19 (0.8)	490 (6.0)	-3 (1.1) ▼	31 (1.0)	470 (4.7)	-2 (1.3)
Italy	22 (1.2)	524 (3.6)	3 (1.5)	16 (0.7)	516 (4.3)	2 (0.9) ●	28 (0.8)	495 (2.7)	3 (1.0) ●
Japan	16 (0.8)	586 (4.4)	-1 (1.0)	16 (0.8)	573 (3.7)	0 (0.9)	32 (0.8)	561 (2.5)	0 (1.2)
Jordan	9 (0.6)	515 (6.1)	0 (0.9)	10 (0.6)	511 (7.3)	2 (0.7) ●	29 (0.8)	500 (4.0)	2 (1.2)
Korea, Rep. of	26 (1.0)	592 (2.7)	7 (1.3) ●	25 (0.7)	562 (2.4)	3 (1.0) ●	29 (0.8)	543 (2.6)	-4 (1.1) ▼
Kuwait	10 (0.5)	414 (5.8)	◊ ◊	9 (0.4)	451 (6.1)	◊ ◊	24 (0.7)	435 (3.9)	◊ ◊
Lebanon	10 (0.7)	441 (10.0)	2 (0.9) ●	10 (0.6)	457 (9.7)	2 (1.0)	28 (1.1)	437 (7.8)	3 (1.5) ●
Lithuania	10 (0.6)	560 (5.2)	-2 (1.0)	13 (0.5)	553 (4.0)	-2 (0.8) ▼	33 (0.8)	533 (2.9)	-1 (1.2)
Malaysia	5 (0.6)	528 (10.1)	0 (0.8)	9 (0.7)	517 (6.8)	1 (0.9)	29 (0.8)	489 (5.9)	0 (1.1)
Malta	19 (0.5)	507 (3.7)	◊ ◊	19 (0.5)	495 (3.8)	◊ ◊	37 (0.7)	457 (2.9)	◊ ◊
Norway	25 (0.9)	518 (2.6)	-2 (1.5)	20 (0.7)	503 (2.6)	-2 (1.0)	30 (0.7)	488 (2.8)	-3 (1.1) ▼
Oman	9 (0.7)	446 (6.5)	◊ ◊	11 (0.8)	449 (5.1)	◊ ◊	28 (1.0)	444 (3.6)	◊ ◊
Palestinian Nat'l Auth.	7 (0.6)	420 (9.5)	0 (0.8)	7 (0.4)	435 (7.8)	0 (0.6)	23 (0.9)	427 (5.3)	-1 (1.1)
Qatar	16 (0.5)	331 (4.0)	◊ ◊	13 (0.4)	350 (4.2)	◊ ◊	27 (0.6)	339 (2.9)	◊ ◊
Romania	9 (0.7)	516 (6.9)	-3 (1.4) ▼	11 (0.6)	507 (5.8)	-2 (1.2)	30 (1.1)	479 (3.3)	1 (1.6)
Russian Federation	16 (0.8)	556 (5.0)	-6 (1.5) ▼	21 (0.8)	545 (4.4)	-5 (1.3) ▼	37 (0.9)	531 (4.7)	4 (1.6) ●
Saudi Arabia	8 (0.8)	412 (7.1)	--	7 (0.6)	436 (6.2)	--	25 (1.0)	425 (3.7)	--
Scotland	15 (0.8)	561 (4.5)	-3 (1.3) ▼	14 (0.7)	538 (4.4)	-2 (1.0) ▼	25 (0.8)	508 (3.1)	-4 (1.2) ▼
Serbia	8 (0.6)	508 (6.9)	2 (0.8)	9 (0.6)	501 (6.1)	0 (0.8)	26 (0.9)	497 (3.9)	0 (1.4)
Singapore	14 (0.6)	626 (4.1)	-1 (0.8)	15 (0.6)	613 (4.6)	-1 (0.7)	32 (0.8)	579 (4.1)	-2 (1.1)
Slovenia	11 (0.6)	573 (4.1)	-2 (1.0)	15 (0.7)	569 (3.4)	0 (1.0)	37 (0.9)	545 (2.6)	0 (1.3)
Sweden	26 (1.0)	548 (3.0)	-5 (1.6) ▼	20 (0.7)	529 (3.4)	-1 (0.9)	29 (0.8)	503 (3.5)	2 (1.2)
Syrian Arab Republic	5 (0.4)	446 (7.8)	◊ ◊	7 (0.4)	472 (4.6)	◊ ◊	22 (0.8)	465 (3.3)	◊ ◊
Thailand	3 (0.5)	554 (12.5)	◊ ◊	4 (0.4)	521 (9.9)	◊ ◊	21 (1.0)	499 (6.3)	◊ ◊
Tunisia	3 (0.3)	468 (9.0)	-1 (0.5)	5 (0.5)	483 (5.5)	-1 (0.8)	21 (1.0)	461 (3.1)	-1 (1.4)
Turkey	5 (0.5)	501 (8.4)	◊ ◊	9 (0.6)	507 (6.3)	◊ ◊	23 (0.9)	485 (4.5)	◊ ◊
Ukraine	12 (0.9)	517 (6.3)	◊ ◊	16 (0.7)	512 (3.8)	◊ ◊	35 (0.9)	496 (3.8)	◊ ◊
United States	18 (0.8)	564 (3.4)	-6 (1.2) ▼	17 (0.6)	555 (3.4)	-1 (0.8)	28 (0.7)	526 (2.7)	1 (0.9)
‡ Morocco	6 (0.7)	401 (8.2)	--	8 (0.8)	423 (7.2)	--	22 (1.4)	412 (5.4)	--
International Avg.	12 (0.1)	500 (1.0)	--	12 (0.1)	496 (0.9)	--	27 (0.1)	479 (0.6)	--
<b>Benchmarking Participants</b>									
Basque Country, Spain	26 (1.3)	531 (3.8)	1 (1.9)	22 (1.1)	507 (3.4)	2 (1.4)	33 (1.3)	491 (3.9)	-3 (1.8)
British Columbia, Canada	24 (1.0)	555 (2.9)	◊ ◊	21 (0.8)	540 (3.3)	◊ ◊	31 (0.8)	525 (2.9)	◊ ◊
Dubai, UAE	11 (0.9)	534 (6.2)	◊ ◊	14 (0.9)	524 (4.5)	◊ ◊	29 (0.9)	509 (3.4)	◊ ◊
Massachusetts, US	26 (2.0)	600 (5.7)	◊ ◊	19 (1.1)	573 (5.4)	◊ ◊	27 (1.5)	559 (5.0)	◊ ◊
Minnesota, US	23 (1.9)	570 (6.4)	◊ ◊	21 (1.5)	562 (4.8)	◊ ◊	30 (1.6)	536 (4.7)	◊ ◊
Ontario, Canada	23 (1.3)	561 (4.2)	-5 (2.0) ▼	22 (1.0)	540 (4.7)	1 (1.3)	31 (0.9)	522 (3.3)	1 (1.5)
Quebec, Canada	12 (0.9)	547 (7.0)	-1 (1.2)	13 (0.7)	536 (6.4)	-3 (1.1) ▼	32 (1.0)	513 (3.2)	-2 (1.3)

● 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by students.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

A diamond (◊) indicates the country did not participate in the assessment.

Exhibit 4.4 Books in the Home with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	11–25 Books			0–10 Books		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	41 (0.8)	408 (2.1)	0 0	36 (1.2)	403 (2.5)	0 0
Armenia	24 (1.0)	485 (6.2)	0 (1.3)	16 (0.9)	482 (9.2)	0 (1.3)
Australia	15 (1.0)	480 (5.0)	4 (1.2) ▲	9 (0.6)	440 (5.8)	4 (0.8) ▲
Bahrain	27 (0.8)	454 (3.4)	1 (1.1)	17 (0.7)	445 (4.0)	6 (0.8) ▲
Bosnia and Herzegovina	45 (1.0)	462 (3.0)	0 0	26 (1.0)	442 (4.1)	0 0
Botswana	37 (1.0)	358 (3.8)	7 (1.3) ▲	39 (0.8)	345 (4.3)	-10 (1.5) ▼
Bulgaria	18 (1.1)	461 (7.9)	--	26 (1.7)	428 (10.8)	--
Chinese Taipei	21 (0.9)	541 (4.5)	-3 (1.2) ▼	17 (1.1)	489 (5.3)	0 (1.4)
Colombia	35 (1.1)	419 (4.0)	0 0	37 (1.9)	389 (3.5)	0 0
Cyprus	25 (0.7)	431 (3.0)	-2 (1.0)	10 (0.5)	398 (5.3)	-1 (0.7)
Czech Republic	20 (0.7)	506 (3.2)	0 0	7 (0.5)	481 (5.0)	0 0
Egypt	38 (0.9)	408 (4.4)	0 (1.2)	31 (1.1)	399 (4.7)	-2 (1.6)
El Salvador	32 (1.0)	394 (3.3)	0 0	44 (1.4)	368 (3.3)	0 0
England	21 (0.9)	509 (5.3)	4 (1.3) ▲	15 (1.0)	476 (6.3)	2 (1.5)
Georgia	25 (1.3)	406 (7.4)	0 0	13 (1.4)	385 (6.0)	0 0
Ghana	39 (1.3)	300 (5.7)	5 (1.6) ▲	38 (1.7)	301 (6.2)	3 (2.2)
Hong Kong SAR	30 (0.8)	525 (5.5)	1 (1.1)	26 (1.0)	500 (6.4)	-2 (1.3)
Hungary	15 (0.9)	500 (4.9)	2 (1.1)	7 (0.6)	456 (6.3)	3 (0.9) ▲
Indonesia	55 (1.2)	421 (3.2)	10 (1.5) ▲	25 (1.3)	423 (5.4)	-7 (1.6) ▼
Iran, Islamic Rep. of	30 (1.2)	461 (4.3)	-1 (1.4)	43 (1.8)	434 (3.4)	4 (2.2)
Israel	20 (1.0)	443 (6.0)	3 (1.3)	9 (0.6)	419 (10.4)	3 (0.8) ▲
Italy	23 (0.8)	472 (4.1)	-6 (1.1) ▼	11 (0.6)	451 (6.9)	-2 (0.9) ▼
Japan	21 (0.7)	539 (3.4)	0 (0.9)	15 (0.8)	507 (4.0)	1 (1.1)
Jordan	35 (0.9)	470 (4.6)	2 (1.3)	17 (0.9)	452 (7.0)	-6 (1.2) ▼
Korea, Rep. of	11 (0.6)	521 (3.9)	0 (0.8)	9 (0.6)	489 (4.8)	-6 (0.9) ▼
Kuwait	30 (0.8)	420 (3.7)	0 0	27 (0.9)	399 (4.4)	0 0
Lebanon	30 (1.1)	405 (6.0)	-6 (1.6) ▼	22 (1.3)	376 (7.3)	-1 (1.9)
Lithuania	32 (1.0)	495 (3.4)	3 (1.5)	12 (0.9)	472 (5.2)	2 (1.2)
Malaysia	38 (1.0)	460 (5.6)	-2 (1.4)	19 (1.0)	427 (7.2)	2 (1.4)
Malta	18 (0.6)	415 (4.4)	0 0	8 (0.3)	352 (5.7)	0 0
Norway	17 (0.8)	455 (4.2)	6 (1.0) ▲	7 (0.5)	417 (6.2)	1 (0.6)
Oman	31 (0.9)	417 (3.9)	0 0	21 (1.0)	388 (3.9)	0 0
Palestinian Nat'l Auth.	35 (1.0)	409 (4.4)	-1 (1.3)	29 (1.2)	379 (4.9)	2 (1.6)
Qatar	25 (0.5)	304 (3.8)	0 0	19 (0.5)	281 (3.5)	0 0
Romania	33 (1.1)	448 (5.9)	7 (1.7) ▲	17 (1.1)	408 (6.0)	-3 (2.1)
Russian Federation	22 (0.8)	502 (4.3)	5 (1.3) ▲	5 (0.6)	498 (9.1)	1 (0.8)
Saudi Arabia	32 (0.9)	401 (3.4)	--	27 (1.1)	379 (3.8)	--
Scotland	24 (0.9)	478 (3.5)	3 (1.3) ▲	22 (1.1)	436 (4.3)	6 (1.4) ▲
Serbia	39 (1.3)	458 (3.1)	1 (1.6)	18 (1.0)	427 (4.9)	-3 (1.5)
Singapore	24 (0.8)	537 (5.4)	0 (1.0)	16 (0.8)	498 (7.5)	4 (1.0) ▲
Slovenia	29 (0.9)	515 (3.0)	3 (1.2) ▲	7 (0.5)	478 (4.9)	0 (0.8)
Sweden	16 (0.7)	480 (3.7)	2 (1.0)	8 (0.5)	446 (5.2)	2 (0.7) ▲
Syrian Arab Republic	39 (0.8)	452 (2.9)	0 0	27 (1.1)	441 (4.3)	0 0
Thailand	42 (1.2)	466 (3.9)	0 0	30 (1.5)	443 (4.5)	0 0
Tunisia	41 (1.0)	439 (2.7)	-3 (1.5) ▼	30 (1.4)	435 (2.3)	7 (1.8) ▲
Turkey	37 (1.0)	449 (4.0)	0 0	26 (1.5)	410 (3.6)	0 0
Ukraine	30 (1.1)	458 (4.1)	0 0	7 (0.5)	436 (7.2)	0 0
United States	20 (0.7)	492 (2.9)	2 (0.9) ▲	17 (0.9)	464 (3.7)	4 (1.0) ▲
‡ Morocco	38 (1.2)	398 (4.5)	--	25 (1.7)	392 (4.2)	--
International Avg.	29 (0.1)	452 (0.6)		20 (0.2)	426 (0.8)	
<b>Benchmarking Participants</b>						
Basque Country, Spain	15 (1.0)	465 (6.0)	-1 (1.3)	5 (0.6)	432 (10.3)	0 (0.8)
British Columbia, Canada	15 (0.8)	493 (5.6)	0 0	9 (0.6)	477 (5.4)	0 0
Dubai, UAE	29 (1.4)	468 (3.8)	0 0	17 (0.9)	448 (6.0)	0 0
Massachusetts, US	15 (0.7)	513 (7.1)	0 0	12 (1.0)	485 (7.6)	0 0
Minnesota, US	16 (1.1)	507 (8.1)	0 0	10 (0.9)	477 (7.3)	0 0
Ontario, Canada	16 (1.0)	494 (4.8)	3 (1.3) ▲	8 (0.9)	473 (9.5)	1 (1.1)
Quebec, Canada	26 (1.0)	492 (3.3)	2 (1.4)	18 (0.8)	473 (3.8)	3 (1.1) ▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower



with a computer, and particularly a computer with Internet access, have opportunities for a greatly enhanced science learning experience compared to those less fortunate. Exhibit 4.5 presents fourth and eighth grade students' reports of having a computer at home and whether or not it has an Internet connection, in relation to their average achievement in science.

At both grades, 70 percent of students reported having a computer at home, and about half (56% at fourth grade, 50% at eighth grade) had an Internet connection. Ninety percent or more of the fourth grade students reported having a computer at home in Australia, Austria, the Czech Republic, Denmark, England, Germany, Hong Kong SAR, the Netherlands, New Zealand, Norway, Scotland, Singapore, Sweden, the United States, as well as Massachusetts, Minnesota, and the four Canadian provinces. In addition, in Denmark, the Netherlands, Norway, Sweden, and the state of Massachusetts, more than 90 percent of students reported having an Internet connection for the computer. Although having a computer at home is clearly very common in many countries, there also are countries where relatively few fourth grade students come from computer equipped homes, and even fewer from homes with computers connected to the Internet. More than 60 percent of students in Algeria, Colombia, El Salvador, Georgia, Iran, Kazakhstan, and Yemen are from homes without a computer, and about 80 percent (or more) do not have a computer connected to the Internet.

On average across countries at the fourth grade, students from homes with a computer had science achievement 40 points above those from homes without a computer (487 points, on average vs. 447 points), and those from homes with an Internet-connected computer nearly 30 points above students from homes without such a facility (487 vs. 459). These achievement differences may be at least partly a reflection of socioeconomic differences, since, in many countries, computers and Internet connections require significant financial outlay.

At the eighth grade, in 18 of the 49 countries and in all 7 benchmarking entities, 90 percent or more of the students reported that they had a computer in the home, and the vast majority of students in these countries also reported

having an Internet connection for the computer. However, there also were countries where many students did not have a computer at home, including Armenia, Botswana, Colombia, El Salvador, Georgia, Ghana, Indonesia, and Tunisia, where 60 percent or more of students reported not having a computer at home, and 80 percent or more did not have Internet access at home. Like at the fourth grade, eighth grade students with a computer at home had higher average science achievement than students without a computer, and students with an Internet-connected computer had higher achievement than students than those that did not.

From an educational perspective, actually using a computer may be more important for a student than merely having one in the home. Exhibit 4.6 presents students' reports on where, if anywhere, they use a computer. This exhibit presents, for each TIMSS participant at fourth and eighth grades, the percentage of students that reported using a computer both at home and at school, at home but not at school, at school but not at home, only at places other than home and school, and not using a computer at all. Also shown is the average science achievement for students in each category of computer use, as well as changes in the percentages in each category since 2003. Countries are ordered by the percentage of students using a computer both at home and at school.

At fourth grade, on average across countries, 38 percent of students reported using a computer both at home and at school and a further 31 percent at home but not at school. Just 9 percent reported using a computer at school but not at home, 5 percent only at places other than home and school, and 17 percent reported not using a computer at all. Average achievement was highest among those reporting using a computer at home and at school and at home only, perhaps reflecting an economic advantage for those with a computer at home, and lowest among those reporting that they do not use a computer at all or use one only at places other than the home and the school.

TIMSS participants with the highest percentage (more than 70%) of students reporting using a computer both at home and at school included Chinese Taipei, Scotland, Australia, England, Hong Kong SAR,

Exhibit 4.5 Computer and Internet Connection in the Home

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Have Computer		Do Not Have Computer		Have Internet Connection		Do Not Have Internet Connection	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Algeria	32 (1.5)	370 (8.1)	68 (1.5)	350 (6.2)	13 (1.0)	351 (9.4)	87 (1.0)	357 (6.2)
Armenia	38 (1.6)	482 (6.5)	62 (1.6)	492 (6.9)	21 (1.3)	493 (17.5)	79 (1.3)	486 (5.3)
Australia	95 (0.6)	532 (3.1)	5 (0.6)	464 (10.3)	84 (0.8)	537 (3.1)	16 (0.8)	485 (6.6)
Austria	93 (0.5)	529 (2.5)	7 (0.5)	487 (7.1)	73 (1.2)	537 (2.3)	27 (1.2)	496 (4.0)
Chinese Taipei	87 (0.6)	563 (2.0)	13 (0.6)	522 (4.6)	80 (0.7)	563 (2.1)	20 (0.7)	538 (3.9)
Colombia	39 (1.2)	421 (7.4)	61 (1.2)	393 (5.0)	16 (0.9)	424 (10.7)	84 (0.9)	400 (5.0)
Czech Republic	90 (0.7)	520 (3.0)	10 (0.7)	478 (6.4)	65 (1.2)	524 (3.4)	35 (1.2)	500 (4.1)
Denmark	95 (0.4)	519 (2.8)	5 (0.4)	488 (9.4)	93 (0.4)	521 (2.9)	7 (0.4)	480 (7.0)
El Salvador	26 (1.3)	425 (5.9)	74 (1.3)	382 (3.7)	14 (0.9)	411 (8.1)	86 (0.9)	390 (3.2)
England	95 (0.4)	545 (2.7)	5 (0.4)	493 (8.4)	86 (0.7)	549 (2.8)	14 (0.7)	499 (4.5)
Georgia	33 (1.5)	418 (4.4)	67 (1.5)	422 (5.4)	17 (1.5)	416 (6.1)	83 (1.5)	422 (4.8)
Germany	93 (0.5)	534 (2.4)	7 (0.5)	491 (6.7)	81 (0.8)	538 (2.4)	19 (0.8)	497 (4.2)
Hong Kong SAR	94 (0.5)	556 (3.5)	6 (0.5)	530 (7.6)	86 (0.8)	558 (3.4)	14 (0.8)	532 (5.6)
Hungary	81 (0.7)	550 (3.3)	19 (0.7)	493 (4.5)	54 (1.3)	554 (3.6)	46 (1.3)	519 (3.6)
Iran, Islamic Rep. of	29 (1.7)	486 (5.5)	71 (1.7)	417 (4.8)	18 (1.3)	493 (6.9)	82 (1.3)	424 (4.5)
Italy	88 (0.8)	539 (3.0)	12 (0.8)	511 (6.4)	54 (1.0)	544 (2.6)	46 (1.0)	525 (4.5)
Japan	82 (0.9)	555 (2.2)	18 (0.9)	524 (3.0)	70 (1.2)	556 (2.1)	30 (1.2)	530 (2.6)
Kazakhstan	28 (1.8)	543 (5.3)	72 (1.8)	529 (6.7)	16 (1.6)	537 (6.6)	84 (1.6)	532 (6.2)
Kuwait	82 (1.0)	366 (4.3)	18 (1.0)	307 (7.0)	64 (1.4)	362 (4.6)	36 (1.4)	344 (6.0)
Latvia	76 (1.2)	549 (2.3)	24 (1.2)	526 (3.4)	57 (1.3)	549 (2.1)	43 (1.3)	533 (3.4)
Lithuania	77 (0.9)	519 (2.5)	23 (0.9)	500 (3.5)	58 (1.4)	523 (2.5)	42 (1.4)	504 (3.0)
Morocco	32 (2.0)	339 (9.6)	68 (2.0)	286 (6.3)	26 (1.7)	323 (12.4)	74 (1.7)	297 (5.8)
Netherlands	95 (0.5)	526 (2.7)	5 (0.5)	479 (6.1)	96 (0.4)	525 (2.6)	4 (0.4)	483 (7.2)
New Zealand	91 (0.5)	511 (2.4)	9 (0.5)	453 (6.2)	77 (0.9)	519 (2.3)	23 (0.9)	457 (4.5)
Norway	95 (0.4)	481 (3.5)	5 (0.4)	418 (7.1)	95 (0.4)	480 (3.6)	5 (0.4)	439 (9.5)
Qatar	80 (0.5)	310 (2.3)	20 (0.5)	265 (4.7)	58 (0.6)	304 (3.1)	42 (0.6)	299 (2.9)
Russian Federation	51 (1.8)	559 (4.2)	49 (1.8)	535 (6.5)	26 (1.4)	560 (4.1)	74 (1.4)	543 (5.5)
Scotland	94 (0.5)	504 (2.2)	6 (0.5)	449 (8.4)	85 (0.7)	508 (2.2)	15 (0.7)	457 (5.2)
Singapore	90 (0.5)	594 (4.1)	10 (0.5)	525 (6.6)	80 (0.7)	601 (3.9)	20 (0.7)	532 (5.5)
Slovak Republic	77 (1.2)	538 (4.2)	23 (1.2)	497 (7.7)	43 (1.1)	540 (4.0)	57 (1.1)	517 (5.4)
Slovenia	85 (0.6)	528 (2.2)	15 (0.6)	483 (3.8)	75 (0.8)	525 (2.1)	25 (0.8)	502 (2.8)
Sweden	98 (0.2)	526 (2.9)	2 (0.2)	~ ~	93 (0.5)	528 (2.9)	7 (0.5)	490 (6.3)
Tunisia	34 (1.3)	357 (8.0)	66 (1.3)	308 (5.6)	21 (1.1)	312 (8.0)	79 (1.1)	330 (6.2)
Ukraine	40 (1.3)	493 (3.1)	60 (1.3)	465 (3.6)	24 (1.1)	486 (3.8)	76 (1.1)	474 (3.4)
United States	90 (0.5)	544 (2.7)	10 (0.5)	495 (4.7)	78 (0.9)	552 (2.6)	22 (0.9)	497 (3.3)
Yemen	18 (1.5)	213 (9.5)	82 (1.5)	198 (8.1)	11 (1.3)	213 (11.2)	89 (1.3)	201 (7.8)
International Avg.	70 (0.2)	487 (1.2)	30 (0.2)	447 (1.5)	56 (0.2)	487 (1.3)	44 (0.2)	459 (1.4)
<b>Benchmarking Participants</b>								
Alberta, Canada	94 (0.5)	546 (3.6)	6 (0.5)	498 (9.2)	88 (0.9)	547 (3.6)	12 (0.9)	510 (6.4)
British Columbia, Canada	95 (0.5)	539 (2.8)	5 (0.5)	506 (7.8)	89 (0.8)	541 (2.8)	11 (0.8)	510 (5.2)
Dubai, UAE	89 (0.7)	475 (3.1)	11 (0.7)	406 (8.3)	78 (0.8)	481 (3.3)	22 (0.8)	420 (6.2)
Massachusetts, US	96 (0.7)	573 (4.1)	4 (0.7)	517 (10.4)	91 (1.1)	576 (4.1)	9 (1.1)	519 (8.0)
Minnesota, US	92 (0.9)	555 (6.1)	8 (0.9)	510 (7.0)	81 (1.6)	563 (5.1)	19 (1.6)	502 (9.8)
Ontario, Canada	96 (0.4)	538 (3.6)	4 (0.4)	501 (10.7)	89 (1.0)	542 (3.5)	11 (1.0)	497 (9.6)
Quebec, Canada	95 (0.6)	519 (2.7)	5 (0.6)	483 (6.2)	87 (1.0)	522 (2.6)	13 (1.0)	490 (5.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.



Exhibit 4.5 Computer and Internet Connection in the Home (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Have Computer		Do Not Have Computer		Have Internet Connection		Do Not Have Internet Connection	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Algeria	53 (1.7)	408 (2.0)	47 (1.7)	410 (2.3)	15 (0.9)	407 (2.7)	85 (0.9)	409 (2.1)
Armenia	34 (1.2)	495 (9.0)	66 (1.2)	485 (5.0)	17 (0.9)	499 (12.8)	83 (0.9)	487 (5.1)
Australia	97 (0.3)	517 (3.6)	3 (0.3)	449 (14.5)	89 (0.7)	521 (3.5)	11 (0.7)	467 (7.9)
Bahrain	86 (0.8)	469 (1.9)	14 (0.8)	468 (3.9)	74 (0.8)	472 (2.2)	26 (0.8)	458 (3.2)
Bosnia and Herzegovina	72 (1.1)	477 (2.9)	28 (1.1)	439 (3.6)	31 (1.3)	493 (3.7)	69 (1.3)	455 (2.8)
Botswana	26 (0.8)	364 (5.2)	74 (0.8)	356 (3.0)	13 (0.7)	336 (6.8)	87 (0.7)	360 (2.9)
Bulgaria	65 (1.7)	482 (6.2)	35 (1.7)	456 (8.6)	52 (1.6)	484 (6.0)	48 (1.6)	459 (7.5)
Chinese Taipei	94 (0.4)	566 (3.5)	6 (0.4)	495 (8.6)	89 (0.7)	565 (3.5)	11 (0.7)	528 (7.0)
Colombia	37 (1.7)	440 (4.2)	63 (1.7)	405 (4.0)	15 (1.4)	458 (5.8)	85 (1.4)	411 (3.8)
Cyprus	94 (0.3)	456 (1.9)	6 (0.3)	392 (8.0)	65 (0.9)	464 (2.2)	35 (0.9)	431 (3.1)
Czech Republic	94 (0.5)	541 (2.0)	6 (0.5)	497 (5.6)	76 (1.1)	545 (2.0)	24 (1.1)	519 (2.8)
Egypt	48 (1.2)	423 (4.2)	52 (1.2)	403 (4.0)	25 (1.2)	420 (4.7)	75 (1.2)	409 (3.7)
El Salvador	30 (1.3)	408 (4.2)	70 (1.3)	380 (3.1)	10 (0.9)	418 (6.8)	90 (0.9)	385 (2.8)
England	98 (0.2)	543 (4.5)	2 (0.2)	~ ~	92 (0.6)	547 (4.4)	8 (0.6)	491 (9.7)
Georgia	26 (1.4)	423 (5.1)	74 (1.4)	422 (5.1)	14 (1.0)	426 (7.1)	86 (1.0)	422 (4.8)
Ghana	25 (1.2)	307 (8.7)	75 (1.2)	307 (5.6)	10 (0.7)	245 (10.5)	90 (0.7)	313 (5.0)
Hong Kong SAR	99 (0.3)	532 (4.8)	1 (0.3)	~ ~	97 (0.4)	532 (4.8)	3 (0.4)	487 (14.8)
Hungary	90 (0.8)	546 (2.8)	10 (0.8)	490 (5.5)	62 (1.6)	555 (3.1)	38 (1.6)	513 (3.5)
Indonesia	17 (1.3)	454 (6.9)	83 (1.3)	424 (3.5)	8 (0.8)	433 (11.1)	92 (0.8)	428 (3.4)
Iran, Islamic Rep. of	39 (1.9)	493 (5.4)	61 (1.9)	441 (3.0)	25 (1.6)	502 (6.1)	75 (1.6)	446 (2.9)
Israel	95 (0.7)	474 (4.3)	5 (0.7)	407 (12.0)	84 (1.2)	478 (4.7)	16 (1.2)	431 (7.2)
Italy	95 (0.4)	498 (2.7)	5 (0.4)	442 (8.7)	70 (1.1)	506 (2.8)	30 (1.1)	470 (3.9)
Japan	88 (0.7)	559 (1.8)	12 (0.7)	522 (4.5)	77 (0.9)	562 (2.1)	23 (0.9)	529 (2.9)
Jordan	66 (1.3)	499 (3.9)	34 (1.3)	452 (4.9)	24 (1.2)	507 (5.2)	76 (1.2)	476 (4.1)
Korea, Rep. of	99 (0.2)	554 (2.0)	1 (0.2)	~ ~	96 (0.3)	556 (2.0)	4 (0.3)	486 (7.6)
Kuwait	94 (0.5)	422 (2.8)	6 (0.5)	377 (9.4)	71 (0.7)	422 (3.3)	29 (0.7)	413 (3.7)
Lebanon	77 (1.4)	428 (5.8)	23 (1.4)	374 (7.4)	36 (1.6)	433 (7.5)	64 (1.6)	407 (6.1)
Lithuania	85 (0.8)	526 (2.6)	15 (0.8)	480 (4.8)	66 (1.2)	530 (2.8)	34 (1.2)	496 (3.3)
Malaysia	59 (1.7)	490 (6.8)	41 (1.7)	444 (5.7)	27 (1.7)	509 (7.9)	73 (1.7)	457 (5.7)
Malta	--	--	--	--	--	--	--	--
Norway	99 (0.2)	488 (2.1)	1 (0.2)	~ ~	97 (0.3)	489 (2.1)	3 (0.3)	441 (8.7)
Oman	67 (1.1)	439 (3.0)	33 (1.1)	397 (3.7)	35 (1.3)	444 (3.9)	65 (1.3)	415 (3.0)
Palestinian Nat'l Auth.	66 (1.3)	419 (3.5)	34 (1.3)	384 (4.9)	31 (1.2)	427 (4.6)	69 (1.2)	399 (3.8)
Qatar	92 (0.3)	325 (1.8)	8 (0.3)	266 (6.9)	74 (0.5)	324 (2.3)	26 (0.5)	311 (2.8)
Romania	64 (1.3)	479 (4.0)	36 (1.3)	440 (5.3)	33 (1.6)	486 (4.5)	67 (1.6)	453 (4.5)
Russian Federation	61 (1.8)	543 (3.9)	39 (1.8)	509 (4.8)	32 (1.4)	550 (4.9)	68 (1.4)	521 (3.6)
Saudi Arabia	81 (1.2)	409 (2.6)	19 (1.2)	389 (4.4)	41 (1.5)	422 (3.0)	59 (1.5)	393 (3.2)
Scotland	98 (0.3)	498 (3.4)	2 (0.3)	~ ~	92 (0.5)	501 (3.4)	8 (0.5)	454 (6.4)
Serbia	77 (1.0)	481 (3.3)	23 (1.0)	439 (6.0)	47 (1.4)	496 (3.6)	53 (1.4)	451 (3.7)
Singapore	94 (0.5)	574 (4.0)	6 (0.5)	463 (8.4)	87 (0.7)	581 (3.9)	13 (0.7)	471 (7.3)
Slovenia	97 (0.3)	540 (2.1)	3 (0.3)	472 (9.2)	86 (0.7)	543 (2.1)	14 (0.7)	508 (5.3)
Sweden	99 (0.2)	512 (2.5)	1 (0.2)	~ ~	97 (0.3)	513 (2.5)	3 (0.3)	469 (9.0)
Syrian Arab Republic	62 (1.3)	457 (3.0)	38 (1.3)	451 (3.5)	19 (1.1)	461 (4.2)	81 (1.1)	453 (2.8)
Thailand	41 (1.6)	504 (6.3)	59 (1.6)	448 (4.0)	20 (1.4)	524 (8.7)	80 (1.4)	458 (3.8)
Tunisia	39 (2.0)	458 (2.9)	61 (2.0)	440 (2.1)	18 (1.2)	456 (3.8)	82 (1.2)	444 (2.2)
Turkey	43 (1.6)	483 (4.3)	57 (1.6)	435 (3.7)	20 (1.2)	500 (5.3)	80 (1.2)	444 (3.4)
Ukraine	46 (1.6)	508 (3.4)	54 (1.6)	467 (3.8)	22 (1.2)	501 (4.6)	78 (1.2)	483 (3.5)
United States	94 (0.4)	523 (2.8)	6 (0.4)	466 (5.3)	87 (0.6)	527 (2.8)	13 (0.6)	477 (4.3)
‡ Morocco	45 (1.8)	414 (3.7)	55 (1.8)	393 (3.3)	37 (1.6)	411 (3.0)	63 (1.6)	398 (3.5)
International Avg.	70 (0.2)	476 (0.7)	30 (0.2)	430 (1.2)	50 (0.2)	479 (0.8)	50 (0.2)	448 (1.0)
<b>Benchmarking Participants</b>								
Basque Country, Spain	96 (0.5)	501 (2.8)	4 (0.5)	428 (11.1)	84 (1.0)	503 (3.0)	16 (1.0)	474 (5.8)
British Columbia, Canada	98 (0.2)	527 (2.7)	2 (0.2)	~ ~	96 (0.5)	528 (2.7)	4 (0.5)	477 (7.2)
Dubai, UAE	95 (0.5)	496 (2.8)	5 (0.5)	437 (8.1)	84 (0.6)	499 (3.0)	16 (0.6)	453 (6.1)
Massachusetts, US	97 (0.4)	558 (4.3)	3 (0.4)	507 (16.0)	93 (0.7)	561 (4.0)	7 (0.7)	496 (13.3)
Minnesota, US	96 (0.5)	541 (4.6)	4 (0.5)	479 (12.5)	89 (1.2)	544 (4.4)	11 (1.2)	497 (11.0)
Ontario, Canada	99 (0.2)	527 (3.6)	1 (0.2)	~ ~	96 (0.5)	528 (3.7)	4 (0.5)	490 (8.2)
Quebec, Canada	97 (0.4)	508 (3.1)	3 (0.4)	495 (12.1)	93 (0.6)	508 (3.1)	7 (0.6)	497 (6.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.



Exhibit 4.6 Computer Use with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Use Computer Both at Home and at School			Use Computer at Home but Not at School			Use Computer at School but Not at Home		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Chinese Taipei	84 (0.7)	562 (2.1)	3 (1.6)	8 (0.4)	532 (6.1)	2 (1.3)	7 (0.5)	529 (6.3)	-5 (0.9)
Scotland	79 (1.0)	506 (2.2)	2 (1.4)	12 (0.7)	487 (5.2)	5 (1.0)	7 (0.5)	467 (6.4)	-6 (0.9)
Australia	79 (1.4)	537 (3.6)	-2 (2.1)	13 (1.2)	506 (6.1)	7 (1.5)	7 (0.6)	480 (9.0)	-4 (1.2)
England	78 (1.0)	550 (3.0)	-1 (1.5)	13 (0.9)	525 (4.8)	6 (1.1)	7 (0.6)	490 (6.7)	-4 (1.0)
Hong Kong SAR	78 (1.1)	560 (3.5)	2 (1.7)	16 (0.8)	536 (5.1)	7 (1.2)	4 (0.4)	540 (7.8)	-8 (1.0)
Netherlands	77 (1.3)	528 (3.1)	-2 (2.4)	16 (1.3)	510 (4.1)	4 (2.1)	3 (0.3)	503 (7.8)	-1 (0.5)
Denmark	75 (1.4)	521 (2.9)	0 0	21 (1.3)	513 (5.9)	0 0	3 (0.4)	492 (10.9)	0 0
Singapore	67 (1.1)	603 (3.8)	-4 (1.7)	22 (0.8)	572 (5.3)	5 (1.3)	7 (0.5)	526 (8.1)	0 (0.7)
New Zealand	66 (1.0)	518 (2.5)	-5 (1.5)	20 (0.9)	496 (5.0)	8 (1.2)	10 (0.5)	452 (6.3)	-2 (0.9)
Kuwait	61 (1.6)	363 (4.8)	0 0	23 (1.2)	348 (7.2)	0 0	11 (0.7)	315 (8.9)	0 0
Norway	59 (1.8)	485 (3.8)	-1 (2.5)	34 (1.7)	472 (4.1)	6 (2.4)	3 (0.3)	456 (9.4)	-2 (0.6)
United States	58 (1.0)	550 (2.8)	-16 (1.5)	26 (1.0)	536 (3.8)	14 (1.4)	10 (0.5)	499 (3.9)	-1 (0.8)
Sweden	53 (2.0)	530 (2.9)	0 0	42 (2.0)	520 (3.7)	0 0	3 (0.3)	517 (10.3)	0 0
Japan	47 (1.4)	563 (2.2)	-8 (1.8)	19 (1.2)	545 (3.3)	10 (1.4)	26 (1.0)	534 (2.6)	-5 (1.4)
Czech Republic	44 (2.5)	526 (4.0)	0 0	46 (2.4)	512 (3.8)	0 0	6 (0.7)	480 (7.2)	0 0
Qatar	44 (0.6)	302 (3.4)	0 0	38 (0.6)	312 (2.8)	0 0	11 (0.3)	256 (6.6)	0 0
Italy	37 (1.4)	552 (3.4)	7 (2.3)	24 (1.3)	532 (4.0)	-14 (2.3)	5 (0.4)	527 (7.5)	-6 (1.0)
Hungary	33 (2.0)	548 (5.0)	9 (2.9)	49 (2.1)	543 (3.9)	6 (2.9)	7 (0.8)	490 (9.2)	-2 (1.3)
Germany	30 (1.5)	536 (4.5)	0 0	55 (1.5)	531 (2.8)	0 0	3 (0.3)	479 (10.2)	0 0
Slovak Republic	30 (1.7)	547 (5.4)	0 0	46 (1.7)	529 (4.4)	0 0	13 (1.0)	504 (6.8)	0 0
Slovenia	28 (1.5)	527 (3.1)	-4 (2.4)	64 (1.4)	519 (2.2)	18 (2.4)	2 (0.3)	~ ~	-3 (0.7)
Austria	27 (1.5)	534 (3.5)	0 0	56 (1.6)	525 (2.8)	0 0	4 (0.3)	497 (7.3)	0 0
Tunisia	18 (1.4)	330 (11.7)	11 (1.6)	28 (1.5)	355 (7.9)	3 (2.1)	23 (2.1)	316 (9.2)	16 (2.3)
Colombia	15 (1.0)	422 (11.3)	0 0	18 (1.3)	413 (9.4)	0 0	30 (1.8)	401 (6.7)	0 0
Kazakhstan	14 (1.9)	547 (9.8)	0 0	22 (2.0)	531 (6.6)	0 0	26 (2.6)	530 (8.3)	0 0
Latvia	14 (1.2)	546 (6.0)	4 (1.8)	61 (1.6)	548 (2.7)	34 (2.3)	8 (1.0)	516 (8.2)	-9 (2.3)
Morocco	13 (2.2)	311 (26.0)	-3 (2.5)	25 (1.5)	323 (5.7)	0 (2.3)	6 (0.7)	268 (12.6)	-1 (1.0)
Lithuania	13 (1.2)	514 (5.5)	3 (1.7)	64 (1.7)	520 (2.4)	29 (2.2)	7 (0.9)	488 (7.1)	-11 (1.8)
El Salvador	11 (1.3)	416 (13.0)	0 0	20 (1.2)	397 (5.7)	0 0	17 (1.6)	404 (6.7)	0 0
Russian Federation	11 (1.4)	569 (7.5)	7 (1.5)	45 (2.2)	554 (4.2)	25 (2.4)	12 (1.7)	538 (14.1)	1 (2.3)
Yemen	9 (0.9)	189 (11.1)	0 0	23 (1.7)	211 (9.6)	0 0	9 (0.9)	183 (12.5)	0 0
Algeria	8 (1.1)	309 (22.6)	0 0	25 (1.7)	366 (7.4)	0 0	4 (0.5)	310 (18.5)	0 0
Armenia	7 (0.8)	467 (11.9)	2 (0.9)	44 (1.9)	473 (5.4)	14 (2.3)	15 (1.6)	504 (10.9)	6 (2.0)
Ukraine	6 (0.7)	491 (7.8)	0 0	34 (1.3)	491 (3.8)	0 0	8 (1.2)	470 (6.6)	0 0
Georgia	6 (0.6)	380 (10.1)	0 0	37 (1.8)	410 (4.8)	0 0	6 (0.9)	403 (10.7)	0 0
Iran, Islamic Rep. of	2 (0.5)	~ ~	-1 (0.6)	19 (1.3)	501 (4.6)	8 (1.9)	1 (0.2)	~ ~	-2 (0.5)
International Avg.	38 (0.2)	484 (1.4)		31 (0.2)	478 (0.9)		9 (0.2)	452 (1.6)	
<b>Benchmarking Participants</b>									
Alberta, Canada	77 (1.2)	549 (3.7)	0 0	13 (0.9)	523 (5.5)	0 0	7 (0.5)	519 (7.1)	0 0
Ontario, Canada	73 (1.6)	541 (3.6)	-5 (2.6)	20 (1.5)	529 (6.0)	7 (2.2)	5 (0.6)	511 (13.3)	-2 (0.8)
British Columbia, Canada	72 (1.4)	544 (2.8)	0 0	19 (1.2)	527 (4.4)	0 0	6 (0.5)	508 (7.4)	0 0
Minnesota, US	66 (1.8)	559 (5.3)	0 0	22 (1.9)	549 (9.6)	0 0	8 (1.0)	506 (9.4)	0 0
Quebec, Canada	66 (1.7)	523 (2.8)	-10 (2.2)	26 (1.5)	511 (4.4)	14 (1.9)	5 (0.6)	482 (6.7)	-4 (1.0)
Dubai, UAE	63 (1.6)	481 (3.3)	0 0	29 (1.2)	451 (5.1)	0 0	6 (0.7)	401 (15.7)	0 0
Massachusetts, US	62 (2.4)	578 (5.1)	0 0	31 (2.4)	567 (4.1)	0 0	4 (0.8)	511 (11.3)	0 0

▲ 2007 percent significantly higher  
▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

A diamond (0) indicates the country did not participate in the assessment.

Exhibit 4.6 Computer Use with Trends (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Use Computer Only at Places Other than Home and School			Do Not Use Computer at All		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Chinese Taipei	1 (0.1)	~ ~	0 (0.2)	1 (0.1)	~ ~	0 (0.2)
Scotland	1 (0.2)	~ ~	0 (0.3)	1 (0.2)	~ ~	-1 (0.3)
Australia	1 (0.2)	~ ~	-1 (0.3)	1 (0.2)	~ ~	0 (0.2)
England	1 (0.2)	~ ~	0 (0.2)	1 (0.2)	~ ~	0 (0.3)
Hong Kong SAR	1 (0.2)	~ ~	-1 (0.3)	2 (0.3)	~ ~	-1 (0.5)
Netherlands	0 (0.1)	~ ~	0 (0.2)	4 (0.5)	502 (7.1)	0 (0.7)
Denmark	1 (0.2)	~ ~	0 0	1 (0.2)	~ ~	0 0
Singapore	1 (0.2)	~ ~	0 (0.3)	2 (0.2)	~ ~	0 (0.3)
New Zealand	2 (0.2)	~ ~	-1 (0.4)	2 (0.2)	~ ~	0 (0.3)
Kuwait	2 (0.2)	~ ~	0 0	3 (0.5)	360 (15.9)	0 0
Norway	1 (0.1)	~ ~	-1 (0.4)	2 (0.3)	~ ~	-3 (0.7)
United States	3 (0.2)	516 (5.7)	1 (0.3)	3 (0.3)	528 (6.7)	1 (0.3)
Sweden	1 (0.1)	~ ~	0 0	2 (0.3)	~ ~	0 0
Japan	2 (0.3)	~ ~	0 (0.4)	6 (0.6)	511 (7.1)	2 (0.7)
Czech Republic	3 (0.3)	493 (8.6)	0 0	2 (0.2)	~ ~	0 0
Qatar	3 (0.2)	266 (12.3)	0 0	4 (0.2)	313 (8.4)	0 0
Italy	1 (0.1)	~ ~	-8 (0.6)	33 (1.0)	520 (4.3)	21 (1.2)
Hungary	4 (0.6)	508 (7.7)	-8 (1.0)	7 (0.5)	518 (8.3)	-5 (1.0)
Germany	1 (0.2)	~ ~	0 0	11 (0.6)	532 (5.6)	0 0
Slovak Republic	4 (0.6)	507 (7.8)	0 0	7 (1.0)	500 (14.0)	0 0
Slovenia	1 (0.1)	~ ~	-4 (0.6)	4 (0.4)	494 (7.1)	-7 (1.0)
Austria	1 (0.2)	~ ~	0 0	12 (0.8)	527 (4.5)	0 0
Tunisia	6 (0.6)	352 (10.2)	-9 (1.2)	25 (2.6)	294 (9.1)	-21 (3.4)
Colombia	9 (0.9)	404 (7.5)	0 0	28 (1.9)	387 (6.4)	0 0
Kazakhstan	12 (1.4)	532 (6.7)	0 0	26 (3.4)	537 (7.2)	0 0
Latvia	10 (0.8)	538 (5.3)	-14 (2.0)	7 (0.7)	532 (6.1)	-16 (2.0)
Morocco	9 (0.7)	332 (8.6)	-6 (1.4)	46 (2.4)	286 (8.2)	9 (4.0)
Lithuania	8 (0.7)	518 (4.4)	-15 (1.3)	7 (0.6)	502 (4.7)	-6 (1.2)
El Salvador	12 (0.9)	405 (6.8)	0 0	40 (2.4)	382 (5.1)	0 0
Russian Federation	14 (0.9)	545 (5.3)	-16 (1.6)	19 (2.0)	529 (8.8)	-16 (2.6)
Yemen	4 (0.5)	189 (13.8)	0 0	55 (3.0)	203 (9.8)	0 0
Algeria	7 (1.0)	349 (15.0)	0 0	55 (2.5)	359 (5.8)	0 0
Armenia	12 (0.9)	504 (13.3)	-12 (1.4)	21 (1.5)	500 (9.5)	-10 (2.1)
Ukraine	12 (0.8)	494 (4.8)	0 0	40 (1.4)	459 (4.6)	0 0
Georgia	10 (1.0)	436 (8.0)	0 0	42 (2.3)	437 (6.1)	0 0
Iran, Islamic Rep. of	4 (0.5)	457 (9.9)	-4 (1.1)	75 (1.7)	415 (4.6)	-1 (2.6)
International Avg.	5 (0.1)	439 (2.1)		17 (0.2)	445 (1.6)	
<b>Benchmarking Participants</b>						
Alberta, Canada	1 (0.2)	~ ~	0 0	1 (0.2)	~ ~	0 0
Ontario, Canada	1 (0.3)	~ ~	0 (0.5)	1 (0.2)	~ ~	0 (0.3)
British Columbia, Canada	1 (0.2)	~ ~	0 0	1 (0.3)	~ ~	0 0
Minnesota, US	2 (0.3)	~ ~	0 0	2 (0.3)	~ ~	0 0
Quebec, Canada	1 (0.3)	~ ~	0 (0.4)	2 (0.3)	~ ~	1 (0.4)
Dubai, UAE	1 (0.2)	~ ~	0 0	1 (0.2)	~ ~	0 0
Massachusetts, US	2 (0.3)	~ ~	0 0	1 (0.3)	~ ~	0 0

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

● 2007 percent significantly higher

▼ 2007 percent significantly lower



Exhibit 4.6 Computer Use with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Use Computer Both at Home and at School			Use Computer at Home but Not at School			Use Computer at School but Not at Home		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Chinese Taipei	87 (0.7)	569 (3.4)	-1 (1.1)	8 (0.5)	523 (7.1)	6 (0.5)	3 (0.4)	502 (11.0)	-6 (0.9)
Hong Kong SAR	84 (1.0)	539 (4.2)	-4 (1.2)	13 (0.9)	497 (8.1)	5 (1.1)	1 (0.3)	~ ~	-1 (0.4)
Malta	84 (0.6)	464 (1.7)	0 0	12 (0.5)	451 (5.4)	0 0	3 (0.3)	325 (11.1)	0 0
Australia	77 (1.0)	523 (3.7)	-6 (1.4)	17 (0.9)	503 (5.1)	7 (1.3)	4 (0.4)	456 (13.2)	-1 (0.6)
England	76 (1.1)	553 (4.5)	-5 (1.4)	20 (1.0)	520 (5.8)	10 (1.2)	3 (0.4)	469 (10.8)	-4 (0.8)
Czech Republic	76 (1.1)	545 (2.0)	0 0	15 (0.9)	533 (3.9)	0 0	8 (0.6)	497 (4.3)	0 0
Cyprus	74 (0.7)	462 (2.2)	3 (1.0)	17 (0.6)	445 (4.6)	10 (0.7)	6 (0.3)	405 (6.9)	-10 (0.7)
Scotland	71 (1.1)	506 (3.5)	-7 (1.5)	25 (1.0)	478 (5.0)	13 (1.3)	3 (0.3)	458 (9.8)	-6 (0.7)
United States	69 (1.0)	531 (2.8)	-10 (1.4)	22 (0.9)	508 (3.9)	10 (1.3)	6 (0.4)	474 (5.0)	-2 (0.6)
Norway	67 (1.2)	494 (2.3)	-3 (2.0)	30 (1.2)	476 (2.9)	8 (1.9)	1 (0.2)	~ ~	-3 (0.5)
Singapore	67 (1.0)	585 (3.9)	-12 (1.2)	25 (0.8)	555 (5.4)	11 (1.0)	5 (0.4)	460 (10.2)	0 (0.6)
Hungary	67 (1.1)	551 (3.0)	6 (1.8)	21 (0.9)	538 (3.5)	13 (1.3)	10 (0.7)	486 (6.5)	-16 (1.3)
Sweden	67 (1.4)	518 (2.6)	-11 (1.9)	31 (1.4)	503 (3.4)	14 (1.9)	1 (0.1)	~ ~	-2 (0.4)
Qatar	65 (0.5)	330 (1.8)	0 0	23 (0.5)	313 (3.9)	0 0	8 (0.3)	279 (6.0)	0 0
Kuwait	63 (1.0)	428 (2.7)	0 0	26 (1.0)	413 (4.0)	0 0	6 (0.5)	386 (7.9)	0 0
Japan	58 (1.6)	567 (2.1)	3 (2.0)	23 (1.5)	552 (4.0)	7 (1.9)	17 (0.9)	528 (3.8)	-10 (1.2)
Italy	54 (1.9)	505 (3.2)	16 (2.7)	36 (1.9)	496 (3.1)	-2 (2.7)	2 (0.3)	~ ~	-7 (0.7)
Jordan	53 (1.5)	505 (3.6)	17 (2.1)	14 (1.2)	469 (6.1)	5 (1.4)	26 (1.4)	450 (5.1)	-18 (2.0)
Slovenia	51 (1.5)	547 (2.7)	1 (2.1)	46 (1.5)	531 (2.4)	12 (2.3)	2 (0.2)	~ ~	-6 (0.8)
Israel	50 (2.0)	480 (4.5)	-22 (2.7)	43 (2.1)	475 (5.3)	25 (2.6)	4 (0.6)	411 (12.6)	-2 (0.8)
Lebanon	50 (2.3)	444 (6.2)	11 (2.7)	27 (2.1)	399 (9.1)	11 (2.5)	11 (1.4)	386 (10.3)	-10 (2.4)
Palestinian Nat'l Auth.	48 (1.5)	423 (4.1)	23 (2.1)	16 (1.2)	390 (5.8)	-2 (1.7)	26 (1.2)	389 (5.3)	-7 (2.0)
Bosnia and Herzegovina	46 (1.3)	479 (3.1)	0 0	25 (1.3)	473 (4.8)	0 0	22 (1.0)	437 (4.3)	0 0
Russian Federation	41 (2.0)	550 (4.0)	29 (2.3)	21 (1.8)	527 (5.5)	3 (2.9)	25 (1.9)	512 (5.3)	-3 (2.6)
Oman	38 (1.9)	442 (4.5)	0 0	27 (1.7)	429 (3.7)	0 0	18 (1.3)	396 (5.9)	0 0
Serbia	36 (1.7)	488 (4.0)	21 (2.2)	40 (1.8)	473 (4.4)	17 (2.4)	14 (1.0)	445 (6.8)	-9 (2.2)
Bahrain	36 (0.9)	479 (2.9)	5 (1.7)	50 (1.0)	471 (2.4)	5 (1.7)	5 (0.4)	422 (6.8)	-3 (0.5)
Syrian Arab Republic	36 (1.3)	460 (3.5)	0 0	14 (0.9)	450 (5.6)	0 0	34 (1.5)	447 (3.8)	0 0
Lithuania	33 (1.8)	528 (3.2)	7 (2.3)	49 (1.8)	526 (3.3)	27 (2.3)	9 (0.7)	482 (4.8)	-25 (1.8)
Korea, Rep. of	31 (1.5)	566 (2.5)	-4 (2.2)	64 (1.6)	552 (2.5)	3 (2.3)	1 (0.1)	~ ~	0 (0.2)
Romania	30 (1.9)	482 (5.5)	15 (2.6)	37 (2.3)	471 (4.9)	22 (2.6)	18 (1.7)	450 (6.8)	-8 (2.7)
Malaysia	30 (2.0)	505 (6.4)	4 (2.6)	29 (1.7)	478 (8.4)	4 (2.5)	23 (1.4)	451 (7.5)	-1 (2.2)
Thailand	29 (1.4)	515 (6.7)	0 0	8 (0.6)	507 (8.2)	0 0	50 (1.6)	452 (4.3)	0 0
Turkey	26 (1.3)	499 (4.8)	0 0	12 (1.0)	467 (6.2)	0 0	46 (1.9)	442 (3.8)	0 0
Egypt	23 (1.0)	414 (5.6)	5 (1.2)	19 (0.9)	416 (5.0)	13 (1.0)	41 (1.5)	398 (4.5)	-20 (2.0)
Colombia	21 (1.3)	454 (4.5)	0 0	10 (0.9)	439 (5.4)	0 0	48 (1.7)	403 (4.1)	0 0
Bulgaria	20 (1.6)	480 (7.5)	--	43 (1.6)	485 (6.9)	--	20 (1.5)	455 (11.5)	--
Saudi Arabia	18 (1.7)	399 (5.2)	--	51 (1.6)	414 (2.9)	--	7 (0.7)	370 (7.9)	--
Ukraine	16 (1.4)	520 (5.7)	0 0	32 (1.8)	500 (4.0)	0 0	22 (1.7)	472 (5.4)	0 0
Indonesia	14 (1.2)	466 (7.5)	7 (1.9)	2 (0.3)	~ ~	0 (0.4)	66 (2.5)	430 (3.5)	35 (4.1)
Botswana	13 (0.8)	383 (7.4)	8 (1.1)	3 (0.4)	358 (16.2)	-2 (0.6)	57 (1.6)	368 (2.8)	34 (2.9)
El Salvador	13 (1.3)	431 (6.1)	0 0	12 (0.8)	396 (6.1)	0 0	27 (2.2)	388 (4.5)	0 0
Ghana	11 (1.0)	301 (16.8)	1 (1.3)	13 (1.0)	306 (9.7)	4 (1.2)	20 (1.7)	292 (10.1)	-1 (2.3)
Armenia	10 (0.8)	485 (8.0)	3 (1.1)	30 (1.3)	498 (10.7)	16 (1.5)	21 (1.9)	492 (8.0)	6 (2.7)
Georgia	6 (1.1)	418 (9.6)	0 0	20 (1.4)	420 (7.2)	0 0	17 (2.2)	410 (8.5)	0 0
Algeria	6 (0.7)	405 (4.8)	0 0	27 (1.5)	417 (2.9)	0 0	6 (0.8)	400 (6.2)	0 0
Iran, Islamic Rep. of	4 (1.0)	559 (14.2)	2 (1.2)	30 (1.8)	490 (5.4)	13 (2.2)	2 (0.7)	~ ~	1 (0.8)
Tunisia	3 (0.5)	427 (6.0)	-2 (0.7)	39 (1.9)	455 (2.9)	19 (2.4)	7 (0.7)	420 (5.2)	-8 (1.7)
‡ Morocco	20 (1.3)	414 (5.0)	--	24 (1.5)	402 (4.6)	--	19 (1.5)	396 (6.0)	--
International Avg.	42 (0.2)	482 (0.8)		25 (0.2)	466 (0.9)		16 (0.2)	428 (1.1)	
<b>Benchmarking Participants</b>									
Ontario, Canada	80 (1.3)	531 (3.8)	-5 (1.7)	17 (1.4)	512 (5.4)	6 (1.7)	1 (0.3)	~ ~	-2 (0.6)
Minnesota, US	79 (1.5)	544 (4.7)	0 0	15 (1.3)	534 (6.7)	0 0	4 (0.5)	493 (13.2)	0 0
Massachusetts, US	71 (1.6)	565 (4.3)	0 0	25 (1.7)	544 (5.3)	0 0	2 (0.4)	~ ~	0 0
Basque Country, Spain	67 (2.2)	503 (3.5)	-3 (3.0)	27 (2.1)	499 (4.3)	11 (2.8)	3 (0.4)	448 (11.0)	-8 (0.9)
Dubai, UAE	66 (1.2)	503 (3.3)	0 0	28 (1.4)	478 (4.4)	0 0	3 (0.5)	452 (9.7)	0 0
British Columbia, Canada	65 (1.4)	531 (2.7)	0 0	32 (1.3)	522 (4.0)	0 0	2 (0.3)	~ ~	0 0
Quebec, Canada	61 (1.8)	517 (3.8)	-9 (2.6)	34 (1.7)	494 (3.3)	12 (2.5)	3 (0.4)	490 (10.8)	-3 (0.7)

● 2007 percent significantly higher  
 ▼ 2007 percent significantly lower

Background data provided by students.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

A diamond (0) indicates the country did not participate in the assessment.



Exhibit 4.6 Computer Use with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Use Computer Only at Places Other than Home and School			Do Not Use Computer at All		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Chinese Taipei	1 (0.2)	~ ~	0 (0.2)	1 (0.1)	~ ~	0 (0.2)
Hong Kong SAR	0 (0.1)	~ ~	0 (0.1)	1 (0.1)	~ ~	0 (0.2)
Malta	0 (0.1)	~ ~	0 0	1 (0.1)	~ ~	0 0
Australia	1 (0.2)	~ ~	0 (0.3)	0 (0.1)	~ ~	0 (0.2)
England	1 (0.2)	~ ~	0 (0.2)	0 (0.1)	~ ~	-1 (0.2)
Czech Republic	1 (0.2)	~ ~	0 0	1 (0.2)	~ ~	0 0
Cyprus	0 (0.1)	~ ~	-2 (0.3) ▼	3 (0.2)	386 (8.0)	-2 (0.4) ▼
Scotland	1 (0.2)	~ ~	0 (0.3)	0 (0.1)	~ ~	-1 (0.2)
United States	3 (0.2)	467 (7.5)	1 (0.3)	1 (0.1)	~ ~	0 (0.2)
Norway	0 (0.1)	~ ~	-1 (0.2)	1 (0.1)	~ ~	-1 (0.2)
Singapore	2 (0.2)	~ ~	1 (0.3)	0 (0.1)	~ ~	0 (0.1)
Hungary	1 (0.2)	~ ~	-1 (0.4)	1 (0.2)	~ ~	-2 (0.5) ▼
Sweden	0 (0.1)	~ ~	-1 (0.2)	1 (0.1)	~ ~	-1 (0.3)
Qatar	2 (0.2)	~ ~	0 0	2 (0.2)	~ ~	0 0
Kuwait	3 (0.3)	365 (10.3)	0 0	2 (0.2)	~ ~	0 0
Japan	1 (0.2)	~ ~	0 (0.3)	1 (0.2)	~ ~	0 (0.3)
Italy	0 (0.1)	~ ~	-5 (0.4) ▼	8 (0.5)	446 (7.0)	-1 (0.7)
Jordan	1 (0.2)	~ ~	-6 (0.8) ▼	5 (0.5)	483 (9.3)	1 (0.7)
Slovenia	1 (0.1)	~ ~	-3 (0.4) ▼	1 (0.1)	~ ~	-4 (0.4) ▼
Israel	1 (0.2)	~ ~	-1 (0.3)	1 (0.2)	~ ~	1 (0.3)
Lebanon	7 (1.1)	375 (11.8)	-6 (1.6) ▼	4 (0.8)	364 (17.6)	-5 (1.5) ▼
Palestinian Nat'l Auth.	3 (0.3)	391 (10.5)	-10 (1.1) ▼	7 (0.8)	405 (9.1)	-3 (1.2) ▼
Bosnia and Herzegovina	4 (0.4)	458 (7.1)	0 0	3 (0.3)	448 (9.3)	0 0
Russian Federation	8 (1.0)	519 (6.3)	-13 (1.5) ▼	5 (1.0)	494 (9.8)	-15 (2.0) ▼
Oman	3 (0.4)	397 (8.5)	0 0	14 (1.1)	418 (5.9)	0 0
Serbia	5 (0.6)	452 (8.0)	-14 (1.3) ▼	4 (0.5)	427 (7.9)	-15 (1.2) ▼
Bahrain	2 (0.3)	~ ~	-7 (0.6) ▼	6 (0.4)	463 (6.4)	0 (0.6)
Syrian Arab Republic	2 (0.2)	~ ~	0 0	14 (1.1)	459 (4.2)	0 0
Lithuania	4 (0.4)	495 (8.9)	-8 (1.1) ▼	5 (0.4)	479 (8.9)	0 (0.7)
Korea, Rep. of	2 (0.2)	~ ~	0 (0.3)	2 (0.3)	~ ~	2 (0.3) ▲
Romania	8 (0.8)	446 (6.8)	-16 (1.6) ▼	7 (1.3)	412 (7.3)	-13 (2.2) ▼
Malaysia	10 (0.9)	449 (6.1)	-3 (1.3) ▼	8 (0.8)	418 (9.4)	-3 (1.4) ▼
Thailand	4 (0.5)	462 (7.7)	0 0	9 (0.9)	424 (6.3)	0 0
Turkey	13 (1.2)	428 (6.3)	0 0	4 (0.7)	387 (8.9)	0 0
Egypt	10 (0.7)	423 (5.6)	2 (0.9) ▲	7 (0.5)	431 (6.5)	0 (0.9)
Colombia	12 (0.9)	423 (4.4)	0 0	9 (0.8)	381 (8.9)	0 0
Bulgaria	9 (0.9)	454 (10.7)	--	8 (0.9)	455 (10.8)	--
Saudi Arabia	3 (0.4)	386 (9.0)	--	20 (1.0)	403 (3.7)	--
Ukraine	19 (1.0)	477 (4.5)	0 0	11 (0.9)	454 (6.0)	0 0
Indonesia	3 (0.4)	421 (10.0)	-16 (1.3) ▼	15 (2.0)	402 (6.2)	-26 (3.4) ▼
Botswana	2 (0.2)	~ ~	-3 (0.5) ▼	25 (1.4)	319 (5.4)	-36 (2.9) ▼
El Salvador	21 (1.4)	390 (3.9)	0 0	28 (1.9)	371 (3.8)	0 0
Ghana	14 (1.0)	330 (6.3)	-12 (1.8) ▼	42 (2.5)	308 (7.0)	8 (3.5) ▲
Armenia	19 (1.1)	485 (5.7)	0 (1.6)	20 (1.2)	483 (6.0)	-25 (2.5) ▼
Georgia	12 (1.1)	427 (8.6)	0 0	44 (2.6)	436 (7.2)	0 0
Algeria	11 (0.8)	418 (4.2)	0 0	49 (1.9)	406 (2.0)	0 0
Iran, Islamic Rep. of	7 (0.6)	474 (7.2)	-5 (1.0) ▼	57 (2.1)	436 (2.9)	-11 (2.7) ▼
Tunisia	18 (0.9)	446 (3.5)	-5 (1.4) ▼	32 (1.5)	444 (2.4)	-4 (2.3)
‡ Morocco	19 (1.5)	401 (5.0)	--	18 (1.7)	401 (6.2)	--
International Avg.	6 (0.1)	432 (1.5)		10 (0.1)	421 (1.4)	
<b>Benchmarking Participants</b>						
Ontario, Canada	1 (0.2)	~ ~	0 (0.2)	0 (0.1)	~ ~	0 (0.1)
Minnesota, US	2 (0.4)	~ ~	0 0	0 (0.2)	~ ~	0 0
Massachusetts, US	2 (0.3)	~ ~	0 0	0 (0.1)	~ ~	0 0
Basque Country, Spain	2 (0.3)	~ ~	-1 (0.5)	1 (0.2)	~ ~	0 (0.3)
Dubai, UAE	1 (0.3)	~ ~	0 0	2 (0.2)	~ ~	0 0
British Columbia, Canada	1 (0.2)	~ ~	0 0	1 (0.1)	~ ~	0 0
Quebec, Canada	1 (0.3)	~ ~	0 (0.4)	1 (0.2)	~ ~	0 (0.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 percent significantly higher  
▼ 2007 percent significantly lower

the Netherlands, Denmark, and Canadian provinces of Alberta, Ontario, and British Columbia. As a contrast, 40 percent or more of fourth grade students in Morocco (46%), El Salvador (40%), Yemen and Algeria (55%), the Ukraine (40%), Georgia (42%), and Iran (75%) reported never using a computer.

At the fourth grade, computer use increased in a number of countries between 2003 and 2007. Students reported increases in using the computer both at home and in school in Italy, Hungary, Tunisia, Latvia, and the Russian Federation and in using the computer at home but not in school in 16 countries and 2 benchmarking entities.

At eighth grade, 42 percent of students, on average across countries, reported using a computer both at home and at school and 25 percent at home only. Compared to fourth grade, relatively more students (16% vs. 9%) reported using a computer at school but not at home and relatively fewer reported not using a computer at all (10% vs. 17%). There was a stronger association between using a computer and science achievement at eighth grade, with highest average achievement (482 points) among students using a computer both at home and at school, next highest (466 points) among those using a computer at home but not at school, somewhat similar among those using a computer at school but not at home and those using a computer only at places other than home and school (428 and 432 points, respectively), and lowest (421 points) among those not using a computer at all.

Eighth grade TIMSS participants with the highest percentages of students (more than 70%) of students using a computer both at home and at school included Chinese Taipei, Hong Kong SAR, Malta, Australia, England, the Czech Republic, Cyprus, Scotland, the province of Ontario, and the states of Minnesota and Massachusetts. Lowest levels of computer use were reported in Ghana, Georgia, Algeria, and Iran, where 40 percent or more of eighth grade students reported never using a computer.

Similar to the findings at the fourth grade, computer use also increased at the eighth grade in a substantial number of countries. Students in 15 countries reported more use both at home and at school, and in 10 of

those countries there also were increases in use at home but not in school. Students in an additional 15 countries and 3 benchmarking entities reported increases in use at home but not at school. However, in 9 of these countries and 2 benchmarking entities the increase in use at home corresponded to a decrease in the use both at home and at school category.

### **How Much of Their Out-of-school Time Do Students Spend on Homework During the School Week?**

Homework provides an opportunity for students to extend and consolidate what they have learned in school, and for teachers to extend the time for learning beyond what is available during the hours of formal schooling. Consequently, it might be expected that students who are assigned homework and who spend time on it would have higher achievement than students who do little or no homework. However, the situation is not as straightforward as that. The tradition of assigning homework and expecting students to devote a portion of their after-school time to completing this assignment varies from country to country and from grade to grade. In some countries and especially at the fourth grade, homework is rarely assigned, and when students spend time on homework, it often can be for remedial purposes, to enable them to catch up on material not fully mastered during class. Under these circumstances, lower achievement is associated with time spent on homework. Also, even when homework is regularly assigned as a means of extending classroom learning, the more able students may accomplish the assignment more expeditiously, resulting in a situation where high achievement is associated with less time spent on homework.

To summarize the amount of time typically devoted to science homework in each country, TIMSS constructed an index that assigns students to a high, medium, or low level on the basis of the frequency of science homework they are assigned each week and the amount of time they spend on it. Students at the high level of the Index of Time Students Spend Doing Science Homework (TSH) reported that they were assigned science homework at least 3–4 times a week and spend more than 30 minutes on each assignment. Students at the low level reported being assigned homework

no more than twice a week and spending no more than 30 minutes on each assignment. The medium level included all other response combinations. For each TIMSS 2007 participant, Exhibit 4.7 presents the percentages of fourth and eighth grade students at the three levels of the index, together with their average science achievement. Participants are ordered by the percentage of students at the high level of the index. At fourth grade, results are presented for science as a single subject for all participants. However, at eighth grade, the 20 countries that taught biology, earth science, chemistry, and physics as separate science subjects are presented in separate panels for each subject.

At fourth grade, students generally reported that they spent relatively little time on science homework, with 57 percent of students, on average across countries, at the low level of the index (30 minutes or less no more than twice a week). Thirty-five percent of students were at the medium level and just 9 percent at the high level. The highest percentages of students at the low level of the index (80% or more) were in Denmark, Austria, Norway, the Czech Republic, Australia, Sweden, Japan, England, Scotland, the Netherlands, the states of Minnesota and Massachusetts, and the province of Quebec. Countries with the greatest percentages of students at the high level of the index (20% or more) included Colombia (23%), Yemen (21%), and El Salvador (20%). Average science achievement was highest among students at the low level of the homework index (488 points), next highest at the medium level (474 points), and lowest among students at the high level (446 points), i.e., those assigned most science homework.

Twenty-nine countries and all seven benchmarking participants taught science as a single subject at the eighth grade. On average across these, 14 percent of students were at the high level of the science homework index, 45 percent at the medium level, and 41 percent at the low level. Countries with the greatest homework emphasis (20% or more at the high level) included El Salvador, Colombia, Malaysia, Egypt, Ghana, Jordan, Singapore, and Thailand, and among benchmarking participants, British Columbia and Dubai. In contrast, 50 percent or more of students were at the low level of the index in Tunisia, Israel, the United States, England, Australia, Korea, Scotland, Japan, and the provinces of Ontario and Quebec. Average science

achievement was lower among students at the high level of the index than among students at the medium or low levels.

In countries teaching the sciences as separate subjects at the eighth grade, on average 10 percent of students were at the high level of the homework index in biology, compared with 9 percent for earth science, and 13 percent in both chemistry and physics. Countries with highest percentages of students at the high level of the homework index in all four science subjects included the Russian Federation, the Syrian Arab Republic, and Ukraine (among the top five countries in all four subjects). In each science subject, average achievement was lowest among students at the high level of the science homework index.



Exhibit 4.7 **Index of Time Students Spend Doing Science Homework (TSH)  
in a Normal School Week**

TIMSS2007  
Science **4<sup>th</sup>**  
Grade

Country		High TSH		Medium TSH		Low TSH	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Colombia	r	23 (1.1)	423 (6.5)	55 (1.2)	407 (5.5)	22 (1.4)	426 (6.1)
Yemen	r	21 (2.0)	232 (11.3)	57 (2.6)	222 (7.5)	22 (2.6)	189 (15.2)
El Salvador	r	20 (1.0)	403 (5.0)	59 (1.3)	398 (4.1)	21 (1.4)	413 (4.2)
Tunisia	r	19 (1.4)	357 (9.8)	50 (1.5)	347 (6.7)	31 (1.8)	347 (8.9)
Singapore		17 (0.7)	585 (5.7)	47 (0.9)	587 (4.9)	36 (0.9)	594 (4.5)
Algeria	r	17 (1.1)	364 (9.3)	47 (1.4)	359 (9.9)	36 (1.7)	369 (6.6)
Qatar	s	16 (0.6)	287 (7.3)	54 (0.8)	306 (3.2)	30 (0.7)	327 (3.1)
Italy		15 (1.2)	525 (5.6)	48 (2.2)	535 (3.7)	36 (2.7)	546 (4.5)
Kazakhstan		15 (1.5)	512 (13.6)	45 (2.6)	529 (6.0)	41 (3.0)	545 (5.1)
Latvia		13 (1.0)	527 (5.0)	43 (1.1)	541 (2.8)	44 (1.4)	554 (3.3)
Slovenia		13 (0.8)	505 (4.9)	66 (1.2)	523 (2.2)	21 (1.2)	524 (3.4)
Morocco	r	13 (1.0)	289 (9.1)	46 (2.2)	305 (7.8)	42 (2.2)	328 (9.3)
Armenia	r	12 (0.9)	476 (8.4)	51 (1.6)	495 (7.5)	37 (1.7)	494 (6.5)
Iran, Islamic Rep. of		12 (0.9)	438 (8.7)	44 (1.5)	435 (5.4)	45 (2.0)	437 (4.7)
Kuwait	r	12 (0.8)	328 (10.1)	54 (1.5)	361 (4.5)	35 (1.5)	390 (6.7)
Georgia		10 (1.1)	415 (11.8)	45 (1.9)	415 (4.8)	46 (2.0)	440 (5.2)
Ukraine		8 (0.7)	449 (6.3)	40 (1.3)	471 (3.8)	52 (1.4)	490 (3.7)
Lithuania		8 (0.5)	496 (4.8)	35 (1.0)	511 (3.3)	57 (1.2)	524 (2.7)
Russian Federation		6 (0.7)	508 (9.6)	34 (1.3)	539 (5.2)	60 (1.6)	558 (4.9)
Hungary		6 (0.5)	520 (6.8)	33 (1.2)	532 (4.1)	61 (1.3)	549 (3.7)
Hong Kong SAR		5 (0.5)	547 (8.8)	43 (1.8)	562 (4.4)	52 (2.0)	554 (3.3)
Germany	r	4 (0.4)	512 (6.5)	30 (1.3)	527 (3.4)	66 (1.4)	536 (2.6)
Slovak Republic		3 (0.3)	498 (10.2)	24 (1.0)	513 (4.5)	73 (1.2)	540 (3.7)
New Zealand		3 (0.3)	463 (12.6)	23 (1.0)	503 (4.0)	74 (1.1)	515 (3.0)
United States		3 (0.2)	502 (8.1)	23 (1.0)	532 (3.3)	75 (1.1)	549 (2.8)
Chinese Taipei		2 (0.3)	~ ~	19 (0.9)	538 (4.2)	79 (1.0)	567 (1.9)
Denmark		2 (0.3)	~ ~	13 (1.0)	501 (4.8)	85 (1.0)	522 (2.9)
Austria		2 (0.3)	~ ~	14 (0.9)	493 (6.0)	84 (1.0)	537 (2.7)
Norway		1 (0.3)	~ ~	16 (1.2)	467 (5.4)	83 (1.3)	486 (3.4)
Czech Republic		1 (0.3)	~ ~	16 (0.9)	496 (5.6)	83 (0.9)	523 (3.2)
Australia		1 (0.2)	~ ~	17 (1.5)	520 (6.9)	81 (1.6)	536 (3.1)
Sweden		1 (0.2)	~ ~	19 (1.1)	514 (5.4)	80 (1.2)	533 (2.7)
Japan		1 (0.2)	~ ~	15 (1.1)	539 (3.9)	84 (1.2)	551 (2.2)
England		1 (0.2)	~ ~	16 (1.4)	540 (8.4)	83 (1.4)	547 (2.8)
Scotland		1 (0.1)	~ ~	10 (0.9)	490 (5.8)	89 (0.9)	507 (2.4)
Netherlands		1 (0.2)	~ ~	9 (1.0)	509 (5.5)	91 (1.1)	527 (2.8)
International Avg.		9 (0.1)	446 (2.2)	35 (0.2)	474 (1.2)	57 (0.3)	488 (1.2)
<b>Benchmarking Participants</b>							
Dubai, UAE	r	10 (1.0)	450 (7.7)	37 (1.4)	461 (4.3)	53 (1.6)	488 (4.7)
Alberta, Canada		3 (0.4)	503 (11.4)	22 (1.2)	532 (4.9)	75 (1.5)	550 (3.6)
British Columbia, Canada		3 (0.4)	496 (10.2)	24 (1.4)	529 (5.3)	73 (1.5)	544 (3.0)
Ontario, Canada		3 (0.5)	527 (15.9)	26 (1.4)	522 (5.7)	71 (1.6)	544 (3.8)
Minnesota, US		2 (0.3)	~ ~	16 (2.1)	537 (8.4)	83 (2.3)	560 (5.6)
Massachusetts, US		1 (0.3)	~ ~	17 (1.6)	572 (10.2)	82 (1.7)	575 (3.8)
Quebec, Canada		1 (0.2)	~ ~	12 (1.0)	511 (5.4)	87 (1.0)	522 (2.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on students' reports on the frequency of science homework they are given and the amount of time they spend on that homework. High level indicates science homework assigned at least 3 or 4 times a week and students spend more than 30 minutes on that homework. Low level indicates science homework assigned no more than twice a week and students spend no more than 30 minutes on that homework. Medium level includes all other possible combinations of responses.

- ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A tilde (~) indicates insufficient data to report achievement.  
 An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

**Exhibit 4.7 Index of Time Students Spend Doing Science Homework (TSH) in a Normal School Week (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

General/Integrated Science						
Country	High TSH		Medium TSH		Low TSH	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
El Salvador	33 (1.2)	395 (3.2)	50 (0.9)	386 (3.3)	17 (1.0)	389 (4.6)
Colombia	30 (1.3)	419 (4.3)	50 (1.0)	420 (3.6)	21 (1.2)	411 (5.4)
Malaysia	27 (1.0)	480 (6.2)	46 (0.8)	471 (5.9)	27 (1.2)	469 (7.7)
Egypt	25 (1.0)	392 (4.8)	64 (1.2)	425 (3.4)	11 (1.0)	417 (8.4)
Ghana	23 (0.9)	321 (7.3)	54 (0.9)	302 (5.4)	23 (1.0)	318 (6.0)
Jordan	22 (1.1)	477 (5.3)	57 (1.1)	490 (3.9)	21 (1.4)	490 (6.3)
Singapore	21 (0.7)	586 (3.8)	45 (1.0)	579 (4.9)	34 (1.2)	552 (5.7)
Thailand	21 (0.9)	472 (5.5)	48 (0.8)	473 (4.6)	30 (1.2)	469 (5.2)
Turkey	18 (1.1)	458 (5.4)	45 (1.0)	456 (4.0)	37 (1.5)	456 (4.8)
Palestinian Nat'l Auth.	17 (1.2)	406 (5.1)	52 (1.5)	405 (4.4)	31 (1.8)	424 (4.9)
Botswana	15 (0.8)	364 (5.6)	45 (1.0)	359 (3.3)	40 (1.1)	364 (4.0)
Chinese Taipei	15 (1.3)	591 (5.0)	40 (1.4)	576 (3.6)	46 (2.1)	552 (4.4)
Qatar	13 (0.4)	321 (4.8)	54 (0.6)	329 (2.3)	33 (0.6)	322 (2.5)
Norway	11 (0.9)	486 (3.3)	43 (1.3)	488 (2.4)	45 (1.8)	492 (3.1)
Kuwait	11 (0.6)	403 (5.9)	47 (1.5)	427 (3.4)	41 (1.7)	427 (3.5)
Italy	11 (0.7)	485 (5.4)	42 (1.2)	496 (4.3)	47 (1.3)	501 (2.8)
Tunisia	11 (0.7)	435 (4.0)	37 (1.1)	444 (3.0)	52 (1.3)	450 (2.2)
Bahrain	11 (0.6)	465 (5.0)	50 (1.0)	470 (2.3)	39 (1.0)	477 (3.0)
Oman	10 (0.6)	408 (6.3)	69 (1.4)	433 (3.1)	21 (1.5)	421 (4.4)
Israel	10 (0.7)	456 (9.4)	40 (1.3)	465 (5.9)	50 (1.3)	490 (4.3)
Saudi Arabia	9 (0.6)	384 (8.7)	61 (1.4)	414 (2.8)	30 (1.6)	403 (4.3)
United States	9 (0.7)	503 (5.4)	41 (1.3)	526 (3.1)	50 (1.5)	524 (3.4)
Hong Kong SAR	8 (0.8)	523 (7.3)	43 (1.4)	540 (4.7)	48 (1.6)	531 (5.7)
Iran, Islamic Rep. of	8 (0.7)	476 (8.6)	45 (1.4)	462 (3.9)	47 (1.5)	454 (4.0)
England	7 (0.9)	588 (8.6)	31 (1.1)	558 (5.0)	62 (1.4)	536 (4.7)
Australia	6 (0.6)	539 (8.9)	32 (1.1)	529 (4.3)	62 (1.4)	511 (4.1)
Korea, Rep. of	2 (0.4)	~ ~	20 (1.4)	556 (3.6)	77 (1.6)	556 (2.2)
Scotland	2 (0.3)	~ ~	22 (0.9)	500 (4.2)	76 (1.0)	500 (3.5)
Japan	1 (0.2)	~ ~	20 (1.1)	550 (3.7)	79 (1.2)	558 (2.1)
<b>International Avg.</b>	<b>14 (0.2)</b>	<b>455 (1.2)</b>	<b>45 (0.2)</b>	<b>466 (0.8)</b>	<b>41 (0.3)</b>	<b>464 (0.9)</b>
<b>Benchmarking Participants</b>						
British Columbia, Canada	27 (1.3)	523 (3.7)	46 (1.2)	529 (3.2)	27 (1.7)	533 (4.2)
Dubai, UAE	20 (1.1)	509 (5.4)	41 (1.7)	501 (3.5)	39 (1.8)	482 (4.6)
Basque Country, Spain	15 (1.5)	491 (5.4)	44 (2.0)	499 (3.7)	40 (2.3)	502 (3.7)
Massachusetts, US	13 (1.8)	546 (8.1)	52 (3.2)	564 (6.0)	35 (4.3)	552 (6.6)
Minnesota, US	12 (2.3)	526 (8.1)	45 (2.3)	540 (5.7)	43 (3.3)	543 (4.9)
Ontario, Canada	8 (0.9)	526 (9.2)	37 (1.7)	534 (4.1)	55 (2.1)	526 (4.2)
Quebec, Canada	3 (0.4)	511 (10.0)	20 (1.1)	519 (5.5)	77 (1.3)	508 (2.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on students' reports on the frequency of science homework they are given and the amount of time they spend on that homework. High level indicates science homework assigned at least 3 or 4 times a week and students spend more than 30 minutes on that homework. Low level indicates science homework assigned no more than twice a week and students spend no more than 30 minutes on that homework. Medium level includes all other possible combinations of responses.

- (1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.
- A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.
- An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 4.7 **Index of Time Students Spend Doing Science Homework (TSH) in a Normal School Week (Continued)**

TIMSS2007  
Science **8<sup>th</sup>** Grade

Biology							
Country		High TSH		Medium TSH		Low TSH	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Syrian Arab Republic	r	24 (1.1)	453 (4.1)	51 (1.0)	458 (2.6)	25 (1.0)	464 (3.9)
Russian Federation		20 (1.1)	514 (7.0)	52 (0.9)	530 (4.1)	28 (1.2)	544 (4.7)
Ukraine		18 (0.9)	481 (5.4)	49 (0.9)	489 (3.4)	33 (0.9)	494 (4.3)
Armenia	r	15 (0.9)	484 (8.9)	49 (1.0)	488 (6.5)	36 (1.1)	494 (5.7)
Indonesia		12 (0.7)	434 (7.1)	47 (1.3)	430 (4.0)	41 (1.4)	428 (3.7)
Georgia	r	11 (0.9)	419 (8.0)	51 (1.9)	429 (5.7)	38 (2.3)	438 (5.3)
Lithuania		10 (0.8)	495 (6.2)	40 (1.2)	512 (3.5)	49 (1.5)	532 (2.9)
Serbia		10 (0.9)	455 (5.9)	24 (0.9)	468 (4.5)	66 (1.4)	479 (3.4)
Lebanon	r	8 (0.8)	409 (12.2)	41 (1.7)	400 (5.7)	51 (1.7)	433 (6.3)
Bulgaria	r	8 (0.9)	456 (13.4)	26 (1.5)	468 (8.0)	67 (1.9)	483 (6.1)
Romania		8 (0.8)	430 (8.3)	22 (1.1)	449 (5.4)	70 (1.5)	476 (4.1)
Bosnia and Herzegovina		7 (0.5)	462 (5.0)	28 (1.1)	453 (4.1)	65 (1.1)	476 (3.2)
Hungary		6 (0.5)	521 (5.9)	35 (1.3)	528 (4.0)	59 (1.6)	549 (3.0)
Malta	r	5 (0.3)	497 (7.3)	22 (0.7)	517 (3.9)	74 (0.7)	452 (2.0)
Slovenia		5 (0.5)	506 (8.2)	39 (1.1)	533 (3.0)	56 (1.3)	546 (2.3)
Cyprus	s	2 (0.3)	~ ~	7 (0.6)	398 (9.0)	90 (0.8)	455 (2.2)
Sweden		2 (0.2)	~ ~	32 (1.1)	512 (3.2)	66 (1.1)	516 (2.6)
Czech Republic		1 (0.1)	~ ~	9 (0.8)	519 (4.8)	90 (0.8)	542 (2.0)
Algeria		--	--	--	--	--	--
‡ Morocco	r	11 (0.8)	402 (6.6)	39 (1.9)	405 (3.9)	50 (2.3)	407 (3.7)
International Avg.		10 (0.2)	464 (2.1)	35 (0.3)	473 (1.4)	55 (0.3)	485 (1.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Earth Science							
Country		High TSH		Medium TSH		Low TSH	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Russian Federation		21 (1.2)	515 (5.9)	50 (0.9)	532 (4.2)	29 (1.3)	542 (4.8)
Syrian Arab Republic	r	18 (1.0)	455 (4.7)	45 (1.2)	457 (2.8)	37 (1.3)	462 (3.5)
Ukraine		16 (0.8)	477 (4.7)	47 (1.0)	489 (3.4)	36 (1.2)	495 (4.4)
Romania		15 (1.4)	460 (7.3)	28 (1.2)	458 (4.6)	58 (2.0)	472 (4.2)
Lithuania		13 (0.8)	498 (5.2)	41 (1.1)	512 (3.4)	46 (1.4)	533 (2.8)
Armenia	r	13 (0.8)	482 (6.8)	43 (1.2)	490 (5.3)	44 (1.2)	494 (6.1)
Serbia		9 (0.9)	453 (8.4)	25 (1.1)	468 (5.2)	66 (1.5)	479 (3.3)
Georgia	r	8 (0.6)	411 (7.8)	36 (2.4)	422 (8.0)	57 (2.8)	438 (5.3)
Bosnia and Herzegovina		7 (0.5)	443 (5.7)	25 (1.0)	454 (3.7)	68 (1.1)	477 (3.1)
Bulgaria	r	6 (0.7)	458 (15.0)	24 (1.6)	474 (7.9)	69 (1.9)	480 (6.5)
Cyprus		6 (0.4)	425 (6.5)	39 (0.9)	455 (3.0)	55 (1.0)	460 (2.4)
Hungary		6 (0.5)	519 (7.1)	34 (1.7)	528 (4.0)	60 (1.9)	550 (3.1)
Slovenia		4 (0.5)	509 (7.1)	37 (1.1)	535 (3.2)	59 (1.1)	543 (2.4)
Malta	r	3 (0.3)	437 (11.9)	22 (0.7)	462 (4.8)	75 (0.7)	462 (1.9)
Sweden		2 (0.3)	~ ~	31 (1.2)	511 (3.4)	66 (1.2)	516 (2.6)
Czech Republic		1 (0.2)	~ ~	11 (0.8)	529 (4.9)	88 (0.9)	542 (2.1)
Algeria		--	--	--	--	--	--
Indonesia		--	--	--	--	--	--
Lebanon		--	--	--	--	--	--
‡ Morocco	r	11 (1.0)	400 (6.9)	36 (1.4)	405 (3.8)	53 (2.0)	409 (4.0)
International Avg.		9 (0.2)	463 (2.1)	34 (0.3)	481 (1.2)	57 (0.4)	491 (1.0)

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

**Exhibit 4.7 Index of Time Students Spend Doing Science Homework (TSH)  
in a Normal School Week (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

Chemistry						
Country	High TSH		Medium TSH		Low TSH	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Russian Federation	33 (1.5)	521 (5.1)	48 (1.0)	533 (4.2)	19 (1.2)	546 (5.2)
Syrian Arab Republic	r 24 (1.1)	455 (3.9)	48 (0.9)	458 (2.5)	28 (1.0)	464 (4.1)
Armenia	r 23 (1.1)	487 (9.0)	48 (1.5)	496 (6.7)	29 (1.6)	489 (5.4)
Ukraine	21 (1.1)	480 (4.9)	47 (1.0)	490 (3.2)	32 (1.1)	495 (4.5)
Georgia	r 19 (1.1)	436 (6.2)	52 (1.2)	428 (6.1)	29 (1.5)	432 (6.8)
Lithuania	17 (0.8)	499 (4.7)	43 (0.9)	516 (3.1)	41 (1.3)	534 (3.1)
Serbia	11 (0.7)	463 (6.3)	29 (1.0)	472 (4.0)	60 (1.3)	478 (3.7)
Romania	11 (0.7)	440 (6.8)	31 (1.6)	457 (5.1)	59 (2.0)	475 (4.2)
Bulgaria	r 10 (1.1)	461 (10.6)	29 (1.4)	474 (8.0)	60 (1.7)	481 (6.1)
Bosnia and Herzegovina	10 (0.5)	454 (5.6)	27 (1.0)	458 (4.0)	63 (1.1)	475 (3.1)
Cyprus	9 (0.5)	431 (6.1)	38 (0.8)	452 (2.8)	53 (0.9)	462 (2.2)
Hungary	8 (0.6)	520 (6.4)	34 (1.4)	531 (3.7)	58 (1.7)	550 (3.4)
Lebanon	r 8 (0.8)	396 (11.1)	42 (1.5)	408 (6.7)	50 (1.6)	430 (5.6)
Slovenia	7 (0.6)	515 (5.9)	42 (1.0)	537 (2.9)	51 (1.1)	544 (2.3)
Malta	s 3 (0.3)	537 (10.3)	14 (0.6)	555 (4.6)	83 (0.6)	451 (1.8)
Sweden	2 (0.3)	~ ~	33 (1.0)	509 (3.5)	65 (1.1)	518 (2.6)
Czech Republic	1 (0.2)	~ ~	13 (0.9)	519 (5.6)	86 (1.0)	543 (2.1)
Algeria	--	--	--	--	--	--
Indonesia	--	--	--	--	--	--
‡ Morocco	r 12 (0.8)	397 (8.1)	40 (1.4)	403 (4.0)	48 (1.8)	410 (3.9)
International Avg.	13 (0.2)	468 (1.9)	37 (0.3)	483 (1.2)	51 (0.3)	488 (1.1)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Physics						
Country	High TSH		Medium TSH		Low TSH	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Russian Federation	28 (1.3)	520 (5.1)	48 (1.0)	533 (4.4)	24 (1.0)	539 (4.9)
Armenia	r 24 (1.1)	491 (7.4)	52 (1.4)	492 (5.4)	24 (1.1)	485 (6.1)
Syrian Arab Republic	r 22 (0.9)	453 (3.7)	48 (0.9)	456 (2.5)	30 (1.0)	465 (4.2)
Georgia	r 20 (1.2)	432 (6.1)	52 (1.2)	428 (6.0)	28 (1.6)	431 (6.0)
Ukraine	20 (1.1)	478 (4.5)	48 (0.8)	489 (3.6)	32 (1.1)	496 (4.1)
Lithuania	16 (0.8)	503 (4.2)	42 (0.9)	512 (3.5)	42 (1.3)	534 (2.7)
Indonesia	16 (0.7)	437 (5.5)	53 (1.1)	431 (3.9)	31 (1.2)	424 (4.0)
Bosnia and Herzegovina	12 (0.7)	457 (4.5)	31 (1.1)	462 (3.8)	57 (1.2)	474 (3.2)
Serbia	11 (0.7)	456 (6.2)	29 (1.1)	474 (4.5)	61 (1.4)	478 (3.6)
Cyprus	11 (0.6)	430 (4.9)	40 (0.8)	455 (2.7)	50 (1.1)	461 (2.4)
Slovenia	10 (0.8)	520 (4.4)	40 (1.0)	537 (2.9)	50 (1.2)	543 (2.5)
Lebanon	r 9 (0.8)	395 (10.2)	42 (1.6)	412 (6.6)	49 (1.8)	429 (6.0)
Bulgaria	r 9 (0.8)	460 (9.8)	30 (1.3)	475 (6.6)	62 (1.7)	481 (6.5)
Malta	9 (0.5)	456 (6.0)	36 (0.8)	477 (2.7)	56 (0.8)	455 (1.9)
Hungary	7 (0.6)	515 (6.4)	33 (1.3)	529 (3.7)	60 (1.6)	550 (3.4)
Romania	r 5 (0.6)	439 (9.7)	27 (1.7)	451 (5.1)	68 (1.8)	474 (3.8)
Sweden	2 (0.3)	~ ~	32 (1.0)	510 (3.4)	66 (1.1)	518 (2.6)
Czech Republic	2 (0.3)	~ ~	13 (0.9)	518 (4.9)	85 (1.1)	544 (2.1)
Algeria	--	--	--	--	--	--
‡ Morocco	r 15 (0.8)	391 (6.3)	44 (1.4)	401 (3.6)	40 (1.5)	415 (3.9)
International Avg.	13 (0.2)	461 (1.6)	39 (0.3)	476 (1.1)	48 (0.3)	484 (1.1)

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

### What Are Students' Attitudes Toward Science?

Developing positive attitudes toward science and scientific explanations is an important goal of the science curriculum in many countries. To summarize information about progress toward these goals, TIMSS examined students' general attitudes toward science, the value they place on science as a way of improving their lives, and their self-confidence in learning science.

To investigate how students feel about science, TIMSS created an Index of Students' Positive Affect Toward Science (PATS), based on students' responses to three statements about science:

- ▶ I enjoy learning science.
- ▶ Science is boring.<sup>4</sup>
- ▶ I like science.

In countries where the sciences are taught as separate subjects at the eighth grade, students were asked about each subject separately. Students were asked to indicate if they *agreed a lot*, *agreed a little*, *disagreed a little*, or *disagreed a lot* with each statement. Students who agreed a little or a lot on average with all three statements were assigned to the high level of the index (i.e., have a positive attitude toward science), while those who disagreed a little or a lot, on average, were assigned to the low level of the index. The medium level includes all other response combinations. For each TIMSS participant at the fourth and eighth grades, the percentage of students at each level of the index is presented in Exhibit 4.8, together with average science achievement. The exhibit also shows changes in percentages since 1995 at the fourth grade, and since 1995 and 1999 at the eighth grade (comparable data were not available from 2003).

Fourth grade students generally had very positive attitudes toward science, with 77 percent, on average across countries, at the high level of the index. There were 13 percent of students at the medium level and 11 percent at the low level. The highest percentage of students at the high level of the index was in Kazakhstan (90%), while countries with proportionately more students with less positive attitudes included the Netherlands, the Czech Republic,

4 The response categories for this statement were reversed in constructing the index.

England, and Denmark, where more than 20 percent of students were at the low level. Australia, Austria, and Latvia, as well as Minnesota and Quebec, had increased percentages of students at the high level in 2007 compared to 1995, whereas Singapore, Slovenia, the Czech Republic, and England showed declines. Across countries, fourth grade students at the high level of the Index of Students' Positive Affect Toward Science had higher average science achievement than students at the medium or low level.

For eighth grade students, Exhibit 4.8 presents results first for the countries and benchmarking participants who teach science as a single subject, and then for countries that teach the four science subjects separately. On average across single-science countries, 65 percent of eighth grade students were at the high level of the positive affect index, compared with 19 percent at the medium level and 16 percent at the low level. Countries with most students expressing positive attitudes included Tunisia, Botswana, Colombia, Oman, Egypt, and Ghana, where 80 percent or more were at the high index level. In contrast, less than half the students in Italy, Australia, Japan, Chinese Taipei, Korea, and the Basque Country of Spain were at the high level of the index. Only Korea (from 1999 and 1995) and Japan (from 1995) showed increased percentages at the high level in 2007, while many countries had declines. Decreased percentages compared to 1999 are shown for Iran, Malaysia, Thailand, Singapore, Hong Kong SAR, England, the United States, Israel, Italy, Chinese Taipei, and the province of British Columbia. Iran, Singapore, Scotland, and England also had declines since 1995. Average science achievement was higher among students at the high index level (476 points) than among those at the medium level (442 points) or the low level (436 points).

On average across the separate science countries, attitudes to biology were about as positive as attitudes to general science in the single science countries (66% at high index level), but somewhat less positive in earth science (58%), and especially in chemistry and physics (both 50%). For each of the four science subjects, average science achievement was higher among

students with the most positive attitudes (i.e., students at the high level of the index).

In addition to having a positive attitude toward science, students' may be more attracted to science and more motivated to learn it if they perceive science achievement as advantageous to their future education and the world of work. The TIMSS Index of Students' Valuing Science (SVS) is based on eighth grade students' responses to four statements about science:

- ▶ I think learning science will help me in my daily life.
- ▶ I need science to learn other school subjects.
- ▶ I need to do well in science to get into the university of my choice.
- ▶ I need to do well in science to get the job I want.

**Exhibit 4.8 Index of Students' Positive Affect Toward Science (PATS) with Trends**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

Country	High PATS			Medium PATS			Low PATS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 1995	2007 Percent of Students	Average Achievement	Difference in Percent from 1995	2007 Percent of Students	Average Achievement	Difference in Percent from 1995
Kazakhstan	90 (1.1)	535 (5.7)	0 0	6 (0.9)	517 (12.8)	0 0	4 (0.5)	515 (10.3)	0 0
Colombia	88 (0.8)	410 (5.4)	0 0	8 (0.7)	378 (12.6)	0 0	4 (0.5)	390 (14.4)	0 0
Algeria	87 (0.9)	365 (5.6)	0 0	9 (0.5)	309 (10.6)	0 0	4 (0.6)	305 (15.0)	0 0
Tunisia	86 (1.0)	348 (5.5)	0 0	10 (0.7)	238 (9.5)	0 0	4 (0.5)	212 (15.1)	0 0
Iran, Islamic Rep. of	r 86 (1.1)	452 (4.2)	3 (1.7)	8 (0.7)	393 (8.2)	-6 (1.3) ▼	6 (0.7)	377 (10.4)	3 (0.8) ▲
Kuwait	85 (0.9)	370 (4.5)	--	8 (0.6)	289 (8.3)	--	7 (0.5)	300 (10.8)	--
Morocco	83 (1.1)	315 (6.0)	0 0	11 (0.9)	262 (14.4)	0 0	5 (0.6)	220 (13.1)	0 0
Ukraine	83 (0.9)	483 (3.0)	0 0	10 (0.6)	456 (6.3)	0 0	7 (0.6)	457 (7.0)	0 0
Georgia	82 (1.0)	428 (4.4)	0 0	12 (0.7)	402 (7.3)	0 0	6 (0.8)	414 (7.1)	0 0
Japan	81 (0.9)	553 (2.1)	1 (1.4)	12 (0.6)	534 (4.1)	-1 (0.9)	7 (0.5)	523 (6.1)	1 (0.8)
Lithuania	81 (1.0)	517 (2.6)	0 0	12 (0.7)	500 (4.6)	0 0	7 (0.6)	510 (4.6)	0 0
Germany	81 (0.8)	536 (2.5)	0 0	11 (0.6)	514 (5.4)	0 0	8 (0.5)	501 (4.7)	0 0
El Salvador	79 (0.9)	399 (3.7)	0 0	15 (0.7)	365 (5.3)	0 0	6 (0.5)	371 (8.8)	0 0
Hong Kong SAR	79 (1.0)	562 (3.4)	-2 (2.1)	11 (0.6)	528 (5.2)	-1 (1.0)	10 (0.8)	522 (5.4)	3 (1.6) ▲
Qatar	79 (0.5)	319 (2.7)	0 0	12 (0.4)	257 (4.8)	0 0	10 (0.3)	262 (5.5)	0 0
Italy	78 (0.8)	541 (3.3)	--	12 (0.6)	522 (4.1)	--	10 (0.5)	516 (5.2)	--
Australia	78 (1.3)	534 (3.6)	4 (1.7) ▲	11 (0.8)	513 (5.8)	-1 (1.0)	11 (0.8)	505 (5.1)	-2 (1.1) ▼
Russian Federation	78 (1.0)	552 (4.5)	0 0	13 (0.8)	540 (7.2)	0 0	9 (0.5)	521 (8.1)	0 0
Armenia	r 77 (1.4)	493 (5.0)	0 0	12 (1.1)	493 (17.4)	0 0	11 (0.8)	490 (14.7)	0 0
Slovak Republic	76 (1.1)	531 (4.4)	0 0	12 (0.7)	514 (7.3)	0 0	12 (0.8)	525 (6.5)	0 0
New Zealand	75 (0.8)	513 (2.6)	0 (1.5)	14 (0.5)	482 (5.7)	1 (1.0)	11 (0.5)	480 (5.3)	-1 (1.1)
United States	75 (0.8)	545 (2.5)	-1 (1.3)	13 (0.4)	529 (4.1)	0 (0.8)	12 (0.6)	521 (4.4)	1 (0.9)
Chinese Taipei	75 (1.4)	564 (2.0)	0 0	14 (0.7)	539 (4.2)	0 0	11 (0.9)	534 (4.5)	0 0
Austria	75 (0.9)	530 (2.6)	6 (1.7) ▲	13 (0.6)	518 (4.1)	-4 (1.1) ▼	12 (0.7)	510 (4.2)	-2 (1.3)
Singapore	75 (0.7)	598 (4.0)	-9 (1.1) ▼	15 (0.5)	557 (6.0)	3 (0.8) ▲	11 (0.5)	553 (5.8)	5 (0.6) ▲
Yemen	r 74 (1.8)	226 (8.3)	0 0	17 (1.2)	167 (7.6)	0 0	9 (0.9)	161 (11.1)	0 0
Sweden	73 (1.0)	531 (3.2)	0 0	14 (0.7)	512 (4.0)	0 0	13 (0.6)	509 (4.1)	0 0
Norway	71 (1.2)	484 (3.4)	1 (1.9)	14 (0.8)	468 (4.9)	-2 (1.2)	15 (0.9)	463 (6.8)	1 (1.4)
Latvia	71 (1.1)	544 (2.5)	5 (1.8) ▲	16 (0.7)	538 (4.2)	-7 (1.3) ▼	13 (0.9)	541 (5.3)	2 (1.3)
Scotland	70 (1.3)	505 (2.5)	--	14 (0.7)	498 (4.6)	--	16 (1.1)	483 (4.9)	--
Hungary	69 (1.3)	544 (3.3)	-1 (2.0)	14 (0.6)	522 (6.7)	-4 (1.0) ▼	18 (1.1)	527 (5.5)	5 (1.5) ▲
Slovenia	69 (1.0)	523 (2.2)	-7 (1.8) ▼	14 (0.6)	510 (4.0)	-3 (1.2) ▼	17 (0.9)	509 (3.2)	10 (1.1) ▲
Netherlands	66 (1.5)	528 (2.8)	3 (2.2)	11 (0.6)	514 (4.1)	-4 (1.1) ▼	23 (1.3)	515 (4.0)	1 (1.8)
Czech Republic	64 (1.4)	521 (3.4)	-9 (1.9) ▼	15 (0.7)	504 (5.8)	0 (1.0)	21 (1.1)	509 (3.6)	9 (1.4) ▲
England	59 (1.2)	548 (3.4)	-13 (1.9) ▼	17 (0.7)	538 (4.7)	4 (1.1) ▲	24 (1.1)	533 (4.1)	9 (1.5) ▲
Denmark	59 (1.9)	525 (3.2)	0 0	20 (1.1)	510 (4.3)	0 0	21 (1.5)	507 (4.1)	0 0
<b>International Avg.</b>	<b>77 (0.2)</b>	<b>485 (0.7)</b>		<b>13 (0.1)</b>	<b>456 (1.2)</b>		<b>11 (0.1)</b>	<b>452 (1.3)</b>	
<b>Benchmarking Participants</b>									
Dubai, UAE	84 (1.0)	474 (3.4)	0 0	9 (0.6)	440 (11.2)	0 0	8 (0.7)	415 (10.7)	0 0
Minnesota, US	79 (1.9)	554 (6.6)	7 (3.1) ▲	11 (1.0)	549 (8.7)	-3 (1.6)	10 (1.2)	542 (8.6)	-4 (2.0) ▼
Quebec, Canada	78 (1.2)	522 (2.9)	9 (4.0) ▲	10 (0.8)	497 (5.2)	-5 (2.1) ▼	12 (0.8)	502 (6.1)	-5 (3.4)
Massachusetts, US	77 (1.5)	576 (4.7)	0 0	12 (0.9)	563 (6.9)	0 0	11 (1.2)	552 (6.8)	0 0
Alberta, Canada	75 (1.2)	547 (3.7)	2 (2.5)	13 (0.7)	533 (6.2)	-1 (1.4)	12 (0.7)	526 (6.4)	-1 (2.1)
British Columbia, Canada	72 (1.2)	542 (2.9)	0 0	14 (0.7)	530 (4.6)	0 0	14 (0.9)	522 (5.0)	0 0
Ontario, Canada	71 (1.4)	541 (4.0)	-4 (1.9)	14 (0.9)	531 (6.7)	0 (1.2)	15 (1.1)	523 (5.0)	3 (1.4) ▲

▲ 2007 percent significantly higher  
▼ 2007 percent significantly lower

Index based on students' responses to three statements about science: 1) I enjoy learning science; 2) Science is boring (Reversed); 3) I like science. Average is computed across the three items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a lot or a little on average across the three statements are assigned to the high level. Students disagreeing a little or a lot on average across the three statements are assigned to the low level. All other students are assigned to the middle level.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
A dash (-) indicates comparable data are not available.  
An "r" indicates data are available for at least 70 but less than 85% of the students.  
A diamond (0) indicates the country did not participate in the assessment.

Exhibit 4.8 **Index of Students' Positive Affect Toward Science (PATS) with Trends (Continued)**

TIMSS2007  
Science **8<sup>th</sup>**  
Grade

General/Integrated Science								
Country	High PATS				Medium PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Tunisia	88 (0.8)	447 (2.1)	1 (1.1)	0 0	7 (0.5)	428 (4.7)	1 (0.7)	0 0
Botswana	84 (0.8)	370 (3.1)	0 0	0 0	11 (0.6)	291 (5.7)	0 0	0 0
Colombia	83 (1.2)	419 (3.6)	0 0	3 (1.7)	12 (0.9)	416 (5.1)	0 0	-4 (1.3) ▾
Oman	82 (0.9)	434 (2.8)	0 0	0 0	14 (0.7)	387 (5.3)	0 0	0 0
Egypt	82 (1.3)	421 (3.6)	0 0	0 0	13 (1.2)	373 (6.9)	0 0	0 0
Ghana	80 (1.0)	320 (4.7)	0 0	0 0	16 (0.8)	254 (7.7)	0 0	0 0
Jordan	77 (1.7)	493 (3.7)	3 (2.0)	0 0	13 (0.9)	455 (7.4)	-3 (1.1) ▾	0 0
Turkey	77 (1.1)	461 (3.7)	--	0 0	15 (0.7)	435 (5.6)	--	0 0
El Salvador	77 (1.2)	390 (3.0)	0 0	0 0	17 (0.9)	380 (4.5)	0 0	0 0
Iran, Islamic Rep. of	73 (1.3)	467 (3.8)	-8 (1.5) ▾	-7 (1.8) ▾	17 (1.0)	444 (5.1)	5 (1.1) ●	2 (1.3) ●
Malaysia	73 (1.2)	483 (6.0)	-17 (1.4) ▾	0 0	18 (0.9)	438 (7.2)	12 (1.0) ●	0 0
Palestinian Nat'l Auth.	70 (1.2)	421 (3.8)	0 0	0 0	18 (0.8)	377 (5.5)	0 0	0 0
Thailand	68 (1.2)	478 (4.5)	-9 (1.6) ▾	--	25 (0.9)	454 (4.7)	9 (1.1) ●	--
Bahrain	68 (1.0)	476 (1.9)	0 0	0 0	18 (0.7)	455 (3.5)	0 0	0 0
Singapore	68 (0.9)	586 (4.3)	-10 (1.6) ▾	-14 (1.5) ▾	19 (0.7)	535 (6.1)	7 (1.0) ●	6 (1.1) ●
Saudi Arabia	68 (1.3)	413 (2.9)	0 0	0 0	19 (0.8)	389 (4.4)	0 0	0 0
Qatar	61 (0.6)	333 (1.8)	0 0	0 0	19 (0.5)	303 (3.9)	0 0	0 0
Hong Kong SAR	60 (1.4)	549 (4.8)	-4 (1.9) ▾	4 (2.2) ●	22 (0.8)	508 (5.4)	4 (1.1) ●	-5 (1.3) ▾
Kuwait	60 (1.1)	428 (3.2)	0 0	--	21 (0.7)	413 (4.5)	0 0	--
Norway	59 (1.3)	495 (2.1)	0 0	2 (2.1) ●	20 (0.8)	483 (3.7)	0 0	-1 (1.2) ▾
Scotland	56 (1.3)	517 (3.4)	0 0	-13 (2.0) ▾	22 (0.8)	482 (4.5)	0 0	7 (1.1) ●
England	55 (1.3)	561 (4.9)	-21 (1.6) ▾	-15 (1.8) ▾	20 (0.8)	532 (4.9)	9 (1.1) ●	4 (1.2) ●
United States	54 (1.2)	533 (2.9)	-6 (1.5) ▾	-1 (1.9) ▾	22 (0.5)	508 (3.6)	4 (0.8) ●	-2 (0.9) ▾
Israel	51 (1.2)	492 (4.6)	-7 (1.8) ▾	--	22 (0.7)	453 (5.3)	3 (1.0) ●	--
Italy	47 (1.1)	511 (3.7)	-16 (1.8) ▾	--	26 (0.9)	488 (3.6)	10 (1.2) ●	--
Australia	47 (1.4)	535 (4.7)	--	-2 (1.7) ▾	22 (0.8)	504 (4.2)	--	-1 (1.1) ▾
Japan	47 (1.1)	574 (2.2)	1 (1.8) ●	3 (1.7) ●	28 (0.9)	545 (2.8)	5 (1.1) ●	-2 (1.1) ▾
Chinese Taipei	40 (1.3)	597 (3.9)	-22 (1.7) ▾	0 0	24 (0.7)	552 (4.2)	8 (0.9) ●	0 0
Korea, Rep. of	38 (1.1)	586 (2.4)	8 (1.5) ●	4 (1.7) ●	27 (0.7)	544 (2.9)	-3 (0.9) ▾	-15 (1.2) ▾
<b>International Avg.</b>	<b>65 (0.2)</b>	<b>476 (0.7)</b>			<b>19 (0.1)</b>	<b>442 (0.9)</b>		
Benchmarking Participants								
Dubai, UAE	68 (1.6)	506 (2.8)	0 0	0 0	18 (0.9)	469 (5.0)	0 0	0 0
Ontario, Canada	56 (1.8)	542 (3.2)	-4 (2.4)	1 (2.4) ●	21 (0.9)	514 (5.7)	5 (1.3) ●	-3 (1.3) ▾
British Columbia, Canada	55 (1.4)	541 (3.3)	-5 (2.4) ▾	0 0	21 (0.8)	512 (3.8)	1 (1.5) ●	0 0
Massachusetts, US	54 (2.9)	568 (6.6)	-5 (3.6) ▾	0 0	22 (1.3)	551 (5.3)	4 (1.6) ●	0 0
Quebec, Canada	53 (2.0)	516 (3.8)	6 (3.9) ●	5 (3.4) ●	18 (1.0)	503 (6.3)	-4 (2.0) ▾	-4 (1.7) ▾
Minnesota, US	50 (2.1)	553 (5.4)	0 0	-3 (3.5) ▾	23 (1.2)	534 (5.6)	0 0	0 (2.0)
Basque Country, Spain	44 (1.7)	516 (3.5)	0 0	0 0	23 (1.2)	496 (3.9)	0 0	0 0

● 2007 percent significantly higher  
 ▾ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on students' responses to three statements about science: 1) I enjoy learning science; 2) Science is boring (Reversed); 3) I like science. Average is computed across the three items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a lot or a little on average across the three statements are assigned to the high level. Students disagreeing a little or a lot on average across the three statements are assigned to the low level. All other students are assigned to the middle level.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An

"s" indicates data are available for at least 50 but less than 70% of the students. An "x"

indicates data are available for less than 50% of the students.

A diamond (0) indicates the country did not participate in the assessment.



**Exhibit 4.8 Index of Students' Positive Affect Toward Science (PATS) with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**General/Integrated Science (Continued)**

Country	Low PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Tunisia	4 (0.4)	434 (7.1)	-2 (0.7) ▼	0 0
Botswana	5 (0.5)	274 (8.4)	0 0	0 0
Colombia	5 (0.4)	425 (8.6)	0 0	1 (0.7)
Oman	3 (0.4)	383 (13.0)	0 0	0 0
Egypt	5 (0.4)	363 (9.7)	0 0	0 0
Ghana	4 (0.3)	226 (10.7)	0 0	0 0
Jordan	10 (1.1)	470 (8.3)	-1 (1.3)	0 0
Turkey	8 (0.8)	429 (6.9)	--	0 0
El Salvador	6 (0.5)	395 (6.8)	0 0	0 0
Iran, Islamic Rep. of	9 (0.7)	448 (6.8)	3 (0.9) ▲	5 (0.9) ▲
Malaysia	8 (0.5)	434 (9.2)	5 (0.7) ▲	0 0
Palestinian Nat'l Auth.	12 (0.7)	380 (7.6)	0 0	0 0
Thailand	6 (0.5)	466 (7.2)	0 (0.7)	--
Bahrain	14 (0.8)	451 (4.7)	0 0	0 0
Singapore	13 (0.6)	517 (6.8)	3 (1.1) ▲	8 (0.8) ▲
Saudi Arabia	13 (0.9)	388 (4.4)	0 0	0 0
Qatar	20 (0.5)	307 (3.9)	0 0	0 0
Hong Kong SAR	19 (1.1)	498 (6.7)	0 (1.5)	0 (1.6)
Kuwait	20 (0.9)	408 (5.9)	0 0	--
Norway	21 (1.0)	472 (3.7)	0 0	0 (1.6)
Scotland	22 (1.1)	459 (4.3)	0 0	6 (1.5) ▲
England	25 (1.1)	510 (5.0)	12 (1.3) ▲	11 (1.4) ▲
United States	24 (0.9)	503 (3.5)	2 (1.1)	3 (1.3) ▲
Israel	28 (1.2)	452 (5.5)	4 (1.6) ▲	--
Italy	26 (1.0)	475 (3.5)	7 (1.5) ▲	--
Australia	31 (1.1)	494 (4.3)	--	3 (1.4)
Japan	25 (1.1)	529 (3.5)	-6 (1.7) ▼	-1 (1.5)
Chinese Taipei	35 (1.2)	527 (3.8)	14 (1.4) ▲	0 0
Korea, Rep. of	36 (1.0)	526 (2.6)	-5 (1.5) ▼	11 (1.6) ▲
<b>International Avg.</b>	<b>16 (0.2)</b>	<b>436 (1.3)</b>		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Dubai, UAE	14 (1.0)	463 (6.7)	0 0	0 0
Ontario, Canada	23 (1.3)	500 (5.3)	0 (1.8)	2 (1.9)
British Columbia, Canada	24 (1.1)	505 (3.3)	3 (1.7) ▲	0 0
Massachusetts, US	24 (2.3)	536 (4.6)	1 (2.9)	0 0
Quebec, Canada	30 (1.7)	497 (4.8)	-3 (3.5)	-2 (3.3)
Minnesota, US	26 (1.5)	516 (5.5)	0 0	3 (2.5)
Basque Country, Spain	33 (1.7)	476 (4.3)	0 0	0 0

- ▲ 2007 percent significantly higher
- ▼ 2007 percent significantly lower

**Exhibit 4.8 Index of Students' Positive Affect Toward Science (PATS) with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

Biology								
Country	High PATS				Medium PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Indonesia	86 (0.9)	429 (3.4)	--	0 0	11 (0.7)	415 (5.3)	--	0 0
Algeria	84 (0.8)	413 (1.8)	0 0	0 0	11 (0.6)	395 (3.9)	0 0	0 0
Syrian Arab Republic	78 (1.0)	463 (2.8)	0 0	0 0	15 (0.7)	434 (4.8)	0 0	0 0
Bulgaria	r 73 (1.5)	478 (6.5)	--	--	15 (1.0)	452 (8.8)	--	--
Georgia	73 (1.4)	436 (4.7)	0 0	0 0	16 (1.1)	400 (6.0)	0 0	0 0
Ukraine	72 (1.2)	490 (3.3)	0 0	0 0	17 (0.7)	480 (5.2)	0 0	0 0
Armenia	71 (1.0)	492 (6.5)	0 0	0 0	16 (0.7)	490 (7.8)	0 0	0 0
Bosnia and Herzegovina	68 (1.4)	470 (3.0)	0 0	0 0	14 (0.7)	465 (5.2)	0 0	0 0
Russian Federation	66 (1.4)	532 (3.7)	-9 (1.9)	▼ -4 (2.1)	21 (0.9)	523 (4.7)	5 (1.2)	▲ -2 (1.5)
Lebanon	61 (1.4)	436 (5.4)	0 0	0 0	23 (1.0)	392 (7.9)	0 0	0 0
Romania	61 (1.5)	466 (4.7)	-10 (2.0)	▼ -4 (2.1)	19 (0.8)	456 (4.8)	4 (1.1)	▲ -6 (1.4)
Serbia	56 (1.5)	478 (3.5)	0 0	0 0	17 (0.8)	467 (5.3)	0 0	0 0
Lithuania	55 (1.5)	521 (2.9)	-13 (2.1)	▼ -11 (2.1)	23 (0.9)	518 (3.9)	7 (1.3)	▲ 0 (1.4)
Czech Republic	55 (1.4)	543 (2.5)	-8 (2.6)	▼ 6 (2.6)	▲ 21 (0.8)	533 (3.4)	4 (1.2)	▲ -7 (1.3)
Hungary	53 (1.5)	541 (3.6)	-8 (2.0)	▼ -5 (2.2)	▼ 20 (0.8)	532 (4.8)	-1 (1.2)	-6 (1.4)
Sweden	52 (1.3)	525 (3.0)	0 0	-8 (2.5)	▼ 21 (0.6)	505 (3.7)	0 0	-2 (1.4)
Slovenia	46 (1.6)	543 (2.5)	--	-15 (2.5)	▼ 20 (0.7)	537 (3.5)	--	-5 (1.2)
Cyprus	x x	x x	--	--	x x	x x	--	--
Malta	x x	x x	0 0	0 0	x x	x x	0 0	0 0
‡ Morocco	84 (1.0)	407 (3.1)	--	--	11 (0.7)	376 (6.0)	--	--
International Avg.	66 (0.3)	481 (0.9)			17 (0.2)	465 (1.3)		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Earth Science								
Country	High PATS				Medium PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Syrian Arab Republic	r 75 (0.9)	455 (3.1)	0 0	0 0	17 (0.7)	437 (4.5)	0 0	0 0
Romania	66 (1.6)	472 (4.0)	-7 (2.1)	▼ 4 (2.2)	17 (0.9)	446 (6.2)	1 (1.2)	-9 (1.4)
Bulgaria	r 66 (1.4)	483 (7.3)	--	--	19 (0.9)	456 (8.4)	--	--
Ukraine	64 (1.3)	493 (3.6)	0 0	0 0	21 (0.8)	477 (4.3)	0 0	0 0
Armenia	64 (1.3)	494 (5.8)	0 0	0 0	22 (0.9)	483 (6.0)	0 0	0 0
Bosnia and Herzegovina	62 (1.4)	467 (3.1)	0 0	0 0	17 (0.8)	467 (5.0)	0 0	0 0
Georgia	s 61 (1.8)	433 (5.2)	0 0	0 0	23 (1.3)	420 (6.2)	0 0	0 0
Russian Federation	60 (1.2)	538 (4.1)	-1 (2.3)	8 (1.8)	▲ 23 (0.9)	516 (5.0)	0 (1.5)	-8 (1.2)
Lithuania	59 (1.5)	523 (2.5)	--	9 (2.0)	▲ 23 (0.9)	512 (4.0)	--	-15 (1.4)
Malta	r 54 (0.8)	462 (2.2)	0 0	0 0	17 (0.6)	430 (5.0)	0 0	0 0
Sweden	r 54 (1.3)	521 (2.7)	0 0	-5 (2.2)	▼ 20 (0.6)	509 (4.5)	0 0	-5 (1.2)
Serbia	51 (1.5)	475 (3.8)	0 0	0 0	19 (0.9)	472 (4.0)	0 0	0 0
Cyprus	50 (1.2)	462 (2.6)	--	--	21 (0.8)	444 (4.2)	--	--
Slovenia	49 (1.5)	545 (3.0)	--	--	21 (0.8)	539 (3.7)	--	--
Czech Republic	44 (1.4)	543 (2.7)	-11 (2.3)	▼ -6 (2.8)	▼ 22 (0.7)	533 (2.9)	4 (1.0)	▲ -5 (1.2)
Hungary	39 (1.6)	546 (3.5)	-9 (2.1)	▼ -5 (2.3)	▼ 21 (1.1)	529 (4.6)	-4 (1.4)	▼ -11 (1.6)
Algeria	x x	x x	0 0	0 0	x x	x x	0 0	0 0
Indonesia	--	--	--	0 0	--	--	--	0 0
Lebanon	--	--	0 0	0 0	--	--	0 0	0 0
‡ Morocco	r 73 (1.3)	408 (2.8)	--	--	16 (1.1)	387 (7.1)	--	--
International Avg.	58 (0.3)	489 (0.9)			20 (0.2)	474 (1.3)		

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

**Exhibit 4.8 Index of Students' Positive Affect Toward Science (PATS) with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**Biology (Continued)**

Country	Low PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Indonesia	2 (0.3)	~ ~	--	∅ ∅
Algeria	5 (0.4)	399 (5.8)	∅ ∅	∅ ∅
Syrian Arab Republic	7 (0.5)	425 (6.5)	∅ ∅	∅ ∅
Bulgaria	r 11 (1.1)	465 (9.5)	--	--
Georgia	11 (0.8)	412 (7.4)	∅ ∅	∅ ∅
Ukraine	11 (0.9)	488 (5.9)	∅ ∅	∅ ∅
Armenia	12 (0.6)	479 (7.1)	∅ ∅	∅ ∅
Bosnia and Herzegovina	18 (1.1)	464 (4.7)	∅ ∅	∅ ∅
Russian Federation	13 (0.8)	537 (6.7)	4 (1.1) ▲	6 (1.1) ▲
Lebanon	16 (1.0)	381 (8.1)	∅ ∅	∅ ∅
Romania	20 (1.1)	466 (5.1)	6 (1.5) ▲	10 (1.3) ▲
Serbia	27 (1.2)	466 (4.1)	∅ ∅	∅ ∅
Lithuania	22 (1.3)	516 (3.8)	6 (1.6) ▲	11 (1.6) ▲
Czech Republic	24 (1.2)	537 (2.9)	4 (2.1) ▲	1 (2.2)
Hungary	27 (1.3)	541 (3.9)	8 (1.7) ▲	11 (1.7) ▲
Sweden	27 (1.1)	498 (3.3)	∅ ∅	10 (1.8) ▲
Slovenia	34 (1.4)	533 (3.2)	--	20 (1.9) ▲
Cyprus	x x	x x	--	--
Malta	x x	x x	∅ ∅	∅ ∅
‡ Morocco	5 (0.6)	381 (8.4)	--	--
International Avg.	16 (0.2)	470 (1.5)		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Earth Science (Continued)**

Country	Low PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Syrian Arab Republic	r 9 (0.5)	445 (5.9)	∅ ∅	∅ ∅
Romania	17 (1.1)	451 (5.6)	7 (1.4) ▲	5 (1.3) ▲
Bulgaria	r 16 (1.2)	452 (8.8)	--	--
Ukraine	15 (0.8)	486 (4.3)	∅ ∅	∅ ∅
Armenia	15 (0.9)	482 (11.9)	∅ ∅	∅ ∅
Bosnia and Herzegovina	21 (1.1)	467 (3.8)	∅ ∅	∅ ∅
Georgia	s 16 (1.3)	409 (7.5)	∅ ∅	∅ ∅
Russian Federation	17 (0.9)	528 (5.0)	1 (1.4)	0 (1.3)
Lithuania	18 (0.9)	514 (4.7)	--	6 (1.2) ▲
Malta	r 29 (0.7)	426 (3.0)	∅ ∅	∅ ∅
Sweden	r 26 (1.2)	504 (4.0)	∅ ∅	9 (1.7) ▲
Serbia	30 (1.3)	470 (4.8)	∅ ∅	∅ ∅
Cyprus	29 (1.0)	444 (3.0)	--	--
Slovenia	31 (1.2)	528 (2.6)	--	--
Czech Republic	33 (1.4)	538 (2.8)	7 (2.1) ▲	12 (2.2) ▲
Hungary	40 (1.4)	538 (3.6)	13 (1.8) ▲	16 (1.9) ▲
Algeria	x x	x x	∅ ∅	∅ ∅
Indonesia	--	--	--	∅ ∅
Lebanon	--	--	∅ ∅	∅ ∅
‡ Morocco	r 11 (0.8)	392 (9.2)	--	--
International Avg.	22 (0.3)	475 (1.4)		

▲ 2007 percent significantly higher  
▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

**Exhibit 4.8 Index of Students' Positive Affect Toward Science (PATS) with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

Chemistry									
Country	High PATS				Medium PATS				
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995	
Algeria	78 (1.1)	411 (2.4)	0 0	0 0	14 (0.8)	398 (3.7)	0 0	0 0	
Syrian Arab Republic	68 (1.1)	461 (3.0)	0 0	0 0	19 (0.7)	440 (4.0)	0 0	0 0	
Lebanon	62 (1.4)	427 (5.7)	0 0	0 0	24 (1.2)	394 (7.7)	0 0	0 0	
Russian Federation	54 (1.2)	538 (4.2)	-1 (2.2)	29 (1.7) ▲	26 (0.7)	521 (5.1)	-2 (1.2)	-31 (1.3) ▼	
Bulgaria	52 (1.8)	486 (6.5)	--	--	21 (0.8)	457 (9.5)	--	--	
Ukraine	51 (1.6)	497 (3.7)	0 0	0 0	24 (0.8)	478 (4.2)	0 0	0 0	
Cyprus	48 (0.9)	469 (2.6)	--	--	21 (0.5)	438 (3.4)	--	--	
Georgia	48 (2.0)	439 (5.4)	0 0	0 0	25 (1.1)	420 (5.8)	0 0	0 0	
Armenia	47 (1.5)	496 (6.7)	0 0	0 0	25 (1.0)	483 (6.1)	0 0	0 0	
Bosnia and Herzegovina	47 (1.5)	470 (3.4)	0 0	0 0	18 (0.7)	465 (3.9)	0 0	0 0	
Czech Republic	44 (1.5)	543 (2.9)	2 (2.4)	26 (1.8) ▲	22 (0.7)	537 (3.3)	-2 (1.1)	-42 (1.4) ▼	
Romania	43 (1.4)	467 (5.4)	-8 (2.1) ▼	11 (1.8) ▲	24 (0.8)	457 (4.8)	0 (1.2)	-32 (1.3) ▼	
Sweden	42 (1.1)	533 (3.2)	0 0	14 (1.9) ▲	20 (0.7)	496 (4.1)	0 0	-38 (1.5) ▼	
Slovenia	42 (1.3)	552 (2.9)	--	22 (1.7) ▲	22 (0.7)	535 (3.0)	--	-37 (1.2) ▼	
Lithuania	42 (1.4)	528 (3.5)	5 (2.0) ▲	17 (1.9) ▲	26 (0.9)	514 (3.8)	-4 (1.3) ▼	-29 (1.5) ▼	
Serbia	31 (1.3)	483 (4.6)	0 0	0 0	16 (0.9)	470 (4.7)	0 0	0 0	
Hungary	29 (1.2)	551 (4.4)	-5 (1.9) ▼	7 (1.8) ▲	21 (0.8)	523 (4.8)	-10 (1.2) ▼	-36 (1.4) ▼	
Malta	x x	x x	0 0	0 0	x x	x x	0 0	0 0	
Indonesia	--	--	--	0 0	--	--	--	0 0	
‡ Morocco	76 (1.4)	412 (3.4)	--	--	14 (0.7)	377 (7.1)	--	--	
International Avg.	50 (0.3)	487 (1.0)			21 (0.2)	467 (1.2)			

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Physics									
Country	High PATS				Medium PATS				
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995	
Algeria	83 (0.9)	412 (1.9)	0 0	0 0	12 (0.6)	400 (3.1)	0 0	0 0	
Indonesia	69 (1.5)	426 (3.6)	--	0 0	24 (1.1)	428 (4.4)	--	0 0	
Syrian Arab Republic	67 (1.2)	462 (2.9)	0 0	0 0	21 (0.9)	441 (4.0)	0 0	0 0	
Armenia	60 (1.5)	498 (5.9)	0 0	0 0	21 (0.9)	481 (7.9)	0 0	0 0	
Russian Federation	59 (0.9)	540 (4.4)	-1 (1.7)	6 (1.6) ▲	25 (0.7)	516 (5.3)	-1 (1.1)	-6 (1.2) ▼	
Georgia	58 (1.5)	437 (4.6)	0 0	0 0	23 (1.1)	416 (7.8)	0 0	0 0	
Lebanon	57 (1.2)	431 (5.6)	0 0	0 0	25 (1.0)	394 (8.3)	0 0	0 0	
Bulgaria	55 (2.0)	485 (7.3)	--	--	23 (1.3)	459 (8.3)	--	--	
Ukraine	52 (1.6)	499 (3.6)	0 0	0 0	26 (0.9)	478 (3.8)	0 0	0 0	
Cyprus	49 (0.9)	474 (2.2)	--	--	21 (0.6)	436 (3.9)	--	--	
Malta	45 (0.7)	482 (2.5)	0 0	0 0	19 (0.5)	444 (4.6)	0 0	0 0	
Bosnia and Herzegovina	44 (1.3)	473 (3.3)	0 0	0 0	20 (0.7)	464 (4.0)	0 0	0 0	
Romania	42 (1.4)	469 (5.0)	-5 (2.1) ▼	-6 (2.1) ▼	24 (0.8)	453 (5.5)	-2 (1.3)	-10 (1.2) ▼	
Sweden	37 (1.2)	536 (3.4)	0 0	-7 (2.3) ▼	22 (0.7)	503 (3.8)	0 0	-5 (1.5) ▼	
Lithuania	37 (1.3)	534 (3.6)	-11 (2.1) ▼	-2 (2.2)	28 (0.8)	510 (3.4)	2 (1.2)	-6 (1.5) ▼	
Hungary	31 (1.4)	557 (4.0)	-4 (2.0) ▼	3 (1.9)	24 (0.9)	534 (4.6)	-8 (1.3) ▼	-16 (1.3) ▼	
Czech Republic	31 (1.5)	549 (3.4)	-7 (2.3) ▼	2 (2.0)	23 (0.7)	538 (3.1)	0 (1.1)	-11 (1.1) ▼	
Serbia	28 (1.5)	477 (4.9)	0 0	0 0	19 (0.9)	473 (4.2)	0 0	0 0	
Slovenia	23 (1.1)	558 (4.3)	--	-14 (2.0) ▼	23 (0.8)	534 (3.4)	--	-17 (1.4) ▼	
‡ Morocco	79 (1.6)	410 (3.2)	--	--	14 (1.0)	373 (4.9)	--	--	
International Avg.	50 (0.3)	485 (0.9)			22 (0.2)	464 (1.2)			

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

**Exhibit 4.8 Index of Students' Positive Affect Toward Science (PATS) with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

**Chemistry (Continued)**

Country	Low PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Algeria	8 (0.6)	395 (6.3)	0 0	0 0
Syrian Arab Republic	13 (0.7)	450 (4.0)	0 0	0 0
Lebanon	14 (1.0)	409 (7.2)	0 0	0 0
Russian Federation	21 (1.0)	524 (4.5)	3 (1.6)	2 (1.5)
Bulgaria	27 (1.7)	460 (7.1)	--	--
Ukraine	25 (1.5)	483 (4.3)	0 0	0 0
Cyprus	31 (0.8)	437 (3.8)	--	--
Georgia	27 (2.0)	420 (4.9)	0 0	0 0
Armenia	28 (1.4)	487 (7.5)	0 0	0 0
Bosnia and Herzegovina	35 (1.3)	465 (3.5)	0 0	0 0
Czech Republic	35 (1.6)	536 (2.8)	0 (2.3)	16 (2.0) ▲
Romania	33 (1.3)	465 (3.6)	7 (1.8) ▲	21 (1.5) ▲
Sweden	38 (1.1)	500 (3.4)	0 0	24 (1.6) ▲
Slovenia	36 (1.3)	524 (2.8)	--	15 (1.6) ▲
Lithuania	32 (1.5)	512 (2.9)	-2 (1.9)	12 (1.9) ▲
Serbia	54 (1.3)	468 (3.6)	0 0	0 0
Hungary	50 (1.5)	539 (2.8)	15 (2.2) ▲	29 (2.0) ▲
Malta	x x	x x	0 0	0 0
Indonesia	--	--	--	0 0
‡ Morocco	10 (1.0)	376 (9.0)	--	--
International Avg.	29 (0.3)	469 (1.2)		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Physics (Continued)**

Country	Low PATS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 1999	Difference in Percent from 1995
Algeria	6 (0.4)	402 (5.0)	0 0	0 0
Indonesia	7 (0.6)	443 (6.2)	--	0 0
Syrian Arab Republic	12 (0.7)	448 (4.7)	0 0	0 0
Armenia	19 (1.2)	480 (8.5)	0 0	0 0
Russian Federation	16 (0.7)	519 (4.8)	2 (1.1)	1 (1.4)
Georgia	19 (1.4)	420 (4.6)	0 0	0 0
Lebanon	18 (1.0)	405 (7.3)	0 0	0 0
Bulgaria	22 (1.5)	460 (6.7)	--	--
Ukraine	22 (1.1)	481 (4.1)	0 0	0 0
Cyprus	29 (0.7)	432 (3.8)	--	--
Malta	36 (0.7)	435 (2.4)	0 0	0 0
Bosnia and Herzegovina	36 (1.2)	463 (4.0)	0 0	0 0
Romania	34 (1.3)	467 (3.8)	7 (2.0) ▲	16 (1.8) ▲
Sweden	41 (1.2)	502 (3.3)	0 0	12 (2.1) ▲
Lithuania	35 (1.2)	511 (3.4)	9 (1.7) ▲	8 (1.9) ▲
Hungary	45 (1.8)	530 (3.4)	12 (2.2) ▲	12 (2.2) ▲
Czech Republic	46 (1.4)	534 (2.3)	8 (2.3) ▲	9 (2.0) ▲
Serbia	53 (1.8)	471 (3.3)	0 0	0 0
Slovenia	54 (1.2)	531 (2.3)	--	31 (1.8) ▲
‡ Morocco	8 (1.1)	392 (10.4)	--	--
International Avg.	28 (0.3)	466 (1.2)		

- ▲ 2007 percent significantly higher  
 ▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

In countries where the sciences are taught as separate subjects at the eighth grade, students were asked about each subject separately. Students were asked to indicate if they *agreed a lot*, *agreed a little*, *disagreed a little*, or *disagreed a lot* with each statement. Students who agreed a little or a lot on average with all four statements were assigned to the high level of the index (i.e., placed a high value on science), while those who disagreed a little or a lot, on average, were assigned to the low level of the index. The medium level includes all other response combinations. The percentage of students at each level of the index is presented in Exhibit 4.9 for each eighth-grade TIMSS participant, together with average science achievement and changes in percentages since 2003.

Eighth grade students in countries teaching science as a single subject generally placed a high value on science, with 66 percent of students, on average in these countries, at the high level of the valuing science index. In addition, 23 percent of students were at the medium level and 11 percent at the low level. The highest percentages of students at the high level of the index were in Ghana and Oman, with more than 90 percent. In contrast, less than half the students in Israel, Norway, Australia, Korea, Chinese Taipei, Italy, and Japan, several of which are among the highest performing countries on the TIMSS 2007 assessment. There was an increase since 2003 in the percentage of students at the high level of the index in Ghana, Egypt, Tunisia, Bahrain, Iran, Hong Kong SAR, England, Norway, Korea, and Japan, and declines in Botswana and Malaysia. On average across the countries, eighth grade science achievement was higher among students at the high level of the valuing science index (471 points) than at the medium level (449 points) or the low level (441 points).

Among the separate science countries, students reported placing less value on individual science subjects than students in the single science countries reported placing on general science. Compared with 66 percent of students at high valuing science index level, 52 percent of students were at the high level of the index of students valuing biology, 44 percent at the high valuing earth science index level, 47 percent at the high valuing chemistry

Exhibit 4.9 Index of Students' Valuing Science (SVS) with Trends

TIMSS2007  
Science 8<sup>th</sup> Grade

General/Integrated Science

Country	High SVS			Medium SVS			Low SVS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Ghana	92 (0.8)	311 (5.0)	6 (1.2) ▲	7 (0.7)	245 (16.0)	-5 (1.0) ▼	2 (0.2)	~ ~	-1 (0.3)
Oman	91 (0.5)	429 (2.9)	◇ ◇	8 (0.4)	386 (7.0)	◇ ◇	2 (0.2)	~ ~	◇ ◇
Jordan	88 (0.9)	491 (3.5)	2 (1.1)	10 (0.6)	446 (7.9)	-1 (0.8)	3 (0.4)	439 (19.9)	-1 (0.6)
Egypt	86 (0.7)	417 (3.6)	3 (1.1) ▲	11 (0.5)	375 (6.9)	-3 (0.9) ▼	2 (0.3)	~ ~	0 (0.4)
Thailand	85 (0.7)	475 (4.3)	◇ ◇	14 (0.6)	447 (5.7)	◇ ◇	2 (0.2)	~ ~	◇ ◇
Tunisia	85 (0.8)	446 (2.2)	5 (1.1) ▲	11 (0.6)	442 (4.1)	-3 (0.9) ▼	4 (0.3)	438 (5.5)	-2 (0.6) ▼
Palestinian Nat'l Auth.	84 (0.9)	418 (3.8)	2 (1.2)	12 (0.7)	355 (6.7)	-2 (1.0)	3 (0.4)	350 (10.6)	0 (0.5)
Botswana	83 (0.7)	372 (3.3)	-3 (1.0) ▼	14 (0.6)	287 (4.7)	3 (0.9) ▲	3 (0.3)	274 (13.4)	0 (0.3)
Bahrain	82 (0.8)	472 (1.8)	9 (1.1) ▲	13 (0.6)	460 (4.7)	-6 (0.9) ▼	5 (0.4)	442 (7.2)	-3 (0.6) ▼
Kuwait	82 (0.8)	426 (2.8)	◇ ◇	12 (0.6)	409 (5.5)	◇ ◇	7 (0.5)	385 (9.6)	◇ ◇
Saudi Arabia	80 (1.1)	408 (2.7)	--	14 (0.8)	399 (4.7)	--	6 (0.7)	391 (6.8)	--
El Salvador	78 (0.9)	384 (3.0)	◇ ◇	17 (0.7)	403 (4.4)	◇ ◇	5 (0.5)	411 (7.8)	◇ ◇
Qatar	76 (0.5)	329 (1.9)	◇ ◇	16 (0.4)	305 (4.0)	◇ ◇	9 (0.3)	301 (5.9)	◇ ◇
Colombia	74 (1.0)	414 (3.6)	◇ ◇	20 (0.8)	433 (4.5)	◇ ◇	6 (0.5)	432 (8.3)	◇ ◇
Turkey	69 (1.0)	458 (3.9)	◇ ◇	22 (0.7)	455 (4.7)	◇ ◇	9 (0.5)	430 (6.3)	◇ ◇
Malaysia	69 (1.3)	486 (5.7)	-7 (1.8) ▼	25 (1.0)	449 (6.1)	4 (1.3) ▲	6 (0.6)	390 (12.6)	3 (0.7) ▲
Singapore	67 (0.9)	585 (4.2)	-2 (1.3)	25 (0.7)	547 (5.2)	0 (1.0)	8 (0.6)	483 (7.9)	2 (0.7) ▲
Iran, Islamic Rep. of	67 (1.2)	461 (3.7)	5 (1.7) ▲	25 (1.0)	457 (4.8)	-1 (1.3)	9 (0.6)	450 (6.1)	-4 (0.9) ▼
Hong Kong SAR	58 (1.2)	543 (4.9)	5 (1.6) ▲	33 (0.9)	525 (5.1)	-5 (1.2) ▼	9 (0.8)	472 (9.1)	0 (1.0)
Scotland	57 (1.1)	511 (3.5)	1 (1.5)	27 (0.7)	489 (3.7)	1 (1.1)	16 (0.7)	461 (4.6)	-2 (1.1)
United States	53 (0.9)	532 (3.4)	-2 (1.2)	30 (0.6)	515 (3.0)	0 (0.9)	17 (0.6)	497 (3.2)	1 (0.8)
England	52 (1.3)	552 (5.2)	7 (2.1) ▲	31 (1.0)	542 (5.1)	-4 (1.5) ▼	17 (0.8)	515 (5.2)	-3 (1.4) ▼
Israel	49 (1.2)	481 (5.0)	1 (1.7)	27 (0.9)	470 (5.1)	1 (1.2)	24 (1.0)	459 (6.0)	-2 (1.4)
Norway	45 (0.9)	492 (2.4)	6 (1.4) ▲	35 (0.8)	492 (2.7)	-1 (1.2)	21 (0.9)	472 (3.3)	-5 (1.3) ▼
Australia	42 (1.2)	531 (5.1)	0 (1.6)	30 (0.8)	511 (4.3)	-1 (1.2)	28 (0.9)	496 (3.7)	1 (1.3)
Korea, Rep. of	41 (1.0)	573 (2.6)	5 (1.4) ▲	41 (0.9)	550 (2.3)	-3 (1.1) ▼	17 (0.7)	514 (4.0)	-2 (0.9) ▼
Chinese Taipei	35 (1.0)	588 (4.8)	2 (1.4)	42 (0.9)	566 (3.2)	-1 (1.2)	24 (0.9)	514 (4.7)	-1 (1.3)
Italy	34 (0.9)	512 (4.5)	1 (1.2)	46 (0.8)	492 (2.9)	-2 (1.2)	21 (0.8)	477 (3.2)	1 (1.1)
Japan	26 (0.8)	576 (3.3)	5 (1.1) ▲	43 (0.9)	561 (2.1)	-4 (1.2) ▼	32 (1.0)	528 (3.2)	-1 (1.4)
International Avg.	66 (0.2)	471 (0.7)		23 (0.1)	449 (1.0)		11 (0.1)	441 (1.6)	
<b>Benchmarking Participants</b>									
Dubai, UAE	r 73 (1.1)	495 (3.0)	◇ ◇	18 (0.9)	489 (5.6)	◇ ◇	8 (0.6)	476 (7.0)	◇ ◇
Minnesota, US	57 (1.3)	547 (5.4)	◇ ◇	29 (0.9)	531 (5.0)	◇ ◇	14 (1.0)	521 (6.9)	◇ ◇
Ontario, Canada	53 (1.5)	541 (3.3)	-3 (2.0)	31 (1.3)	515 (5.0)	2 (1.6)	16 (0.8)	499 (6.0)	2 (1.1)
British Columbia, Canada	53 (1.0)	539 (3.2)	◇ ◇	30 (0.8)	518 (3.4)	◇ ◇	17 (0.8)	501 (4.3)	◇ ◇
Massachusetts, US	50 (1.0)	569 (5.3)	◇ ◇	32 (0.9)	548 (5.3)	◇ ◇	19 (0.9)	539 (4.3)	◇ ◇
Basque Country, Spain	41 (1.4)	507 (3.8)	-2 (1.8)	30 (1.1)	500 (3.5)	1 (1.4)	28 (1.4)	483 (4.4)	1 (1.7)
Quebec, Canada	35 (1.4)	522 (4.3)	-4 (2.0)	39 (1.2)	509 (2.9)	1 (1.6)	26 (1.2)	487 (4.2)	2 (1.6)

▲ 2007 percent significantly higher      ▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on students' responses to four statements about science: 1) I think learning science will help me in my daily life; 2) I need science to learn other school subjects; 3) I need to do well in science to get into the university of my choice; 4) I need to do well in science to get the job I want. Average is computed across the four items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a lot or a little on average across the four statements are assigned to the high level. Students disagreeing a little or a lot on average across the four statements are assigned to the low level. All other students are assigned to the middle level.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.  
 An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.  
 A diamond (◇) indicates the country did not participate in the assessment.

Exhibit 4.9 Index of Students' Valuing Science (SVS) with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Biology

Country	High SVS			Medium SVS			Low SVS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Indonesia	88 (0.7)	426 (3.4)	16 (1.4) ▲	10 (0.7)	439 (7.2)	-16 (1.3) ▼	1 (0.2)	~ ~	-1 (0.3)
Algeria	86 (0.7)	411 (1.9)	◊ ◊	11 (0.6)	404 (3.4)	◊ ◊	2 (0.2)	~ ~	◊ ◊
Syrian Arab Republic	78 (0.8)	456 (3.0)	◊ ◊	17 (0.7)	454 (3.9)	◊ ◊	5 (0.4)	458 (6.1)	◊ ◊
Lebanon	66 (1.2)	423 (7.0)	-2 (1.8)	25 (0.9)	402 (5.7)	3 (1.4)	9 (0.7)	407 (10.5)	0 (0.9)
Malta	63 (1.0)	524 (3.1)	◊ ◊	22 (0.8)	500 (6.4)	◊ ◊	14 (0.7)	472 (9.9)	◊ ◊
Ukraine	53 (1.2)	478 (4.1)	◊ ◊	31 (0.9)	502 (3.2)	◊ ◊	16 (0.9)	499 (4.7)	◊ ◊
Georgia	49 (1.9)	422 (5.1)	◊ ◊	28 (1.1)	435 (6.6)	◊ ◊	23 (1.7)	433 (5.4)	◊ ◊
Bosnia and Herzegovina	49 (1.2)	458 (3.4)	◊ ◊	28 (0.8)	479 (3.4)	◊ ◊	23 (1.0)	474 (4.0)	◊ ◊
Bulgaria	48 (1.5)	461 (7.5)	--	31 (1.2)	483 (7.8)	--	21 (1.5)	483 (7.0)	--
Lithuania	47 (1.0)	514 (3.4)	1 (1.5)	34 (0.8)	522 (3.1)	1 (1.2)	19 (0.9)	524 (3.7)	-2 (1.2)
Russian Federation	44 (1.1)	523 (3.9)	0 (1.4)	35 (0.7)	535 (4.2)	-2 (1.1)	21 (0.9)	540 (5.9)	2 (1.2)
Armenia	43 (1.4)	484 (5.6)	-3 (1.9)	29 (0.9)	495 (7.0)	1 (1.2)	28 (1.2)	494 (8.7)	3 (1.6)
Romania	37 (1.2)	443 (5.1)	-2 (1.9)	33 (0.8)	469 (4.2)	1 (1.2)	30 (1.1)	483 (4.2)	1 (1.7)
Serbia	34 (1.4)	464 (4.6)	2 (1.9)	30 (1.0)	480 (3.5)	0 (1.3)	36 (1.3)	475 (3.8)	-2 (1.8)
Sweden	31 (1.0)	518 (3.9)	7 (1.4) ▲	46 (0.8)	517 (2.5)	-4 (1.3) ▼	23 (0.8)	499 (3.7)	-3 (1.3) ▼
Hungary	31 (1.1)	530 (4.5)	-2 (1.5)	37 (0.9)	539 (3.3)	0 (1.2)	31 (1.1)	548 (3.5)	2 (1.6)
Slovenia	31 (0.9)	537 (3.5)	-2 (1.3)	48 (0.9)	542 (2.4)	3 (1.2) ▲	21 (1.0)	531 (3.6)	0 (1.4)
Czech Republic	24 (0.8)	535 (2.9)	◊ ◊	44 (0.8)	541 (2.6)	◊ ◊	31 (0.9)	540 (2.5)	◊ ◊
Cyprus	x x	x x	--	x x	x x	--	x x	x x	--
‡ Morocco	82 (0.9)	401 (2.9)	--	13 (0.7)	410 (5.2)	--	5 (0.6)	405 (10.1)	--
International Avg.	52 (0.3)	474 (1.0)		29 (0.2)	482 (1.1)		19 (0.2)	486 (1.5)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Earth Science

Country	High SVS			Medium SVS			Low SVS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	79 (1.5)	404 (3.1)	◊ ◊	15 (1.1)	398 (5.7)	◊ ◊	7 (0.8)	403 (7.3)	◊ ◊
Syrian Arab Republic	71 (1.0)	449 (3.2)	◊ ◊	20 (0.8)	453 (4.8)	◊ ◊	9 (0.7)	473 (5.2)	◊ ◊
Lithuania	52 (1.1)	516 (3.0)	1 (1.5)	31 (0.8)	525 (3.3)	-1 (1.2)	17 (0.8)	516 (4.4)	0 (1.1)
Georgia	50 (2.4)	420 (5.5)	◊ ◊	23 (1.1)	432 (6.3)	◊ ◊	26 (1.9)	426 (8.5)	◊ ◊
Ukraine	50 (1.2)	479 (4.1)	◊ ◊	32 (1.0)	501 (3.5)	◊ ◊	18 (0.8)	494 (3.6)	◊ ◊
Romania	48 (1.6)	447 (4.5)	4 (2.1)	29 (1.0)	478 (4.5)	-2 (1.3)	23 (1.1)	481 (5.4)	-2 (1.5)
Bulgaria	47 (1.4)	469 (8.1)	--	29 (1.1)	475 (7.0)	--	24 (1.4)	475 (6.7)	--
Bosnia and Herzegovina	43 (1.1)	453 (3.6)	◊ ◊	29 (0.8)	478 (3.3)	◊ ◊	28 (1.0)	478 (3.9)	◊ ◊
Sweden	40 (1.0)	512 (3.4)	11 (1.4) ▲	46 (0.9)	522 (2.7)	-8 (1.4) ▼	14 (0.7)	494 (4.7)	-3 (1.1) ▼
Russian Federation	39 (1.0)	527 (4.2)	0 (1.4)	36 (0.8)	535 (4.4)	-1 (1.4)	25 (1.0)	530 (5.2)	1 (1.4)
Armenia	38 (1.1)	485 (6.9)	-1 (1.9)	31 (1.0)	491 (6.1)	3 (1.4) ▲	31 (1.3)	493 (6.1)	-2 (1.9)
Slovenia	36 (1.1)	540 (3.6)	--	45 (1.0)	543 (2.5)	--	19 (0.9)	522 (3.5)	--
Serbia	31 (1.0)	457 (5.3)	6 (1.4) ▲	29 (1.1)	479 (4.1)	0 (1.4)	40 (1.1)	480 (3.8)	-5 (1.7) ▼
Hungary	28 (1.2)	526 (4.4)	0 (1.6)	38 (1.2)	544 (3.5)	-1 (1.5)	34 (1.0)	545 (3.4)	1 (1.6)
Cyprus	25 (0.7)	434 (4.2)	-3 (1.0) ▼	33 (0.8)	459 (2.5)	-2 (1.1)	43 (1.0)	459 (2.6)	4 (1.3) ▲
Czech Republic	24 (0.8)	533 (3.2)	◊ ◊	43 (0.8)	542 (2.2)	◊ ◊	33 (1.0)	541 (2.4)	◊ ◊
Malta	23 (0.7)	429 (3.8)	◊ ◊	32 (0.8)	448 (3.1)	◊ ◊	45 (0.8)	454 (2.7)	◊ ◊
Indonesia	--	--	--	--	--	--	--	--	--
Lebanon	--	--	--	--	--	--	--	--	--
‡ Morocco	71 (1.3)	398 (3.0)	--	18 (1.2)	407 (5.8)	--	11 (0.8)	429 (8.1)	--
International Avg.	44 (0.3)	471 (1.1)		31 (0.2)	484 (1.0)		25 (0.2)	483 (1.2)	

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).



Exhibit 4.9 Index of Students' Valuing Science (SVS) with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

**Chemistry**

Country	High SVS			Medium SVS			Low SVS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	79 (0.9)	409 (2.2)	0 0	15 (0.7)	404 (3.6)	0 0	6 (0.5)	409 (6.7)	0 0
Syrian Arab Republic	71 (1.0)	455 (3.0)	0 0	20 (0.7)	451 (4.2)	0 0	8 (0.6)	465 (5.0)	0 0
Malta	62 (1.5)	565 (3.8)	0 0	21 (1.4)	526 (7.0)	0 0	17 (1.0)	494 (10.1)	0 0
Lebanon	61 (1.3)	419 (6.7)	-3 (1.8)	26 (1.2)	411 (6.5)	0 (1.5)	13 (0.8)	420 (8.3)	3 (1.1) ▲
Lithuania	50 (1.1)	518 (3.3)	5 (1.6) ▲	28 (0.8)	524 (2.8)	-3 (1.2) ▼	23 (0.9)	516 (4.3)	-2 (1.4)
Ukraine	49 (1.3)	484 (4.0)	0 0	29 (0.9)	497 (3.8)	0 0	22 (1.1)	490 (3.9)	0 0
Bosnia and Herzegovina	48 (1.2)	455 (3.3)	0 0	24 (0.9)	477 (4.2)	0 0	28 (1.0)	479 (3.6)	0 0
Russian Federation	46 (1.0)	526 (4.6)	1 (1.3)	30 (0.6)	535 (4.3)	-3 (1.0) ▼	24 (0.8)	534 (4.5)	2 (1.2)
Georgia	46 (2.2)	423 (6.0)	0 0	24 (1.0)	436 (4.9)	0 0	30 (1.8)	431 (4.7)	0 0
Bulgaria	41 (1.8)	468 (7.6)	--	26 (1.0)	474 (8.0)	--	33 (1.6)	477 (7.2)	--
Armenia	36 (1.5)	484 (5.9)	-2 (2.0)	25 (0.8)	498 (8.4)	-1 (1.1)	39 (1.5)	492 (6.0)	2 (1.9)
Romania	35 (1.6)	445 (5.2)	3 (2.1)	27 (1.0)	469 (4.9)	-1 (1.4)	37 (1.5)	479 (3.7)	-2 (2.1)
Cyprus	34 (0.9)	458 (3.4)	4 (1.1) ▲	28 (0.8)	455 (2.8)	-1 (1.1)	38 (0.9)	447 (2.6)	-3 (1.2) ▼
Slovenia	31 (1.0)	542 (3.5)	1 (1.5)	42 (1.0)	544 (2.4)	1 (1.4)	27 (1.0)	524 (2.8)	-2 (1.5)
Serbia	31 (1.3)	463 (5.5)	4 (1.7) ▲	23 (0.8)	478 (3.7)	-1 (1.1)	46 (1.2)	477 (3.5)	-3 (1.7)
Sweden	31 (1.0)	515 (4.2)	11 (1.4) ▲	40 (0.9)	522 (3.0)	-3 (1.3) ▼	30 (0.8)	500 (3.3)	-8 (1.5) ▼
Czech Republic	28 (0.9)	529 (3.2)	0 0	38 (0.7)	541 (2.4)	0 0	34 (1.1)	545 (2.3)	0 0
Hungary	28 (1.1)	528 (5.3)	3 (1.5) ▲	32 (0.9)	542 (3.2)	-2 (1.3)	40 (1.3)	545 (3.2)	-1 (1.8)
Indonesia	--	--	--	--	--	--	--	--	--
‡ Morocco	77 (1.2)	402 (2.9)	--	16 (0.8)	400 (6.0)	--	7 (0.6)	411 (8.4)	--
International Avg.	47 (0.3)	478 (1.1)		27 (0.2)	483 (1.1)		26 (0.3)	481 (1.2)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Physics**

Country	High SVS			Medium SVS			Low SVS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Indonesia	82 (0.8)	427 (3.5)	16 (1.5) ▲	14 (0.7)	436 (4.5)	-14 (1.2) ▼	3 (0.4)	429 (8.8)	-2 (0.6) ▼
Algeria	82 (0.7)	410 (1.8)	0 0	14 (0.5)	407 (3.5)	0 0	4 (0.3)	420 (6.5)	0 0
Syrian Arab Republic	70 (1.0)	455 (2.9)	0 0	21 (0.7)	452 (3.6)	0 0	9 (0.6)	473 (5.2)	0 0
Lebanon	64 (1.2)	422 (6.5)	2 (1.6)	23 (1.0)	403 (7.3)	-4 (1.3) ▼	13 (0.9)	417 (9.6)	2 (1.1)
Ukraine	55 (1.0)	486 (3.8)	0 0	27 (0.8)	496 (3.8)	0 0	18 (0.8)	487 (3.9)	0 0
Malta	54 (0.8)	474 (2.7)	0 0	26 (0.7)	454 (3.2)	0 0	20 (0.6)	418 (3.6)	0 0
Lithuania	54 (1.0)	524 (3.1)	8 (1.5) ▲	27 (0.7)	517 (3.2)	-2 (1.0) ▼	19 (0.9)	508 (4.6)	-5 (1.2) ▼
Russian Federation	53 (1.1)	533 (4.5)	2 (1.4)	30 (0.9)	532 (4.8)	-2 (1.3)	17 (0.7)	521 (5.2)	0 (1.0)
Bosnia and Herzegovina	52 (1.1)	461 (3.3)	0 0	22 (0.8)	475 (3.5)	0 0	26 (0.9)	472 (3.8)	0 0
Georgia	52 (1.8)	422 (5.1)	0 0	24 (1.2)	438 (5.4)	0 0	24 (1.2)	431 (6.1)	0 0
Bulgaria	47 (1.5)	471 (6.9)	--	27 (1.0)	473 (7.7)	--	26 (1.4)	477 (7.8)	--
Cyprus	46 (0.8)	463 (2.6)	4 (1.3) ▲	26 (0.7)	446 (3.9)	-4 (1.0) ▼	28 (0.8)	442 (3.2)	0 (1.2)
Armenia	46 (1.0)	490 (7.1)	0 (1.6)	27 (1.0)	500 (6.7)	0 (1.3)	27 (1.3)	481 (4.5)	0 (1.7)
Romania	38 (1.4)	446 (5.9)	3 (1.9)	27 (0.9)	470 (4.7)	-3 (1.3) ▼	35 (1.5)	480 (3.5)	-1 (2.0)
Sweden	36 (0.9)	522 (3.6)	12 (1.4) ▲	38 (0.7)	524 (3.2)	-4 (1.2) ▼	26 (0.8)	492 (3.6)	-9 (1.3) ▼
Hungary	34 (1.3)	538 (4.9)	4 (1.7) ▲	33 (1.0)	543 (3.1)	-1 (1.3)	33 (1.2)	537 (3.7)	-3 (1.7)
Slovenia	34 (0.9)	542 (3.3)	2 (1.5)	40 (0.8)	545 (2.4)	1 (1.4)	27 (1.0)	524 (2.5)	-4 (1.7) ▼
Czech Republic	31 (0.8)	541 (2.9)	0 0	39 (0.8)	542 (2.5)	0 0	30 (0.9)	534 (2.6)	0 0
Serbia	31 (1.2)	464 (5.1)	3 (1.5) ▲	24 (0.9)	480 (3.5)	0 (1.3)	45 (1.4)	476 (3.5)	-4 (1.8) ▼
‡ Morocco	81 (1.2)	404 (3.4)	--	13 (0.7)	399 (6.7)	--	6 (0.7)	413 (10.4)	--
International Avg.	52 (0.2)	475 (1.0)		26 (0.2)	477 (1.0)		22 (0.2)	472 (1.3)	

▲ 2007 percent significantly higher      ▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

index level, and 52 at the high valuing physics index level. Unlike the single science countries, where average achievement was highest among students placing most value on science, students at the high level of the indices valuing biology, earth science, and chemistry had lower average science achievement than those placing less value on the subjects. In physics, there was little association between valuing physics and average science achievement.

Regardless of how much students like science or value it for how it can help them in their lives, students' confidence in their ability to learn science is based to some extent on their past experience in learning the subject. This in turn is likely to be determined by the difficulty of the subject as well as the individual student's own learning ability. To investigate how students think about their abilities in science, TIMSS created an Index of Students' Self-Confidence in Learning Science (SCS), based on students' responses to four statements about their science ability:

- ▶ I usually do well in science.
- ▶ Science is harder for me than for many of my classmates.<sup>5</sup>
- ▶ I am just not good at science.<sup>6</sup>
- ▶ I learn things quickly in science.

In countries where the sciences are taught as separate subjects at the eighth grade, students were asked about each subject separately. Students were asked to indicate if they *agreed a lot*, *agreed a little*, *disagreed a little*, or *disagreed a lot* with each statement. Students who agreed a little or a lot on average with all four statements were assigned to the high level of the index (i.e., are confident about their science ability), while those who disagreed a little or a lot, on average, were assigned to the low level of the index. The medium level includes all other response combinations. For each TIMSS participant at the fourth and eighth grades, the percentage of students at each level of the index is presented in Exhibit 4.10, together with average science achievement. The exhibit also shows changes in percentages since 2003.

5 The response categories for this statement were reversed in constructing the index.

6 The response categories for this statement were reversed in constructing the index.

At fourth grade, on average across the countries, students expressed considerable self-confidence in their science ability, with 61 percent at the high level of the index, and a further 30 percent at the medium level. Just 8 percent, on average were at the low level of the index. Highest levels of self-confidence were reported in Austria, Germany, Sweden, Iran, Kazakhstan, and Lithuania, with 70 percent or more at the high level of the index, and lowest levels in Morocco (49%), Yemen (46%), El Salvador (45%), and Singapore (41%), all with less than 50 percent. A number of countries showed an increase since 2003 in the percentage of students at the high index level, including Iran, the United States, Scotland, Chinese Taipei, Japan, New Zealand, and Singapore, while countries with a decrease included the Netherlands, Slovenia, Hungary, and Hong Kong SAR. There was a positive association between level of self-confidence in learning science and science achievement at the fourth grade. Achievement was highest among students at the high level of the science self-confidence index (497 points, on average), next highest among students at the medium level (453 points), and lowest among those at the low level (437 points).

Students' confidence in learning science at the eighth grade was lower than at the fourth grade, on average among students in countries teaching science as a single subject, with just 48 percent of students at the high level of the index (compared with 61% at fourth grade). At the medium level, there were 38 percent of students, on average, and 13 percent at the low level. Self-confidence levels were highest in Tunisia, Jordan, Colombia, and Egypt (60% or more at the high level) and lowest in Malaysia, Korea, Chinese Taipei, and Japan (less than 30% at the high level). There were increased percentages since 2003 at the high level in Jordan, Iran, Botswana, and Korea, and decreases in Egypt, Italy, the Palestinian Authority, Scotland, Australia, Singapore, Malaysia, and Chinese Taipei. As at the fourth grade, there was a positive association between self-confidence in learning science and science achievement at the eighth grade. Students at the high level of the self-confidence index had the highest average science achievement (492 points), followed by students the medium level (439 points), and students at the low index level (427 points).

**Exhibit 4.10 Index of Students' Self-Confidence in Learning Science (SCS) with Trends**
**TIMSS2007**  
**Science** **4<sup>th</sup>**  
**Grade**

Country	High SCS			Medium SCS			Low SCS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Austria	79 (0.9)	539 (2.4)	◇ ◇	16 (0.7)	479 (4.1)	◇ ◇	5 (0.5)	477 (7.2)	◇ ◇
Germany	76 (0.8)	544 (2.5)	◇ ◇	18 (0.6)	491 (4.7)	◇ ◇	5 (0.4)	469 (6.5)	◇ ◇
Sweden	76 (0.9)	534 (3.0)	◇ ◇	20 (0.7)	498 (4.5)	◇ ◇	4 (0.4)	484 (8.1)	◇ ◇
Iran, Islamic Rep. of	74 (1.3)	461 (3.8)	22 (2.0) ▲	21 (1.2)	393 (5.8)	-21 (1.9) ▼	5 (0.6)	359 (13.9)	-1 (0.8)
Kazakhstan	71 (1.7)	542 (5.3)	◇ ◇	23 (1.3)	506 (6.8)	◇ ◇	6 (1.0)	520 (11.0)	◇ ◇
Lithuania	70 (0.9)	527 (2.4)	1 (1.2)	25 (0.8)	491 (3.7)	-1 (1.2)	5 (0.5)	460 (9.3)	0 (0.6)
United States	69 (0.7)	556 (2.4)	14 (1.2) ▲	22 (0.5)	508 (3.8)	-17 (1.0) ▼	8 (0.4)	493 (4.7)	3 (0.5) ▲
Italy	69 (0.9)	548 (3.4)	0 (1.4)	25 (0.7)	514 (3.6)	-1 (1.2)	6 (0.4)	496 (6.6)	0 (0.6)
Slovak Republic	69 (1.2)	546 (3.5)	◇ ◇	24 (1.0)	492 (7.2)	◇ ◇	7 (0.5)	476 (8.9)	◇ ◇
Denmark	68 (1.4)	531 (2.8)	◇ ◇	26 (1.1)	494 (4.3)	◇ ◇	7 (0.6)	485 (6.3)	◇ ◇
Norway	67 (1.3)	492 (3.1)	3 (1.7)	26 (1.0)	454 (4.8)	-3 (1.4) ▼	7 (0.5)	436 (8.4)	0 (0.7)
Netherlands	67 (1.3)	535 (2.7)	-4 (1.8) ▼	25 (1.1)	504 (3.8)	3 (1.4) ▲	8 (0.6)	490 (5.5)	1 (0.9)
Slovenia	65 (1.1)	533 (2.4)	-12 (1.4) ▼	28 (0.9)	497 (3.2)	10 (1.2) ▲	7 (0.5)	472 (6.8)	3 (0.7) ▲
Georgia	65 (1.4)	439 (4.1)	◇ ◇	28 (1.1)	403 (6.3)	◇ ◇	7 (0.6)	393 (9.0)	◇ ◇
Kuwait	65 (1.4)	388 (4.5)	◇ ◇	31 (1.4)	310 (6.3)	◇ ◇	4 (0.5)	285 (13.9)	◇ ◇
Hungary	65 (1.2)	561 (2.9)	-5 (1.6) ▼	26 (1.0)	498 (5.0)	3 (1.3) ▲	10 (0.6)	494 (6.1)	2 (0.8) ▲
Russian Federation	63 (1.2)	563 (4.1)	0 (1.8)	27 (1.1)	523 (6.9)	0 (1.6)	10 (0.7)	520 (7.8)	0 (1.1)
Australia	63 (1.0)	543 (3.0)	-3 (1.6)	28 (0.7)	509 (4.4)	1 (1.3)	9 (0.7)	483 (6.7)	2 (0.8) ▲
Scotland	62 (1.2)	514 (2.6)	5 (1.8) ▲	26 (1.0)	485 (3.9)	-4 (1.5) ▼	11 (0.8)	468 (4.3)	-1 (1.0)
Qatar	62 (0.7)	336 (2.4)	◇ ◇	33 (0.7)	264 (3.7)	◇ ◇	6 (0.3)	233 (6.7)	◇ ◇
Armenia	59 (1.8)	503 (5.3)	0 (2.2)	31 (1.5)	486 (11.8)	-3 (1.8)	10 (0.7)	472 (17.3)	3 (1.0) ▲
Tunisia	58 (1.6)	374 (6.5)	-2 (2.3)	37 (1.4)	283 (6.2)	3 (2.0)	5 (0.6)	222 (10.8)	-2 (0.8) ▼
Chinese Taipei	58 (1.2)	572 (2.3)	8 (1.6) ▲	33 (0.9)	538 (2.9)	-4 (1.2) ▼	9 (0.7)	533 (4.4)	-4 (1.0) ▼
Colombia	58 (1.4)	430 (5.2)	◇ ◇	37 (1.3)	376 (6.6)	◇ ◇	5 (0.6)	366 (13.0)	◇ ◇
Ukraine	57 (1.3)	498 (3.3)	◇ ◇	33 (1.0)	454 (3.6)	◇ ◇	9 (0.6)	447 (6.4)	◇ ◇
Latvia	57 (1.3)	558 (2.8)	3 (2.0)	32 (1.0)	526 (3.2)	-4 (1.6) ▼	11 (0.8)	515 (4.9)	1 (1.3)
Czech Republic	56 (1.3)	534 (3.3)	◇ ◇	30 (1.1)	497 (3.8)	◇ ◇	14 (0.7)	482 (5.0)	◇ ◇
England	55 (1.1)	561 (3.4)	2 (1.6)	31 (0.8)	524 (3.6)	-2 (1.2)	14 (0.8)	512 (4.8)	0 (1.1)
Japan	53 (1.2)	562 (2.4)	8 (1.6) ▲	35 (1.0)	537 (2.8)	-6 (1.3) ▼	12 (0.6)	521 (4.2)	-2 (0.9)
Hong Kong SAR	52 (1.3)	571 (3.4)	-8 (1.9) ▼	38 (1.0)	539 (4.1)	6 (1.5) ▲	11 (0.7)	528 (5.4)	2 (0.8) ▲
Algeria	51 (1.4)	378 (5.6)	◇ ◇	43 (1.2)	341 (7.7)	◇ ◇	6 (0.5)	315 (15.0)	◇ ◇
New Zealand	51 (1.1)	530 (2.7)	15 (1.5) ▲	37 (1.0)	486 (4.0)	-22 (1.4) ▼	12 (0.6)	464 (4.9)	7 (0.7) ▲
Morocco	49 (1.6)	332 (7.2)	-3 (2.5)	42 (1.5)	281 (7.7)	3 (2.3)	8 (0.9)	259 (15.1)	0 (1.5)
Yemen	46 (1.8)	233 (8.3)	◇ ◇	45 (1.5)	194 (7.4)	◇ ◇	9 (0.7)	179 (12.5)	◇ ◇
El Salvador	45 (1.3)	420 (3.9)	◇ ◇	49 (1.1)	372 (3.8)	◇ ◇	6 (0.5)	360 (9.0)	◇ ◇
Singapore	41 (0.9)	621 (4.0)	9 (1.3) ▲	38 (0.7)	568 (4.9)	-3 (1.1) ▼	21 (0.6)	556 (5.0)	-6 (1.0) ▼
International Avg.	61 (0.2)	497 (0.7)		30 (0.2)	453 (0.9)		8 (0.1)	437 (1.5)	
<b>Benchmarking Participants</b>									
Massachusetts, US	75 (1.4)	582 (4.1)	◇ ◇	18 (1.1)	547 (6.7)	◇ ◇	6 (0.7)	517 (7.1)	◇ ◇
Minnesota, US	75 (2.1)	564 (5.7)	◇ ◇	19 (1.5)	519 (10.5)	◇ ◇	5 (0.9)	502 (10.6)	◇ ◇
Quebec, Canada	72 (1.1)	530 (2.9)	3 (1.6)	21 (0.9)	489 (3.8)	-2 (1.4)	7 (0.5)	480 (6.2)	-1 (0.7)
Alberta, Canada	72 (1.1)	555 (3.6)	◇ ◇	22 (0.8)	517 (4.5)	◇ ◇	6 (0.6)	493 (8.1)	◇ ◇
Dubai, UAE	69 (1.4)	488 (3.4)	◇ ◇	25 (1.1)	427 (4.8)	◇ ◇	6 (0.6)	387 (12.5)	◇ ◇
British Columbia, Canada	69 (1.0)	551 (2.8)	◇ ◇	24 (0.7)	513 (4.0)	◇ ◇	7 (0.6)	495 (6.0)	◇ ◇
Ontario, Canada	67 (1.3)	553 (3.6)	0 (1.9)	25 (1.3)	507 (6.0)	1 (1.7)	8 (0.8)	500 (6.4)	-1 (1.1)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Index based on students' responses to four statements about science: 1) I usually do well in science; 2) Science is harder for me than for many of my classmates (Reversed); 3) I am just not good at science (Reversed); 4) I learn things quickly in science. Average is computed across the four items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a little or a lot on average across the four statements are assigned to the high level. Students disagreeing a little or a lot on average are assigned to the low level. All other students are assigned to the middle level.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.

An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (◇) indicates the country did not participate in the assessment.



**Exhibit 4.10 Index of Students' Self-Confidence in Learning Science (SCS) with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**General/Integrated Science**

Country	High SCS			Medium SCS			Low SCS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Tunisia	70 (0.9)	457 (2.2)	1 (1.4)	26 (0.8)	417 (2.3)	0 (1.2)	4 (0.4)	417 (6.2)	0 (0.5)
Jordan	64 (1.5)	511 (3.6)	7 (1.8) ▲	30 (1.2)	446 (4.1)	-6 (1.5) ▼	5 (0.6)	419 (12.3)	-1 (0.8)
Colombia	62 (1.4)	434 (3.3)	0 0	34 (1.2)	396 (4.3)	0 0	5 (0.4)	390 (8.5)	0 0
Egypt	60 (1.4)	438 (3.4)	-4 (1.8) ▼	35 (1.4)	379 (4.6)	3 (1.7)	5 (0.4)	357 (9.6)	1 (0.5)
Saudi Arabia	59 (1.2)	427 (3.0)	--	36 (1.1)	378 (3.0)	--	5 (0.5)	364 (6.5)	--
Bahrain	58 (0.9)	496 (2.2)	2 (1.3)	35 (0.9)	433 (2.5)	-2 (1.3)	7 (0.4)	421 (6.6)	0 (0.7)
Iran, Islamic Rep. of	58 (1.3)	479 (3.9)	11 (1.7) ▲	35 (1.1)	437 (3.9)	-9 (1.4) ▼	7 (0.5)	432 (8.1)	-1 (0.7)
Norway	57 (1.2)	507 (2.0)	-3 (1.7)	32 (0.9)	467 (2.8)	1 (1.3)	11 (0.7)	447 (4.5)	2 (1.0)
Israel	56 (1.6)	507 (4.2)	-3 (1.9)	33 (1.2)	432 (4.9)	1 (1.5)	11 (0.7)	418 (7.0)	1 (0.9)
United States	56 (1.1)	543 (3.1)	0 (1.4)	29 (0.7)	498 (3.2)	-2 (1.0)	15 (0.7)	482 (3.8)	2 (0.9)
Ghana	54 (1.5)	334 (5.3)	-3 (2.0)	41 (1.3)	273 (5.7)	4 (1.7) ▲	5 (0.5)	268 (11.1)	-1 (0.8)
England	53 (1.5)	569 (4.7)	1 (2.1)	31 (1.1)	517 (5.5)	-1 (1.7)	15 (0.9)	504 (4.7)	0 (1.3)
Italy	53 (1.0)	517 (3.6)	-4 (1.5) ▼	33 (0.9)	476 (3.3)	1 (1.3)	14 (0.8)	460 (4.6)	3 (1.0) ▲
Palestinian Nat'l Auth.	53 (1.3)	446 (3.7)	-4 (1.7) ▼	41 (1.1)	368 (4.2)	4 (1.5) ▲	6 (0.5)	348 (7.5)	-1 (0.7)
Qatar	52 (0.6)	357 (2.1)	0 0	40 (0.7)	288 (3.2)	0 0	8 (0.3)	266 (5.4)	0 0
Oman	52 (1.1)	457 (3.0)	0 0	44 (1.0)	393 (3.1)	0 0	4 (0.3)	373 (10.9)	0 0
Scotland	52 (1.4)	530 (3.2)	-7 (2.0) ▼	31 (1.1)	468 (3.6)	4 (1.5) ▲	17 (1.0)	447 (4.5)	3 (1.3) ▲
Turkey	51 (1.3)	484 (4.0)	0 0	37 (1.0)	427 (4.2)	0 0	11 (0.6)	417 (5.3)	0 0
Botswana	49 (1.0)	381 (3.3)	3 (1.4) ▲	41 (0.9)	338 (4.2)	-3 (1.1) ▼	9 (0.5)	316 (6.9)	0 (0.7)
Kuwait	49 (0.9)	445 (3.4)	0 0	42 (0.8)	401 (3.3)	0 0	9 (0.5)	386 (5.8)	0 0
El Salvador	44 (1.3)	408 (3.4)	0 0	51 (1.2)	372 (3.3)	0 0	5 (0.6)	388 (6.9)	0 0
Australia	41 (1.3)	549 (4.9)	-7 (2.0) ▼	39 (1.0)	496 (3.7)	4 (1.5) ▲	20 (1.0)	483 (4.3)	3 (1.3) ▲
Singapore	40 (1.0)	601 (4.5)	-5 (1.3) ▼	38 (0.9)	544 (5.4)	2 (1.1)	21 (0.7)	546 (6.0)	3 (0.9) ▲
Hong Kong SAR	33 (1.3)	561 (4.9)	1 (1.7)	49 (0.9)	516 (5.1)	2 (1.2)	18 (1.0)	515 (5.9)	-2 (1.4)
Thailand	30 (1.2)	495 (4.9)	0 0	59 (1.0)	457 (4.1)	0 0	11 (0.8)	479 (6.8)	0 0
Malaysia	26 (1.3)	514 (6.4)	-12 (1.8) ▼	52 (1.2)	454 (6.3)	4 (1.6) ▲	22 (0.9)	461 (5.8)	8 (1.1) ▲
Korea, Rep. of	24 (1.0)	603 (2.5)	4 (1.2) ▲	40 (0.9)	556 (2.4)	-2 (1.1)	36 (0.9)	516 (2.5)	-2 (1.3)
Chinese Taipei	23 (1.0)	619 (4.0)	-4 (1.4) ▼	36 (0.9)	552 (4.2)	-2 (1.2)	41 (1.2)	536 (3.3)	7 (1.6) ▲
Japan	20 (0.7)	601 (2.8)	0 (1.1)	44 (1.0)	554 (2.4)	-2 (1.2)	36 (1.1)	529 (2.8)	2 (1.5)
<b>International Avg.</b>	<b>48 (0.2)</b>	<b>492 (0.7)</b>		<b>38 (0.2)</b>	<b>439 (0.7)</b>		<b>13 (0.1)</b>	<b>427 (1.3)</b>	
<b>Benchmarking Participants</b>									
Massachusetts, US	58 (2.9)	579 (6.3)	0 0	28 (1.6)	537 (4.8)	0 0	14 (1.7)	506 (6.4)	0 0
Dubai, UAE	57 (1.6)	521 (3.1)	0 0	36 (1.4)	457 (4.1)	0 0	8 (0.7)	452 (8.7)	0 0
British Columbia, Canada	54 (1.2)	548 (3.1)	0 0	32 (0.7)	507 (3.5)	0 0	15 (0.9)	486 (4.0)	0 0
Ontario, Canada	51 (1.4)	553 (3.3)	-1 (2.0)	33 (1.0)	507 (4.0)	0 (1.5)	16 (1.1)	483 (6.5)	1 (1.5)
Minnesota, US	50 (2.8)	567 (4.9)	0 0	32 (1.6)	520 (5.3)	0 0	18 (2.3)	493 (5.3)	0 0
Basque Country, Spain	50 (1.9)	526 (3.4)	-1 (2.6)	33 (1.1)	478 (3.7)	-1 (1.7)	18 (1.3)	455 (4.6)	2 (1.7)
Quebec, Canada	49 (1.5)	525 (3.6)	-1 (2.3)	33 (0.9)	497 (3.9)	2 (1.4)	18 (1.1)	481 (5.6)	-1 (1.6)

▲ 2007 percent significantly higher      ▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on students' responses to four statements about science: 1) I usually do well in science; 2) Science is more difficult for me than for many of my classmates (Reversed); 3) Science is not one of my strengths (Reversed); 4) I learn things quickly in science. Average is computed across the four items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a little or a lot on average across the four statements are assigned to the high level. Students disagreeing a little or a lot on average are assigned to the low level. All other students are assigned to the middle level.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

A diamond (0) indicates the country did not participate in the assessment.

**Exhibit 4.10 Index of Students' Self-Confidence in Learning Science (SCS) with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

**Biology**

Country	High SCS			Medium SCS			Low SCS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Bosnia and Herzegovina	74 (1.2)	479 (3.0)	0 0	18 (0.8)	437 (4.2)	0 0	8 (0.7)	437 (5.5)	0 0
Serbia	69 (1.3)	487 (3.5)	-6 (1.7) ▼	22 (1.1)	445 (5.1)	4 (1.4) ▲	9 (0.6)	431 (7.7)	2 (0.8) ▲
Czech Republic	65 (1.5)	550 (2.3)	0 0	27 (1.1)	523 (2.5)	0 0	9 (0.7)	515 (5.0)	0 0
Lithuania	63 (1.3)	533 (2.6)	-1 (1.8)	30 (1.2)	497 (3.7)	1 (1.6)	7 (0.5)	493 (5.2)	0 (0.8)
Syrian Arab Republic	62 (1.1)	473 (2.8)	0 0	33 (1.0)	431 (3.6)	0 0	5 (0.4)	419 (6.1)	0 0
Georgia	61 (1.4)	448 (3.9)	0 0	32 (1.4)	400 (7.9)	0 0	7 (0.5)	382 (8.7)	0 0
Russian Federation	60 (1.3)	547 (4.1)	-9 (2.5) ▼	30 (0.9)	510 (4.7)	6 (1.8) ▲	10 (0.8)	496 (6.0)	3 (1.0) ▲
Hungary	59 (1.6)	553 (3.2)	-1 (2.1)	30 (1.1)	519 (4.2)	0 (1.5)	11 (0.8)	518 (5.4)	1 (1.1)
Bulgaria	59 (1.4)	491 (6.4)	--	32 (1.2)	446 (7.0)	--	9 (0.8)	448 (15.9)	--
Sweden	57 (1.0)	531 (2.6)	-1 (1.5)	35 (0.8)	495 (3.5)	2 (1.2)	7 (0.4)	466 (5.4)	-1 (0.7)
Slovenia	55 (1.2)	556 (2.2)	-8 (1.7) ▼	33 (0.9)	523 (3.0)	3 (1.3) ▲	12 (0.8)	498 (5.7)	5 (1.0) ▲
Ukraine	53 (1.3)	510 (3.2)	0 0	35 (1.1)	470 (3.8)	0 0	12 (0.7)	449 (5.4)	0 0
Algeria	53 (1.1)	422 (2.2)	0 0	39 (0.9)	398 (4.2)	0 0	8 (0.5)	392 (3.3)	0 0
Malta	51 (1.2)	549 (3.4)	0 0	33 (1.4)	481 (5.7)	0 0	16 (0.9)	454 (5.3)	0 0
Armenia	51 (1.2)	501 (5.7)	-6 (1.7) ▼	37 (1.2)	482 (6.6)	2 (1.6)	12 (0.7)	464 (8.0)	5 (0.8) ▲
Romania	49 (1.4)	480 (4.0)	3 (1.9)	40 (1.1)	449 (4.5)	-5 (1.7) ▼	11 (0.6)	447 (6.9)	2 (0.9)
Lebanon	49 (1.5)	454 (5.8)	0 (2.0)	42 (1.3)	381 (5.8)	-1 (1.8)	9 (0.6)	383 (8.3)	1 (0.9)
Indonesia	41 (1.1)	429 (4.0)	1 (1.7)	54 (0.9)	425 (3.6)	0 (1.5)	5 (0.5)	441 (7.0)	-2 (0.7) ▼
Cyprus	x x	x x	--	x x	x x	--	x x	x x	--
‡ Morocco	48 (1.1)	424 (4.5)	--	43 (1.0)	384 (3.7)	--	9 (0.7)	373 (5.2)	--
International Avg.	57 (0.3)	496 (0.9)		34 (0.3)	458 (1.1)		9 (0.2)	448 (1.6)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Earth Science**

Country	High SCS			Medium SCS			Low SCS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Bosnia and Herzegovina	72 (1.2)	478 (3.0)	0 0	20 (0.8)	439 (3.6)	0 0	8 (0.7)	441 (5.9)	0 0
Serbia	66 (1.2)	488 (3.1)	-3 (1.7) ▼	24 (0.9)	444 (4.1)	3 (1.3) ▲	10 (0.8)	438 (7.7)	1 (1.0)
Lithuania	64 (1.2)	535 (2.6)	0 (1.6)	29 (1.0)	491 (3.7)	-1 (1.3)	7 (0.6)	493 (6.2)	1 (0.8)
Sweden	60 (1.0)	527 (2.9)	-3 (1.6)	33 (0.9)	497 (3.4)	3 (1.4) ▲	7 (0.4)	484 (6.1)	0 (0.7)
Czech Republic	59 (1.2)	550 (2.4)	0 0	29 (0.9)	526 (2.8)	0 0	12 (0.7)	516 (4.2)	0 0
Cyprus	59 (0.9)	476 (2.3)	0 (1.3)	32 (0.7)	422 (2.9)	0 (1.2)	10 (0.5)	416 (4.8)	0 (0.7)
Russian Federation	57 (1.2)	551 (3.9)	-1 (2.1)	32 (1.0)	508 (4.7)	1 (1.7)	10 (0.6)	490 (6.7)	0 (0.9)
Syrian Arab Republic	56 (1.1)	468 (3.3)	0 0	38 (1.0)	432 (3.1)	0 0	5 (0.5)	427 (7.6)	0 0
Slovenia	56 (1.5)	557 (2.4)	--	33 (1.1)	519 (3.3)	--	11 (0.8)	506 (4.2)	--
Bulgaria	52 (1.6)	495 (7.1)	--	37 (1.4)	454 (6.1)	--	11 (0.9)	433 (12.9)	--
Georgia	r 50 (1.4)	450 (5.0)	0 0	41 (1.5)	405 (7.2)	0 0	9 (0.8)	396 (8.6)	0 0
Ukraine	50 (1.5)	515 (3.2)	0 0	37 (1.0)	466 (3.6)	0 0	13 (0.8)	452 (4.5)	0 0
Malta	50 (0.8)	481 (2.3)	0 0	35 (0.8)	418 (3.2)	0 0	15 (0.5)	399 (4.7)	0 0
Romania	49 (1.5)	488 (3.9)	8 (2.0) ▲	37 (1.2)	436 (5.0)	-9 (1.7) ▼	13 (0.9)	453 (5.3)	1 (1.2)
Hungary	47 (1.4)	560 (2.9)	-8 (2.0) ▼	35 (1.1)	523 (4.3)	3 (1.5) ▲	18 (0.9)	517 (4.6)	4 (1.2) ▲
Armenia	45 (1.3)	503 (6.8)	-10 (1.7) ▼	42 (1.0)	481 (6.7)	2 (1.5)	13 (0.9)	469 (8.2)	7 (1.0) ▲
Algeria	r 38 (1.6)	415 (3.9)	0 0	52 (1.5)	394 (3.8)	0 0	11 (0.8)	397 (4.9)	0 0
Indonesia	--	--	--	--	--	--	--	--	--
Lebanon	--	--	--	--	--	--	--	--	--
‡ Morocco	35 (1.2)	431 (4.3)	--	52 (1.1)	392 (2.8)	--	13 (0.9)	375 (6.1)	--
International Avg.	54 (0.3)	498 (0.9)		35 (0.3)	458 (1.0)		11 (0.2)	450 (1.5)	

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

Exhibit 4.10 Index of Students' Self-Confidence in Learning Science (SCS) with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Chemistry									
Country	High SCS			Medium SCS			Low SCS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Malta <sup>s</sup>	52 (1.3)	580 (4.0)	0 0	31 (1.3)	509 (7.2)	0 0	17 (1.1)	512 (7.7)	0 0
Czech Republic	50 (1.5)	554 (2.4)	0 0	31 (1.0)	526 (2.6)	0 0	19 (1.0)	522 (3.6)	0 0
Bosnia and Herzegovina	50 (1.3)	483 (3.1)	0 0	31 (0.8)	453 (3.9)	0 0	19 (1.1)	450 (4.2)	0 0
Slovenia	48 (1.2)	563 (2.5)	3 (1.6)	35 (0.9)	519 (2.7)	-4 (1.4) ▼	16 (0.9)	505 (4.0)	1 (1.2)
Lebanon	48 (1.5)	447 (5.3)	-1 (2.0)	43 (1.3)	387 (6.1)	-2 (1.8)	9 (0.6)	400 (9.0)	2 (0.9) ▲
Cyprus	47 (0.8)	484 (2.3)	1 (1.1)	35 (0.7)	426 (3.0)	-4 (1.1) ▼	17 (0.7)	423 (4.0)	3 (0.9) ▲
Sweden	47 (1.0)	539 (2.6)	0 (1.5)	41 (0.9)	494 (3.4)	2 (1.4)	13 (0.7)	480 (4.7)	-2 (1.0)
Syrian Arab Republic	44 (0.9)	470 (3.1)	0 0	47 (0.9)	444 (3.0)	0 0	9 (0.6)	450 (4.7)	0 0
Lithuania	43 (1.5)	542 (3.5)	4 (1.9) ▲	38 (1.0)	502 (2.8)	-1 (1.3)	20 (1.0)	505 (3.7)	-3 (1.3) ▼
Algeria	41 (1.2)	421 (2.7)	0 0	50 (1.1)	399 (2.7)	0 0	9 (0.6)	398 (4.6)	0 0
Russian Federation	38 (1.1)	555 (4.0)	-3 (1.7) ▼	36 (0.9)	521 (4.2)	0 (1.4)	26 (1.1)	510 (5.8)	4 (1.5) ▲
Georgia	38 (1.5)	457 (4.3)	0 0	45 (1.4)	414 (6.3)	0 0	17 (1.1)	403 (5.4)	0 0
Serbia	38 (1.2)	503 (3.7)	-3 (1.8)	32 (1.3)	453 (4.3)	0 (1.5)	31 (1.3)	457 (4.0)	3 (1.9)
Bulgaria	36 (1.6)	505 (6.7)	--	42 (1.3)	459 (6.7)	--	22 (1.2)	448 (7.4)	--
Ukraine	32 (1.3)	521 (3.5)	0 0	41 (1.0)	476 (3.5)	0 0	27 (1.2)	471 (3.8)	0 0
Hungary	32 (1.0)	565 (3.6)	-2 (1.6)	38 (0.9)	524 (4.0)	3 (1.2) ▲	30 (1.2)	532 (2.8)	-1 (1.7)
Armenia	31 (0.9)	500 (5.9)	-5 (1.6) ▼	49 (0.9)	485 (6.4)	-1 (1.5)	20 (1.0)	482 (5.9)	6 (1.2) ▲
Romania	29 (1.2)	488 (4.8)	3 (1.7)	48 (1.4)	449 (4.6)	-5 (1.8) ▼	24 (1.0)	466 (4.0)	3 (1.4)
Indonesia	--	--	--	--	--	--	--	--	--
‡ Morocco	40 (1.5)	430 (4.9)	--	50 (1.3)	390 (3.7)	--	11 (0.6)	369 (6.6)	--
International Avg.	41 (0.3)	506 (0.9)		40 (0.2)	465 (1.0)		19 (0.2)	462 (1.2)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Physics									
Country	High SCS			Medium SCS			Low SCS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	48 (1.0)	421 (2.2)	0 0	46 (1.1)	400 (2.7)	0 0	6 (0.3)	399 (4.8)	0 0
Georgia	48 (1.4)	452 (4.3)	0 0	41 (1.2)	408 (6.0)	0 0	11 (0.7)	407 (6.5)	0 0
Bosnia and Herzegovina	48 (1.1)	489 (3.1)	0 0	34 (0.9)	449 (3.5)	0 0	19 (0.8)	446 (5.0)	0 0
Cyprus	47 (0.9)	489 (2.5)	4 (1.2) ▲	38 (0.8)	422 (2.3)	-4 (1.1) ▼	15 (0.6)	419 (4.6)	0 (0.9)
Russian Federation	46 (1.2)	558 (3.7)	-4 (1.9) ▼	37 (0.9)	515 (4.3)	2 (1.3)	17 (0.9)	490 (5.2)	2 (1.3)
Syrian Arab Republic	46 (1.0)	472 (3.1)	0 0	47 (0.8)	442 (2.9)	0 0	7 (0.4)	447 (6.6)	0 0
Sweden	45 (1.0)	543 (2.7)	-2 (1.6)	43 (0.9)	496 (3.5)	3 (1.3) ▲	13 (0.7)	481 (4.5)	-1 (1.1)
Lebanon	44 (1.4)	452 (5.7)	0 (1.9)	47 (1.2)	390 (6.2)	-2 (1.6)	9 (0.7)	397 (10.7)	2 (0.9) ▲
Armenia	43 (1.2)	504 (6.9)	-5 (1.8) ▼	44 (1.1)	483 (6.7)	-1 (1.7)	13 (0.6)	470 (7.8)	6 (0.8) ▲
Serbia	43 (1.3)	502 (3.5)	-7 (1.9) ▼	34 (1.0)	453 (4.0)	2 (1.4)	23 (1.1)	451 (4.6)	5 (1.5) ▲
Bulgaria <sup>r</sup>	42 (1.6)	496 (6.7)	--	45 (1.4)	459 (6.6)	--	14 (1.1)	453 (10.7)	--
Czech Republic	41 (1.4)	561 (2.8)	0 0	34 (0.9)	530 (2.4)	0 0	25 (1.1)	516 (2.7)	0 0
Hungary	40 (1.4)	572 (3.6)	-6 (1.8) ▼	37 (0.9)	521 (3.5)	1 (1.3)	24 (1.2)	514 (3.8)	5 (1.5) ▲
Lithuania	39 (1.0)	548 (3.6)	3 (1.6)	40 (0.8)	500 (3.1)	-2 (1.2)	21 (1.0)	502 (3.7)	-1 (1.4)
Ukraine	36 (1.3)	524 (3.0)	0 0	43 (0.9)	473 (3.8)	0 0	21 (1.1)	466 (3.5)	0 0
Malta	33 (0.6)	509 (2.9)	0 0	38 (0.8)	436 (3.0)	0 0	29 (0.6)	430 (2.6)	0 0
Slovenia	29 (1.2)	574 (3.1)	-4 (1.6) ▼	41 (0.9)	527 (2.9)	-3 (1.4)	30 (1.0)	519 (3.2)	7 (1.4) ▲
Indonesia	29 (1.1)	422 (4.6)	2 (1.6)	60 (0.9)	427 (3.6)	2 (1.2)	11 (0.7)	451 (4.8)	-4 (1.1) ▼
Romania	27 (1.1)	484 (4.4)	3 (1.4) ▲	51 (1.1)	452 (4.9)	-5 (1.5) ▼	22 (1.0)	469 (4.0)	2 (1.3)
‡ Morocco	43 (1.8)	429 (4.2)	--	49 (1.5)	387 (3.4)	--	8 (0.8)	380 (7.9)	--
International Avg.	41 (0.3)	500 (0.9)		42 (0.2)	458 (0.9)		17 (0.2)	455 (1.3)	

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

Among countries teaching eighth grade science as separate subjects, student self-confidence was highest in biology and earth science (57% and 54% of students at the high level of the index, on average) and lower in chemistry and physics (41% of students at the high level in both). In all four subjects, however, average science achievement was higher among students at the high level of the index than among students at the medium and low levels.

As shown in Exhibit 4.11, there was little difference between girls and boys at the fourth grade in self-confidence in learning science. On average across countries, the percentage of girls and boys at each level of the self-confidence index was similar, although there was a slight difference favoring girls at the high level and slightly more boys at the low level. Across the countries, there were 9 countries with a difference in favor of girls at the high index level and 6 countries and one benchmarking participant with a difference in favor of boys. At the medium level, there was a greater percentage of girls than boys in 7 countries and a greater percentage of boys in 3 countries. Boys were more strongly represented at the low level of the self-confidence index, however, with higher percentages of boys in 10 countries and of girls in only 5 countries.

At the eighth grade, among countries teaching science as a single subject, boys had higher self-confidence in learning science than girls. On average across countries, 50 percent of boys were at the high level of the self-confidence index, compared to 47 percent of girls, while 15 percent of girls were at the low level, compared to 11 percent of boys. At the high level of the index, there were higher percentages of boys than girls in 11 countries and 2 benchmarking entities, but higher percentages of girls in just 4 countries. At the low level, the pattern was reversed, with higher percentages of girls in 12 countries and 4 benchmarking entities, and higher percentages of boys in just 2 countries.

Although eighth grade boys had higher self-confidence in learning science than eighth grade girls, on average, in the countries where science is taught as a single subject, the situation is more complicated in countries

where the sciences are taught as separate subjects. Especially in biology, where there was a greater percentage of girls than boys at the high index level in 15 of the 20 countries, but also in earth science and chemistry, there was a greater percentage of girls than boys at the high level of the self-confidence index. Only in physics was there a greater percentage of boys than girls, on average across the countries, at the high level of the index, and a greater percentage of girls than boys at the low index level.

**Exhibit 4.11 Index of Students' Self-Confidence in Learning Science (SCS)  
by Gender**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	High SCS Percent of Students		Medium SCS Percent of Students		Low SCS Percent of Students	
	Girls	Boys	Girls	Boys	Girls	Boys
Algeria	53 (1.6) ▲	49 (2.0)	42 (1.6)	43 (1.7)	5 (0.5)	8 (0.8) ▲
Armenia	r 60 (1.9)	57 (2.2)	29 (1.6)	34 (1.9) ▲	11 (1.0)	9 (1.1)
Australia	64 (1.7)	62 (1.4)	28 (1.4)	28 (1.2)	8 (0.9)	10 (1.0) ▲
Austria	78 (1.1)	80 (1.2)	16 (1.0)	16 (1.0)	5 (0.6)	5 (0.5)
Chinese Taipei	54 (1.6)	61 (1.4) ▲	35 (1.3) ▲	31 (1.0)	11 (0.8) ▲	8 (0.9)
Colombia	58 (1.8)	58 (1.6)	37 (1.7)	37 (1.6)	5 (0.8)	5 (0.7)
Czech Republic	59 (1.6) ▲	54 (1.5)	29 (1.2)	31 (1.3)	12 (0.8)	15 (0.9) ▲
Denmark	66 (1.7)	69 (1.7)	26 (1.3)	25 (1.4)	8 (0.9)	5 (0.7)
El Salvador	42 (1.6)	47 (1.6) ▲	51 (1.4) ▲	47 (1.5)	6 (0.7)	6 (0.7)
England	53 (1.5)	57 (1.2) ▲	33 (1.1) ▲	29 (1.0)	14 (1.0)	14 (1.0)
Georgia	66 (1.7)	64 (1.6)	27 (1.3)	30 (1.5)	7 (1.0)	6 (0.7)
Germany	76 (1.1)	77 (1.1)	18 (0.8)	18 (0.9)	6 (0.6) ▲	5 (0.4)
Hong Kong SAR	52 (1.7)	51 (1.6)	38 (1.4)	37 (1.4)	10 (0.9)	11 (0.9)
Hungary	65 (1.7)	64 (1.3)	26 (1.4)	26 (1.0)	10 (0.8)	10 (0.8)
Iran, Islamic Rep. of	76 (1.9)	72 (1.8)	20 (1.8)	22 (1.6)	4 (0.8)	5 (0.8)
Italy	69 (1.2)	69 (1.1)	26 (1.1)	25 (0.9)	5 (0.5)	6 (0.6)
Japan	49 (1.6)	58 (1.6) ▲	38 (1.4) ▲	32 (1.3)	13 (0.9) ▲	10 (0.8)
Kazakhstan	73 (2.2) ▲	69 (1.9)	21 (1.7)	24 (1.6)	6 (1.0)	7 (1.1)
Kuwait	68 (1.7) ▲	61 (2.3)	28 (1.6)	34 (2.2) ▲	4 (0.6)	5 (0.7)
Latvia	60 (1.6) ▲	55 (1.8)	31 (1.5)	33 (1.4)	10 (1.0)	13 (1.1) ▲
Lithuania	73 (1.0) ▲	67 (1.5)	24 (1.0)	26 (1.3)	3 (0.5)	6 (0.8) ▲
Morocco	50 (1.8)	49 (2.0)	43 (1.8)	42 (1.9)	7 (0.7)	9 (1.5)
Netherlands	66 (1.6)	68 (1.4)	26 (1.5)	24 (1.3)	8 (0.8)	8 (0.8)
New Zealand	50 (1.3)	51 (1.4)	38 (1.2)	37 (1.3)	12 (0.7)	12 (0.7)
Norway	68 (1.7)	66 (1.6)	26 (1.5)	25 (1.2)	6 (0.7)	9 (0.8) ▲
Qatar	r 65 (0.8) ▲	58 (0.9)	30 (0.8)	35 (1.0) ▲	5 (0.4)	7 (0.4) ▲
Russian Federation	66 (1.8) ▲	61 (1.4)	26 (1.6)	28 (1.4)	8 (0.7)	11 (1.2) ▲
Scotland	61 (1.6)	63 (1.4)	28 (1.4) ▲	25 (1.3)	10 (1.1)	12 (0.8)
Singapore	36 (1.1)	47 (1.3) ▲	40 (0.9) ▲	35 (1.3)	24 (0.9) ▲	19 (1.0)
Slovak Republic	69 (1.5)	69 (1.4)	24 (1.3)	23 (1.2)	7 (0.7)	7 (0.6)
Slovenia	66 (1.2)	65 (1.4)	28 (1.1)	28 (1.2)	6 (0.7)	7 (0.7)
Sweden	77 (1.1)	75 (1.3)	19 (0.9)	20 (1.0)	4 (0.5)	5 (0.6)
Tunisia	61 (2.0) ▲	55 (1.7)	35 (1.8)	38 (1.6)	4 (0.7)	6 (0.8) ▲
Ukraine	59 (1.6)	56 (1.5)	32 (1.4)	34 (1.3)	8 (0.8)	10 (0.8)
United States	68 (0.9)	71 (1.0) ▲	23 (0.7) ▲	21 (0.7)	9 (0.5) ▲	8 (0.6)
Yemen	r 48 (2.6)	44 (2.1)	44 (2.4)	45 (1.8)	8 (0.9)	11 (0.9) ▲
International Avg.	62 (0.3) ▲	61 (0.3)	30 (0.2)	30 (0.2)	8 (0.1)	9 (0.1) ▲
<b>Benchmarking Participants</b>						
Alberta, Canada	71 (1.3)	72 (1.4)	23 (1.2)	21 (1.0)	6 (0.7)	7 (0.7)
British Columbia, Canada	68 (1.3)	69 (1.3)	25 (1.2)	24 (1.0)	7 (0.9)	6 (0.7)
Dubai, UAE	r 70 (2.0)	69 (1.7)	25 (1.6)	24 (1.2)	5 (0.7)	7 (0.8)
Massachusetts, US	73 (1.9)	78 (1.7) ▲	20 (1.6)	17 (1.4)	7 (0.9)	5 (0.8)
Minnesota, US	76 (2.4)	75 (2.2)	19 (1.8)	20 (2.0)	5 (0.9)	6 (1.2)
Ontario, Canada	65 (1.7)	68 (1.6)	27 (1.5)	24 (1.6)	8 (1.0)	8 (0.9)
Quebec, Canada	73 (1.4)	71 (1.4)	20 (1.2)	22 (1.2)	7 (0.7)	7 (0.8)

▲ Percent significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on students' responses to four statements about science: 1) I usually do well in science; 2) Science is harder for me than for many of my classmates (Reversed); 3) I am just not good at science (Reversed); 4) I learn things quickly in science. Average is computed across the four items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a little or a lot on average across the four

statements are assigned to the high level. Students disagreeing a little or a lot on average are assigned to the low level. All other students are assigned to the middle level.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.



**Exhibit 4.11 Index of Students' Self-Confidence in Learning Science (SCS) by Gender (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**General/Integrated Science**

Country	High SCS Percent of Students		Medium SCS Percent of Students		Low SCS Percent of Students	
	Girls	Boys	Girls	Boys	Girls	Boys
Australia	36 (1.5)	46 (1.6) ▲	40 (1.4)	38 (1.1)	24 (1.2) ▲	15 (1.1)
Bahrain	62 (1.2) ▲	54 (1.3)	30 (1.1)	39 (1.3) ▲	8 (0.4)	7 (0.7)
Botswana	48 (1.3)	51 (1.3)	42 (1.1)	41 (1.2)	10 (0.7)	8 (0.6)
Chinese Taipei	16 (1.1)	30 (1.3) ▲	32 (1.2)	39 (1.1) ▲	51 (1.4) ▲	31 (1.4)
Colombia	61 (1.6)	62 (1.5)	34 (1.5)	33 (1.4)	4 (0.5)	5 (0.6)
Egypt	59 (1.9)	60 (1.7)	36 (1.8)	35 (1.6)	5 (0.6)	5 (0.5)
El Salvador	44 (1.6)	45 (1.7)	51 (1.5)	51 (1.6)	5 (0.8)	4 (0.7)
England	46 (1.7)	61 (1.8) ▲	35 (1.3) ▲	28 (1.4)	19 (1.1) ▲	11 (1.0)
Ghana	49 (1.5)	58 (1.8) ▲	45 (1.4) ▲	37 (1.6)	6 (0.7)	5 (0.5)
Hong Kong SAR	28 (1.4)	38 (1.5) ▲	50 (1.4)	47 (1.2)	22 (1.3) ▲	15 (1.0)
Iran, Islamic Rep. of	61 (1.9)	56 (2.0)	34 (1.7)	37 (1.7)	6 (0.7)	8 (0.7) ▲
Israel	56 (1.8)	57 (1.8)	33 (1.5)	33 (1.5)	11 (0.9)	10 (0.9)
Italy	51 (1.5)	55 (1.5)	34 (1.2)	31 (1.2)	15 (1.1)	14 (1.1)
Japan	15 (0.9)	25 (1.0) ▲	42 (1.3)	47 (1.3) ▲	44 (1.6) ▲	28 (1.3)
Jordan	67 (1.9)	62 (2.2)	29 (1.6)	31 (1.6)	4 (0.5)	7 (1.1) ▲
Korea, Rep. of	18 (1.0)	30 (1.3) ▲	41 (1.2)	39 (1.2)	41 (1.3) ▲	31 (1.2)
Kuwait	51 (1.2) ▲	46 (1.4)	39 (1.1)	45 (1.2) ▲	10 (0.6)	9 (0.7)
Malaysia	25 (1.5)	27 (1.6)	51 (1.3)	53 (1.6)	24 (1.2) ▲	19 (1.0)
Norway	52 (1.5)	62 (1.3) ▲	34 (1.3) ▲	29 (1.1)	14 (1.0) ▲	9 (0.7)
Oman	52 (1.8)	52 (1.4)	44 (1.6)	44 (1.3)	4 (0.4)	4 (0.4)
Palestinian Nat'l Auth.	54 (1.9)	51 (1.7)	39 (1.6)	43 (1.5)	6 (0.7)	6 (0.6)
Qatar	56 (0.7) ▲	49 (0.9)	37 (0.8)	43 (0.9) ▲	7 (0.4)	8 (0.5)
Saudi Arabia	61 (1.7)	57 (1.9)	34 (1.6)	37 (1.7)	5 (0.8)	6 (0.7)
Scotland	47 (1.7)	57 (1.6) ▲	33 (1.4)	30 (1.3)	20 (1.4) ▲	13 (1.0)
Singapore	34 (1.2)	47 (1.2) ▲	39 (1.0)	38 (1.2)	27 (1.0) ▲	16 (0.8)
Thailand	29 (1.4)	31 (1.4)	58 (1.2)	61 (1.3) ▲	14 (1.1) ▲	9 (0.8)
Tunisia	70 (1.2)	70 (1.3)	26 (1.1)	26 (1.2)	4 (0.4)	5 (0.6)
Turkey	55 (1.7) ▲	48 (1.4)	35 (1.4)	40 (1.3) ▲	10 (1.0)	12 (0.8)
United States	52 (1.2)	60 (1.3) ▲	31 (1.0) ▲	28 (0.9)	17 (0.9) ▲	12 (0.8)
International Avg.	47 (0.3)	50 (0.3) ▲	38 (0.2)	39 (0.3)	15 (0.2) ▲	11 (0.2)
<b>Benchmarking Participants</b>						
Basque Country, Spain	48 (2.1)	51 (2.2)	32 (1.4)	33 (1.6)	20 (1.5) ▲	16 (1.5)
British Columbia, Canada	52 (1.5)	56 (1.8)	32 (1.1)	31 (1.1)	16 (1.2)	13 (1.0)
Dubai, UAE	58 (2.2)	55 (1.9)	34 (1.8)	37 (1.8)	7 (1.0)	8 (0.7)
Massachusetts, US	51 (3.4)	65 (2.6) ▲	30 (1.8) ▲	26 (1.9)	19 (2.3) ▲	9 (1.3)
Minnesota, US	46 (3.2)	55 (3.0) ▲	32 (1.6)	32 (2.2)	23 (2.6) ▲	13 (2.2)
Ontario, Canada	49 (1.7)	53 (1.8)	33 (1.0)	34 (1.6)	18 (1.6) ▲	14 (1.1)
Quebec, Canada	49 (1.7)	50 (1.9)	34 (1.2)	32 (1.2)	18 (1.3)	18 (1.3)

▲ Percent significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on students' responses to four statements about science: 1) I usually do well in science; 2) Science is more difficult for me than for many of my classmates (Reversed); 3) Science is not one of my strengths (Reversed); 4) I learn things quickly in science. Average is computed across the four items based on a 4-point scale: 1. Agree a lot; 2. Agree a little; 3. Disagree a little; 4. Disagree a lot. Students agreeing a little or a lot on average across the four statements are assigned to the high level. Students disagreeing a little or a lot on average are assigned to the low level. All other students are assigned to the middle level.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
A dash (-) indicates comparable data are not available.  
An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

**Exhibit 4.11 Index of Students' Self-Confidence in Learning Science (SCS)  
by Gender (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

**Biology**

Country	High SCS Percent of Students		Medium SCS Percent of Students		Low SCS Percent of Students	
	Girls	Boys	Girls	Boys	Girls	Boys
Algeria	54 (1.2)	52 (1.4)	39 (1.1)	40 (1.2)	7 (0.6)	8 (0.6)
Armenia	56 (1.5) ▲	45 (1.6)	34 (1.6)	42 (1.5) ▲	10 (0.9)	13 (1.0) ▲
Bosnia and Herzegovina	80 (1.3) ▲	68 (1.6)	14 (1.0)	22 (1.0) ▲	6 (0.7)	10 (1.0) ▲
Bulgaria	62 (2.0) ▲	56 (1.8)	29 (1.6)	35 (1.7) ▲	9 (1.2)	9 (1.0)
Cyprus	x x	x x	x x	x x	x x	x x
Czech Republic	68 (1.6) ▲	61 (1.7)	25 (1.2)	28 (1.3) ▲	7 (0.8)	10 (0.9) ▲
Georgia	68 (2.0) ▲	53 (1.7)	27 (2.0)	38 (1.6) ▲	5 (0.6)	9 (0.9) ▲
Hungary	64 (1.8) ▲	54 (1.9)	27 (1.4)	33 (1.4) ▲	9 (0.9)	13 (1.1) ▲
Indonesia	41 (1.4)	41 (1.4)	54 (1.2)	53 (1.3)	5 (0.6)	6 (0.6)
Lebanon	52 (1.7) ▲	45 (1.7)	40 (1.6)	45 (1.8) ▲	8 (0.7)	10 (1.1) ▲
Lithuania	66 (1.6) ▲	59 (1.7)	27 (1.3)	33 (1.7) ▲	7 (0.7)	8 (0.7)
Malta	49 (1.6) r	54 (2.0) ▲	34 (1.6)	31 (1.9)	17 (1.4)	15 (1.3)
Romania	54 (1.9) ▲	45 (1.3)	36 (1.4)	44 (1.5) ▲	10 (1.1)	11 (0.9)
Russian Federation	67 (1.6) ▲	53 (1.5)	25 (1.2)	35 (1.2) ▲	8 (0.9)	12 (1.1) ▲
Serbia	76 (1.3) ▲	62 (1.7)	16 (1.0)	28 (1.7) ▲	7 (0.7)	10 (0.9) ▲
Slovenia	60 (1.6) ▲	51 (1.5)	31 (1.2)	36 (1.2) ▲	10 (1.0)	13 (1.1) ▲
Sweden	60 (1.3) ▲	54 (1.2)	32 (1.1)	38 (1.0) ▲	7 (0.6)	7 (0.6)
Syrian Arab Republic	65 (1.6) ▲	58 (1.4)	30 (1.4)	35 (1.3) ▲	5 (0.5)	6 (0.6) ▲
Ukraine	59 (1.8) ▲	47 (1.8)	31 (1.5)	40 (1.8) ▲	10 (0.8)	13 (1.0) ▲
‡ Morocco	49 (1.5)	47 (1.7)	42 (1.7)	44 (1.5)	9 (0.9)	9 (0.9)
International Avg.	61 (0.4) ▲	53 (0.4)	31 (0.3)	37 (0.3) ▲	8 (0.2)	10 (0.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Earth Science**

Country	High SCS Percent of Students		Medium SCS Percent of Students		Low SCS Percent of Students	
	Girls	Boys	Girls	Boys	Girls	Boys
Algeria	36 (2.0) r	39 (2.2)	52 (2.0)	51 (1.9)	12 (1.1)	10 (1.1)
Armenia	47 (1.8) r	42 (1.4) ▲	39 (1.4)	45 (1.4) ▲	14 (1.3)	13 (1.1)
Bosnia and Herzegovina	76 (1.4) ▲	68 (1.6)	17 (1.0)	23 (1.2) ▲	7 (0.8)	9 (0.9)
Bulgaria	52 (2.3) r	53 (1.5)	36 (2.1)	37 (1.4)	13 (1.2) ▲	10 (1.1)
Cyprus	59 (1.2)	58 (1.2)	30 (1.0)	33 (1.1)	11 (0.8)	9 (0.7) ▲
Czech Republic	56 (1.4)	62 (1.5) ▲	30 (0.9)	28 (1.3)	14 (0.9) ▲	10 (0.8)
Georgia	57 (1.8) r	44 (2.0)	34 (1.9)	47 (2.0) ▲	9 (0.8)	9 (1.1)
Hungary	45 (1.9)	49 (1.7)	35 (1.6)	34 (1.5)	20 (1.3)	17 (1.0)
Indonesia	--	--	--	--	--	--
Lebanon	--	--	--	--	--	--
Lithuania	66 (1.3) ▲	61 (1.5)	26 (1.2)	32 (1.3) ▲	8 (0.8)	7 (0.7)
Malta	45 (1.1)	54 (1.0) ▲	36 (1.1)	34 (1.1)	19 (0.8) ▲	12 (0.7)
Romania	52 (2.0) ▲	47 (1.8)	35 (1.5)	40 (1.4) ▲	13 (1.3)	14 (1.1)
Russian Federation	61 (1.2) ▲	53 (1.7)	30 (1.0)	36 (1.5) ▲	9 (0.8)	12 (0.9) ▲
Serbia	70 (1.6) ▲	63 (1.5)	20 (1.2)	27 (1.3) ▲	10 (1.0)	10 (1.0)
Slovenia	55 (1.8)	56 (1.9)	32 (1.2)	35 (1.6)	14 (1.1) ▲	9 (0.8)
Sweden	58 (1.4)	62 (1.3) ▲	33 (1.3)	33 (1.2)	9 (0.7) ▲	5 (0.5)
Syrian Arab Republic	58 (1.4)	55 (1.5)	37 (1.3)	40 (1.4) ▲	6 (0.7)	5 (0.6)
Ukraine	54 (2.1) ▲	46 (1.5)	34 (1.6)	40 (1.2) ▲	12 (0.9)	14 (1.0)
‡ Morocco	34 (1.6)	36 (1.7)	51 (1.7)	53 (1.8)	15 (1.2) ▲	11 (1.3)
International Avg.	54 (0.4) ▲	53 (0.4)	34 (0.3)	37 (0.3) ▲	12 (0.2) ▲	10 (0.2)

▲ Percent significantly higher than other gender

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

**Exhibit 4.11 Index of Students' Self-Confidence in Learning Science (SCS) by Gender (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Chemistry							
Country	High SCS Percent of Students		Medium SCS Percent of Students		Low SCS Percent of Students		
	Girls	Boys	Girls	Boys	Girls	Boys	
Algeria	40 (1.6)	42 (1.4)	50 (1.5)	50 (1.4)	10 (0.9)	8 (0.7)	
Armenia	r 35 (1.3) ▲	27 (1.4)	45 (1.2)	52 (1.3) ▲	20 (1.2)	21 (1.2)	
Bosnia and Herzegovina	56 (1.5) ▲	45 (1.6)	27 (1.0)	34 (1.1) ▲	17 (1.3)	21 (1.3)	▲
Bulgaria	r 38 (2.2)	35 (1.9)	38 (1.8)	45 (2.0) ▲	24 (1.8)	20 (1.4)	
Cyprus	50 (1.2) ▲	45 (0.9)	32 (1.0)	38 (0.9) ▲	18 (0.9)	17 (0.8)	
Czech Republic	51 (1.8)	50 (1.6)	29 (1.2)	32 (1.3)	20 (1.3)	18 (1.0)	
Georgia	42 (1.8) ▲	33 (1.9)	41 (1.9)	49 (1.6) ▲	17 (1.3)	18 (1.4)	
Hungary	30 (1.4)	34 (1.5) ▲	38 (1.2)	39 (1.2)	32 (1.4) ▲	28 (1.4)	
Indonesia	--	--	--	--	--	--	
Lebanon	47 (2.2)	48 (1.3)	44 (2.0)	42 (1.2)	9 (0.8)	9 (0.8)	
Lithuania	44 (1.8) ▲	41 (1.5)	35 (1.4)	40 (1.1) ▲	20 (1.3)	19 (1.2)	
Malta	s 51 (2.2)	53 (1.7)	33 (2.2)	30 (1.6)	17 (1.6)	17 (1.4)	
Romania	30 (1.7)	27 (1.5)	47 (1.5)	49 (2.0)	23 (1.4)	24 (1.3)	
Russian Federation	42 (1.4) ▲	34 (1.4)	33 (1.5)	39 (1.2) ▲	25 (1.7)	27 (1.3)	
Serbia	42 (1.5) ▲	33 (1.4)	28 (1.5)	36 (1.3) ▲	30 (1.5)	31 (1.5)	
Slovenia	50 (1.6)	47 (1.4)	34 (1.3)	36 (1.3)	16 (1.2)	17 (1.1)	
Sweden	43 (1.4)	50 (1.2) ▲	40 (1.2)	41 (1.2)	16 (1.1) ▲	9 (0.7)	
Syrian Arab Republic	45 (1.3)	43 (1.3)	45 (1.1)	49 (1.3)	9 (0.8)	8 (0.7)	
Ukraine	35 (1.6) ▲	30 (1.5)	38 (1.3)	43 (1.4) ▲	27 (1.5)	27 (1.5)	
‡ Morocco	37 (1.8)	43 (1.7) ▲	50 (2.0)	49 (1.5)	13 (1.1) ▲	8 (1.0)	
International Avg.	42 (0.4) ▲	40 (0.3)	38 (0.3)	42 (0.3) ▲	19 (0.3) ▲	18 (0.3)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Physics							
Country	High SCS Percent of Students		Medium SCS Percent of Students		Low SCS Percent of Students		
	Girls	Boys	Girls	Boys	Girls	Boys	
Algeria	46 (1.3)	50 (1.5) ▲	47 (1.3)	45 (1.4)	7 (0.5) ▲	5 (0.5)	
Armenia	r 46 (1.5) ▲	40 (1.5)	42 (1.5)	46 (1.6)	12 (1.0)	14 (1.0)	
Bosnia and Herzegovina	52 (1.4) ▲	43 (1.5)	30 (1.0)	38 (1.3) ▲	18 (1.2)	19 (1.0)	
Bulgaria	r 40 (2.5)	43 (2.0)	44 (2.0)	45 (1.8)	15 (1.5)	13 (1.5)	
Cyprus	47 (1.2)	47 (1.2)	35 (1.1)	41 (1.2) ▲	18 (1.0) ▲	12 (0.7)	
Czech Republic	37 (1.7)	46 (1.6) ▲	33 (1.4)	35 (1.3)	30 (1.5) ▲	20 (1.1)	
Georgia	50 (2.1)	46 (1.9)	39 (1.9)	44 (1.6) ▲	11 (1.0)	10 (1.0)	
Hungary	35 (1.7)	44 (1.7) ▲	37 (1.3)	36 (1.3)	28 (1.7) ▲	20 (1.2)	
Indonesia	29 (1.4)	28 (1.2)	58 (1.3)	62 (1.2) ▲	13 (0.9) ▲	10 (0.8)	
Lebanon	43 (1.8)	45 (1.6)	48 (1.7)	46 (1.3)	9 (1.0)	9 (0.9)	
Lithuania	37 (1.3)	40 (1.2)	38 (1.2)	43 (1.0) ▲	25 (1.2) ▲	17 (1.1)	
Malta	29 (0.9)	36 (1.0) ▲	36 (1.1)	40 (1.1) ▲	35 (1.0) ▲	24 (0.8)	
Romania	27 (1.5)	28 (1.3)	49 (1.3)	52 (1.5)	25 (1.4) ▲	20 (1.2)	
Russian Federation	47 (1.5)	46 (1.6)	35 (1.1)	38 (1.5)	18 (1.1)	16 (1.3)	
Serbia	46 (1.4) ▲	40 (1.7)	29 (1.3)	38 (1.5) ▲	25 (1.6)	22 (1.2)	
Slovenia	24 (1.4)	35 (1.6) ▲	39 (1.2)	42 (1.3)	37 (1.3) ▲	23 (1.1)	
Sweden	39 (1.4)	50 (1.2) ▲	43 (1.1)	42 (1.1)	18 (1.1) ▲	8 (0.7)	
Syrian Arab Republic	48 (1.4) ▲	44 (1.4)	46 (1.2)	49 (1.3)	6 (0.6)	7 (0.6)	
Ukraine	33 (1.5)	40 (1.6) ▲	43 (1.1)	43 (1.3)	24 (1.4) ▲	18 (1.2)	
‡ Morocco	39 (2.2)	48 (2.3) ▲	52 (1.9) ▲	45 (1.9)	9 (1.0) ▲	7 (0.9)	
International Avg.	40 (0.4)	42 (0.3) ▲	41 (0.3)	44 (0.3) ▲	19 (0.3) ▲	15 (0.2)	

▲ Percent significantly higher than other gender

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).



# Chapter 5



## *The Science Curriculum*

Chapter 5 begins by presenting information about the science subjects offered by countries through the eighth grade, and the time provided for science instruction at the fourth and eighth grades. Data are presented about the time intended for science instruction as specified in curriculum guidelines, the time teachers report that they actually spend, and changes over time. The remainder of the chapter describes the coverage of the TIMSS science topics in the intended curriculum for each country, as well as teachers' reports about the science topics actually taught to their students, also known as the implemented curriculum.

In comparing achievement across countries, it is important to consider differences in students' curricular experiences, how these differences may affect the science they have studied, and their subsequent achievement. Students' opportunities to learn the science covered by the TIMSS 2007 content and cognitive domains depends initially to some degree on that science being part of each country's guidelines and policies for science education. Thus, participants provided information about various educational policies and the curriculum topics covered in their respective curriculum guidelines (intended curriculum). Inclusion in the country's curriculum, however, does not guarantee students' opportunity to learn. Just as important is what their teachers choose to teach them. The lessons provided by the teachers ultimately determine the science students are taught.

This chapter contains information for each country about whether the TIMSS 2007 science topics were in the intended curriculum, and teachers' reports about whether the topics were taught. As might be anticipated, there is very close agreement between curriculum guidelines and teachers' reports about the topics covered. Also, there is a substantial correspondence between topics in the intended and implemented curricula in various countries and students' achievement.

### **Which Science Subjects Are Offered Up to and Including Eighth Grade?**

One of the major differences among the science curricula of the TIMSS 2007 countries is that some countries teach science as a single, general subject through the eighth grade, while others teach the sciences as separate subjects, usually beginning in the fifth, sixth, or seventh grades. Exhibit 5.1 shows how science instruction is organized in the TIMSS countries, and presents the grades at which individual science subjects are taught, for countries teaching the science subjects separately. By the eighth grade, most of the continental European countries, as well as Algeria, Indonesia, Lebanon, Mongolia, Morocco, and the Syrian Arab Republic, were teaching some or all of biology, chemistry, physics, and earth science, although not necessarily at the same time. In some cases, chemistry and physics or biology and earth science were combined. Also, in some countries, earth science topics were taught as part of geography. In the other TIMSS 2007 countries, the common practice was to integrate the sciences into a general science curriculum.

**Exhibit 5.1 Science Subjects Offered Up To and Including Eighth Grade**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Separate Science Courses Offered	Science Subjects and Grades Taught
Algeria	●	General/Integrated Science 1-5; Biology 6-8; Chemistry 6-8; Physics 6-8
Armenia	●	Geography 6-8; Chemistry 7-8; Physics 7-8; Biology 7-8
Australia	○	General/Integrated Science
Bahrain	○	General/Integrated Science
Bosnia and Herzegovina	●	Biology 5-8; Geography 5-8; Physics 7,8; Chemistry 7,8
Botswana	○	General/Integrated Science
Bulgaria	●	Geography 6-8; Biology 6-8; Chemistry 7-8; Physics 7-8
Chinese Taipei	○	General/Integrated Science
Colombia	○	General/Integrated Science
Cyprus	●	Chemistry 8; Geography 8; Physics 8
Czech Republic	●	Biology 6-8; Geography 6-8; Physics 6-8; Chemistry 8
Egypt	○	General/Integrated Science
El Salvador	○	General/Integrated Science
England	○	General/Integrated Science
Georgia	●	Biology 7,8; Chemistry 7,8; Physics 7,8
Ghana	○	General/Integrated Science
Hong Kong SAR	○	General/Integrated Science
Hungary	●	Biology 7,8; Chemistry 7,8; Geography 7,8; Physics 7,8
Indonesia	●	Biology 7,8; Earth Science 7,8; Physics 7,8
Iran, Islamic Rep. of	○	General/Integrated Science
Israel	○	General/Integrated Science
Italy	○	General/Integrated Science
Japan	○	General/Integrated Science
Jordan	○	General/Integrated Science
Korea, Rep. of	○	General/Integrated Science
Kuwait	○	General/Integrated Science
Lebanon	●	Chemistry 7,8; Life and Earth Science 7,8; Physics 7,8
Lithuania	●	Geography 6-8; Physics 7-8; Biology 7-8; Chemistry 8
Malaysia	○	General/Integrated Science
Malta	●	General/Integrated Science 1-8; Biology 9; Chemistry 9; Earth Science 1-9; Environmental Studies 9; Physics 9
Mongolia	●	Geography 7-8; Physics 7-8; Biology 7-8; Chemistry 8
Morocco	●	Life and Earth Science 7-8; Physics and Chemistry 7-8
Norway	○	General/Integrated Science
Oman	○	General/Integrated Science
Palestinian Nat'l Auth.	○	General/Integrated Science
Qatar	○	General/Integrated Science
Romania	●	Geography 4-8; Biology 5-8; Physics 6-8; Chemistry 7-8
Russian Federation	●	General/Integrated Science 1-5; Biology 6-8; Geography 6-8; Physics 7-8; Chemistry 8
Saudi Arabia	○	General/Integrated Science
Scotland	○	General/Integrated Science
Serbia	●	Nature 1-4; Biology 5-8; Geography 5-8; Physics 6-8; Chemistry 7-8
Singapore	○	General/Integrated Science
Slovenia	●	Environmental Science 1-3; Science and Technology 4,5; Biology 8; Chemistry 8; Physics 8
Sweden	●	General/Integrated Science 1-8; or Biology 1-8; Chemistry 1-8; Physics 1-8, Social Studies/Geography 1-8
Syrian Arab Republic	●	General/Integrated Science 1-6; Biology 7,8; Chemistry 7,8; Earth Science 7,8; Physics 7,8
Thailand	○	General/Integrated Science
Tunisia	○	General/Integrated Science
Turkey	○	General/Integrated Science
Ukraine	●	Geography 6-8; Biology 7-8; Physics 7-8; Chemistry 8
United States	○	General/Integrated Science
<b>Benchmarking Participants</b>		
Basque Country, Spain	○	General/Integrated Science
British Columbia, Canada	○	General/Integrated Science
Dubai, UAE	○	General/Integrated Science
Massachusetts, US	○	General/Integrated Science
Minnesota, US	○	General/Integrated Science
Ontario, Canada	○	General/Integrated Science
Quebec, Canada	○	General/Integrated Science

SOURCE: IEAs Trends in International Mathematics and Science Study (TIMSS) 2007

● Yes    ○ No

Background data provided by National Research Coordinators.

### How Much Instructional Time Is Spent on Science?

Exhibit 5.2 presents the hours per week for science instruction designated by countries in their curriculum at the fourth and eighth grades, and teachers' reports about the amount of instructional time actually provided. In each case, the total amount of instructional time is given together with the percentage of that time devoted to science. For teachers' reports, changes are provided between 2003 and 2007. At the fourth grade, most of the countries reported that the curriculum prescribed a specific amount of time for instruction in all subjects and for science instruction. There was some variation, but the countries averaged 23 hours of total instruction per week, with less than one-tenth of the time (9%) being prescribed for science instruction. On average, there was very close agreement between the curriculum guidelines and teachers' reports about the implementation. On average internationally, fourth grade teachers reported a total of 24 hours of weekly instruction, with 8 percent being devoted to science. Across countries, teachers reported a decrease (slight but statistically significant) in total instructional time in 10 countries and an increase in 2 countries and 1 benchmarking entity. The teachers reported increases in the percentage of instructional time per week devoted to science (again slight but significant statistically) in 7 countries. In 6 countries teachers reported decreases in total instructional time accompanied with increases in the percentages of time devoted to science instruction.

At the eighth grade for countries teaching general/integrated science, the average total instruction time per week was 27 hours with 12 percent being devoted to science instruction. Teachers' reports of 28 hours per week in total and 11 percent devoted to science instruction corresponded with the instructional time guidelines across the countries' curricula. In these countries, eighth grade teachers reported increases in total instructional time in 8 countries and decreases in 6 countries. They reported increases in the percentages of time devoted to science instruction in 3 countries and decreases in 7 countries. Among separate science countries at the eighth

grade, the total instructional time, on average, was similar to general science countries (28 hours vs. 27), but the percentage of instructional time devoted to science instruction was higher—24 percent (6% for each of four science subjects) compared to 12 percent. In general, teacher reports corresponded with curricular guidelines across the four science subjects.

Exhibit 5.3 presents the total instructional time in science per year at the fourth and eighth grades and changes from 2003 for each TIMSS 2007 country and benchmarking participant. At the fourth grade, those reporting that students averaged more than 100 hours of science instruction per year included Colombia (139 hours), El Salvador (135 hours), and Germany (106 hours), and the benchmarking province of Alberta (122 hours). The average internationally was 67 hours. Slovenia, Singapore, Norway, and the Russian Federation had increases in the yearly hours of science instruction, and Chinese Taipei and New Zealand had decreases. At the eighth grade among general science countries, the international average was 110 hours, and those reporting that students averaged 140 hours of science instruction or more per year included Chinese Taipei (145), Jordan (141), and Singapore (140). Instructional time for science increased since 2003 in 3 countries and decreased in 4 countries and one benchmarking participant. Among separate science countries, average instructional hours for science subjects were in the 52-63 range, giving almost 240 hours per year, on average, for countries teaching all four subjects simultaneously.

Exhibit 5.4 shows teachers' reports about how the instructional time for science is distributed across the TIMSS 2007 content areas. At the fourth grade, on average across countries, teachers reported devoting 40 percent of the science instructional time to life science, 25 percent to physical science, 24 percent to earth science, and 10 percent to other areas. At the eighth grade, on average internationally, teachers reported devoting 28 percent of the science instructional time to biology, 24 percent to chemistry, 27 percent to physics, 16 percent to earth science, and 6 percent to other areas.

### Exhibit 5.2 Weekly Intended and Implemented Instructional Time for Science with Trends

**TIMSS2007**  
 Science **4<sup>th</sup>** Grade

Country	Intended Time Prescribed in the Curriculum		Time Implemented in Schools				
	Total Hours of Instructional Time per Week	Science Instructional Time as a Percent of Total Instructional Time	Total Hours of Instructional Time per Week		Science Instructional Time as a Percent of Total Instructional Time		
			2007 Hours	Difference from 2003	2007 Percent	Difference from 2003	
Algeria	32	6	30 (0.3)	∅ ∅	r	6 (0.4)	∅ ∅
Armenia	23	10	s 27 (0.5)	-1 (0.7)	▼	9 (0.4)	--
Australia	27	8	25 (0.2)	0 (0.2)	s	5 (0.2)	0 (0.3)
Austria	21	15	21 (0.1)	∅ ∅		12 (0.1)	∅ ∅
Chinese Taipei	20	14	23 (0.4)	-1 (0.4)	▼ r	9 (0.2)	0 (0.2)
Colombia	25	np	27 (0.4)	∅ ∅	r	13 (0.4)	∅ ∅
Czech Republic	18	8	19 (0.1)	∅ ∅		5 (0.2)	∅ ∅
Denmark	20	9	r 21 (0.2)	∅ ∅	s	7 (0.1)	∅ ∅
El Salvador	19	20	24 (0.7)	∅ ∅		15 (0.5)	∅ ∅
England	24	10	r 25 (0.2)	1 (0.4)	▲	7 (0.2)	--
Georgia	23	5	r 19 (0.3)	∅ ∅	s	5 (0.5)	∅ ∅
Germany	21	18	22 (0.2)	∅ ∅	r	13 (0.2)	∅ ∅
Hong Kong SAR	23	13	r 27 (0.3)	0 (0.4)	s	7 (0.5)	-1 (0.7)
Hungary	17	9	r 20 (0.3)	-4 (0.3)	▼ s	8 (0.2)	2 (0.2) ▲
Iran, Islamic Rep. of	21	13	s 21 (0.2)	-3 (0.4)	▼	12 (0.4)	--
Italy	30	15	r 30 (0.3)	0 (0.4)	r	6 (0.1)	-1 (0.3) ▼
Japan	20	10	22 (0.2)	-5 (0.3)	▼	9 (0.1)	2 (0.2) ▲
Kazakhstan	20	8	22 (0.2)	∅ ∅		7 (0.2)	∅ ∅
Kuwait	30	10	26 (0.3)	∅ ∅	x x		∅ ∅
Latvia	17	8	20 (0.4)	-3 (0.5)	▼ r	7 (0.2)	--
Lithuania	18	4	20 (0.2)	-3 (0.3)	▼	8 (0.1)	2 (0.2) ▲
Mongolia	22	5	--	∅ ∅	--	--	∅ ∅
Morocco	28	5	r 28 (0.4)	0 (0.5)	s	5 (0.3)	--
Netherlands	np	np	r 27 (0.1)	0 (0.1)	s	3 (0.1)	0 (0.2)
New Zealand	np	np	24 (0.1)	0 (0.2)	s	5 (0.3)	-2 (0.5) ▼
Norway	19	7	23 (0.0)	0 (0.0)	r	5 (0.2)	1 (0.3) ▲
Qatar	26	8	31 (0.0)	∅ ∅	x x		∅ ∅
Russian Federation	15	5	s 19 (0.2)	-4 (0.3)	▼ s	6 (0.2)	2 (0.2) ▲
Scotland	25	5	25 (0.1)	0 (0.2)	r	5 (0.3)	--
Singapore	25	8	26 (0.0)	-5 (0.2)	▼	9 (0.1)	2 (0.1) ▲
Slovak Republic	20	10	21 (0.3)	∅ ∅		7 (0.1)	∅ ∅
Slovenia	18	13	19 (0.1)	-3 (0.2)	▼ r	12 (0.1)	3 (0.3) ▲
Sweden	np	np	24 (0.3)	∅ ∅	r	6 (0.3)	∅ ∅
Tunisia	25	8	r 29 (0.9)	0 (0.9)	s	8 (0.3)	--
Ukraine	16	4	18 (0.2)	∅ ∅		5 (0.2)	∅ ∅
United States	32	7	30 (0.2)	1 (0.3)	▲ r	8 (0.2)	0 (0.4)
Yemen	23	9	24 (0.4)	∅ ∅	r	10 (0.5)	∅ ∅
<b>International Avg.</b>	<b>23</b>	<b>9</b>	<b>24 (0.1)</b>			<b>8 (0.0)</b>	
<b>Benchmarking Participants</b>							
Alberta, Canada	25	15	27 (0.2)	∅ ∅		13 (0.4)	∅ ∅
British Columbia, Canada	24	np	24 (0.2)	∅ ∅	s	8 (0.3)	∅ ∅
Dubai, UAE	24	8	r 28 (0.0)	∅ ∅		x x	∅ ∅
Massachusetts, US	25	np	28 (0.5)	∅ ∅	r	8 (0.5)	∅ ∅
Minnesota, US	29	3	29 (0.5)	∅ ∅	r	7 (0.8)	∅ ∅
Ontario, Canada	25	np	26 (0.5)	0 (0.5)	r	9 (0.5)	-1 (0.6)
Quebec, Canada	25	4	25 (0.1)	1 (0.2)	▲ r	5 (0.2)	-1 (0.4)

▲ 2007 significantly higher  
 ▼ 2007 significantly lower

Intended instructional time provided by National Research Coordinators. Implemented instructional time for science provided by teachers, and total instructional time provided by schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

An "np" indicates not prescribed by the curriculum.

A diamond (∅) indicates the country did not participate in the assessment.

Note: For Norway, hours of intended instructional time is only an estimate and only prescribed for grades 1–7 and 8–10, not for single grades.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



**Exhibit 5.2 Weekly Intended and Implemented Instructional Time for Science with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**General/Integrated Science**

Country	Intended Time Prescribed in the Curriculum		Time Implemented in Schools				
	Total Hours of Instructional Time per Week	Science Instructional Time as a Percent of Total Instructional Time	Total Hours of Instructional Time per Week			Science Instructional Time as a Percent of Total Instructional Time	
			2007 Hours	Difference from 2003		2007 Percent	Difference from 2003
Australia	25	7	26 (0.2)	0 (0.3)	s	12 (0.1)	-1 (0.4)
Bahrain	31	13	28 (0.0)	3 (0.0)	▲ r	8 (0.3)	-6 (0.3)
Botswana	30	13	s 30 (0.6)	2 (0.8)	▲ r	13 (0.3)	--
Chinese Taipei	25	15	29 (0.3)	--		12 (0.3)	--
Colombia	30	np	31 (0.4)	◇ ◇	r	10 (0.6)	◇ ◇
Egypt	26	11	32 (0.4)	1 (0.6)	▲	7 (0.4)	--
El Salvador	19	20	23 (0.6)	◇ ◇		16 (0.4)	◇ ◇
England	25	15	s 26 (0.2)	0 (0.2)		14 (0.7)	--
Ghana	27	13	r 28 (0.4)	1 (0.6)	▲	11 (0.6)	--
Hong Kong SAR	27	13	28 (0.3)	0 (0.4)	s	10 (0.3)	-1 (0.5)
Iran, Islamic Rep. of	31	12	27 (0.2)	-2 (0.4)	▼ s	11 (0.2)	0 (0.4)
Israel	23	10	32 (0.6)	0 (0.7)	r	10 (0.4)	--
Italy	30	7	r 31 (0.4)	0 (0.5)	s	6 (0.1)	0 (0.1)
Japan	23	11	25 (0.2)	-3 (0.3)	▼ r	10 (0.2)	2 (0.2)
Jordan	26	14	28 (0.3)	3 (0.4)	▲	13 (0.2)	-1 (0.2)
Korea, Rep. of	26	12	29 (0.4)	-7 (0.4)	▼ s	11 (0.2)	3 (0.3)
Kuwait	30	10	r 26 (0.4)	◇ ◇	s	6 (0.5)	◇ ◇
Malaysia	29	11	30 (0.3)	3 (0.3)	▲	11 (0.2)	-1 (0.2)
Norway	23	10	22 (0.0)	0 (0.0)		10 (0.1)	-1 (0.3)
Oman	27	17	27 (0.4)	◇ ◇		13 (0.5)	◇ ◇
Palestinian Nat'l Auth.	20	11	r 26 (0.3)	-2 (0.3)	▼ s	10 (0.4)	-1 (0.4)
Qatar	26	8	r 28 (0.0)	◇ ◇		x x	◇ ◇
Saudi Arabia	-	7	r 27 (0.3)	--		x x	--
Scotland	28	10	s 28 (0.2)	0 (0.2)	r	10 (0.3)	--
Singapore	23	15	29 (0.0)	-5 (0.0)	▼	14 (0.2)	4 (0.3)
Sweden	np	np	26 (0.3)	-1 (0.4)	▼	--	--
Thailand	35	8	32 (0.3)	◇ ◇		10 (0.2)	◇ ◇
Tunisia	32	13	r 39 (0.7)	8 (0.8)	▲ r	5 (0.1)	--
Turkey	20	10	27 (0.9)	◇ ◇		8 (0.2)	◇ ◇
United States	29	13	31 (0.2)	2 (0.3)	▲ s	13 (0.2)	0 (0.3)
International Avg.	27	12	28 (0.1)			11 (0.1)	
<b>Benchmarking Participants</b>							
Basque Country, Spain	30	8	30 (0.2)	--		8 (0.2)	--
British Columbia, Canada	26	12	26 (0.2)	◇ ◇	s	14 (0.5)	◇ ◇
Dubai, UAE	28	11	s 29 (0.1)	◇ ◇		x x	◇ ◇
Massachusetts, US	28	np	29 (0.3)	◇ ◇		13 (0.6)	◇ ◇
Minnesota, US	29	4	30 (0.5)	◇ ◇		14 (0.6)	◇ ◇
Ontario, Canada	25	np	26 (0.2)	0 (0.3)	r	10 (0.3)	-1 (0.7)
Quebec, Canada	25	11	26 (0.2)	0 (0.3)	r	11 (0.3)	-1 (0.8)

▲ 2007 significantly higher  
▼ 2007 significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Intended instructional time provided by National Research Coordinators. Implemented instructional time for science provided by teachers, and total instructional time provided by schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

An "np" indicates not prescribed by the curriculum.

A diamond (◇) indicates the country did not participate in the assessment.

Note: Total instructional time for Thailand is only applicable to the majority of schools. For Norway, hours of intended instructional time is only an estimate and only prescribed for grades 1-7 and 8-10, not for single grades.

**Exhibit 5.2 Weekly Intended and Implemented Instructional Time for Science with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>** Grade

**Biology**

Country	Intended Time Prescribed in the Curriculum		Time Implemented in Schools			
	Total Hours of Instructional Time per Week	Biology Instructional Time as a Percent of Total Instructional Time	Total Hours of Instructional Time per Week		Biology Instructional Time as a Percent of Total Instructional Time	
			2007 Hours	Difference from 2003	2007 Percent	Difference from 2003
<sup>b</sup> Algeria	30	6	r 36 (0.5)	◊ ◊	s 6 (0.2)	◊ ◊
Armenia	27	6	r 31 (0.6)	-3 (0.7) ▼	7 (0.4)	--
Bosnia and Herzegovina	26	6	29 (0.9)	◊ ◊	r 6 (0.2)	◊ ◊
Bulgaria	32	6	23 (0.4)	--	8 (0.4)	--
Cyprus	26	--	--	--	--	--
Czech Republic	23	6	24 (0.3)	◊ ◊	r 6 (0.1)	◊ ◊
Georgia	23	4	24 (0.4)	◊ ◊	9 (0.4)	◊ ◊
Hungary	21	6	r 22 (0.3)	-7 (0.3) ▼	s 6 (0.2)	0 (0.3)
<sup>c</sup> Indonesia	32	--	r 34 (0.6)	0 (0.8)	s 10 (0.9)	3 (0.9) ▲
Lebanon	35	--	r 30 (0.3)	--	s 8 (0.4)	--
Lithuania	23	--	24 (0.3)	-3 (0.4) ▼	r 3 (0.1)	-1 (0.4) ▼
<sup>d</sup> Malta	27	11	27 (0.0)	◊ ◊	10 (0.1)	◊ ◊
Mongolia	30	2	--	◊ ◊	--	◊ ◊
Romania	24	3-7	26 (0.3)	-3 (0.5) ▼	r 5 (0.3)	1 (0.4)
Russian Federation	23	6	26 (0.3)	-1 (0.4) ▼	r 6 (0.1)	0 (0.1)
Serbia	24	7	r 23 (0.3)	-1 (0.4)	s 7 (0.1)	0 (0.2)
Slovenia	23	5	23 (0.1)	-5 (0.2) ▼	r 6 (0.1)	0 (0.1)
<sup>f</sup> Syrian Arab Republic	30	7	25 (0.4)	◊ ◊	6 (0.3)	◊ ◊
Ukraine	25	--	24 (0.2)	◊ ◊	7 (0.1)	◊ ◊
<sup>e</sup> <sup>‡</sup> Morocco	28	7	37 (0.9)	--	r 6 (0.4)	--
International Avg.	28	6	27 (0.1)		7 (0.1)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Earth Science**

Country	Intended Time Prescribed in the Curriculum		Time Implemented in Schools			
	Total Hours of Instructional Time per Week	Earth Science Instructional Time as a Percent of Total Instructional Time	Total Hours of Instructional Time per Week		Earth Science Instructional Time as a Percent of Total Instructional Time	
			2007 Hours	Difference from 2003	2007 Percent	Difference from 2003
<sup>b</sup> Algeria	30	--	--	◊ ◊	--	◊ ◊
Armenia	27	6	r 31 (0.6)	-2 (0.7) ▼	6 (0.3)	--
Bosnia and Herzegovina	26	6	29 (0.9)	◊ ◊	r 5 (0.1)	◊ ◊
Bulgaria	32	6	23 (0.4)	--	7 (0.4)	--
Cyprus	26	5	r 26 (0.0)	-1 (0.1) ▼	s 6 (0.0)	0 (0.3)
Czech Republic	23	6	24 (0.3)	◊ ◊	r 6 (0.1)	◊ ◊
Georgia	23	5	24 (0.4)	◊ ◊	r 7 (0.3)	◊ ◊
Hungary	21	6	r 22 (0.3)	-7 (0.3) ▼	s 6 (0.2)	0 (0.3)
<sup>c</sup> Indonesia	32	--	--	--	--	--
Lebanon	35	--	--	--	--	--
Lithuania	23	--	24 (0.3)	-3 (0.4) ▼	r 6 (0.1)	1 (0.1) ▲
<sup>d</sup> Malta	27	3	27 (0.0)	◊ ◊	4 (0.0)	◊ ◊
Mongolia	30	5	--	◊ ◊	--	◊ ◊
Romania	24	7	26 (0.3)	-3 (0.5) ▼	r 7 (0.2)	1 (0.2) ▲
Russian Federation	23	6	26 (0.3)	-1 (0.4) ▼	r 6 (0.1)	0 (0.1)
Serbia	24	7	r 23 (0.3)	-1 (0.4)	s 7 (0.1)	0 (0.3)
Slovenia	23	--	--	--	--	--
<sup>f</sup> Syrian Arab Republic	30	--	--	◊ ◊	--	◊ ◊
Ukraine	25	--	24 (0.2)	◊ ◊	7 (0.1)	◊ ◊
<sup>e</sup> <sup>‡</sup> Morocco	28	--	--	--	--	--
International Avg.	28	6	25 (0.1)		6 (0.1)	

▲ 2007 significantly higher

▼ 2007 significantly lower

- <sup>a</sup> Algeria: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.
- <sup>b</sup> Indonesia: Data reported in biology and physics panels include data from integrated/general science teachers.
- <sup>c</sup> Malta: Data reported in earth science panel include data from environmental studies teachers.

- <sup>d</sup> Morocco: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.
- <sup>e</sup> Syrian Arab Republic: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.
- <sup>‡</sup> Did not satisfy guidelines for sample participation rates (see Appendix A).



**Exhibit 5.2 Weekly Intended and Implemented Instructional Time for Science with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**Chemistry**

Country	Intended Time Prescribed in the Curriculum		Time Implemented in Schools					
	Total Hours of Instructional Time per Week	Chemistry Instructional Time as a Percent of Total Instructional Time	Total Hours of Instructional Time per Week			Chemistry Instructional Time as a Percent of Total Instructional Time		
			2007 Hours	Difference from 2003		2007 Percent	Difference from 2003	
<sup>b</sup> Algeria	30	–	–	∅ ∅		–	∅ ∅	
Armenia	27	6	r	31 (0.6)	–2 (0.7)	▼	8 (0.3)	–
Bosnia and Herzegovina	26	6		29 (0.9)	∅ ∅		6 (0.2)	∅ ∅
Bulgaria	32	6		23 (0.4)	–	r	9 (0.4)	–
Cyprus	26	3	r	26 (0.0)	–1 (0.1)	▼ s	3 (0.1)	–1 (0.2)
Czech Republic	23	6		24 (0.3)	∅ ∅	r	6 (0.1)	∅ ∅
Georgia	23	4		24 (0.4)	∅ ∅	r	8 (0.5)	∅ ∅
Hungary	21	6	r	22 (0.3)	–7 (0.3)	▼ s	6 (0.1)	0 (0.2)
<sup>c</sup> Indonesia	32	–		–	–		–	–
Lebanon	35	–	r	30 (0.3)	–	s	9 (0.4)	–
Lithuania	23	–		24 (0.3)	–3 (0.4)	▼ r	6 (0.1)	0 (0.2)
<sup>d</sup> Malta	27	11		27 (0.0)	∅ ∅		9 (0.0)	∅ ∅
Mongolia	30	5		–	∅ ∅		–	∅ ∅
Romania	24	7		26 (0.3)	–3 (0.5)	▼ r	7 (0.3)	1 (0.4)
Russian Federation	23	6		26 (0.3)	–1 (0.4)	▼ r	6 (0.1)	0 (0.2)
Serbia	24	7	r	23 (0.3)	–1 (0.4)	s	7 (0.1)	–1 (0.5)
Slovenia	23	7		23 (0.1)	–5 (0.2)	▼	7 (0.1)	1 (0.2)
<sup>f</sup> Syrian Arab Republic	30	–		–	∅ ∅		–	∅ ∅
Ukraine	25	–		24 (0.2)	∅ ∅		7 (0.1)	∅ ∅
<sup>e</sup> <sup>‡</sup> Morocco	28	–		–	–		–	–
International Avg.	28	6		26 (0.1)			7 (0.1)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

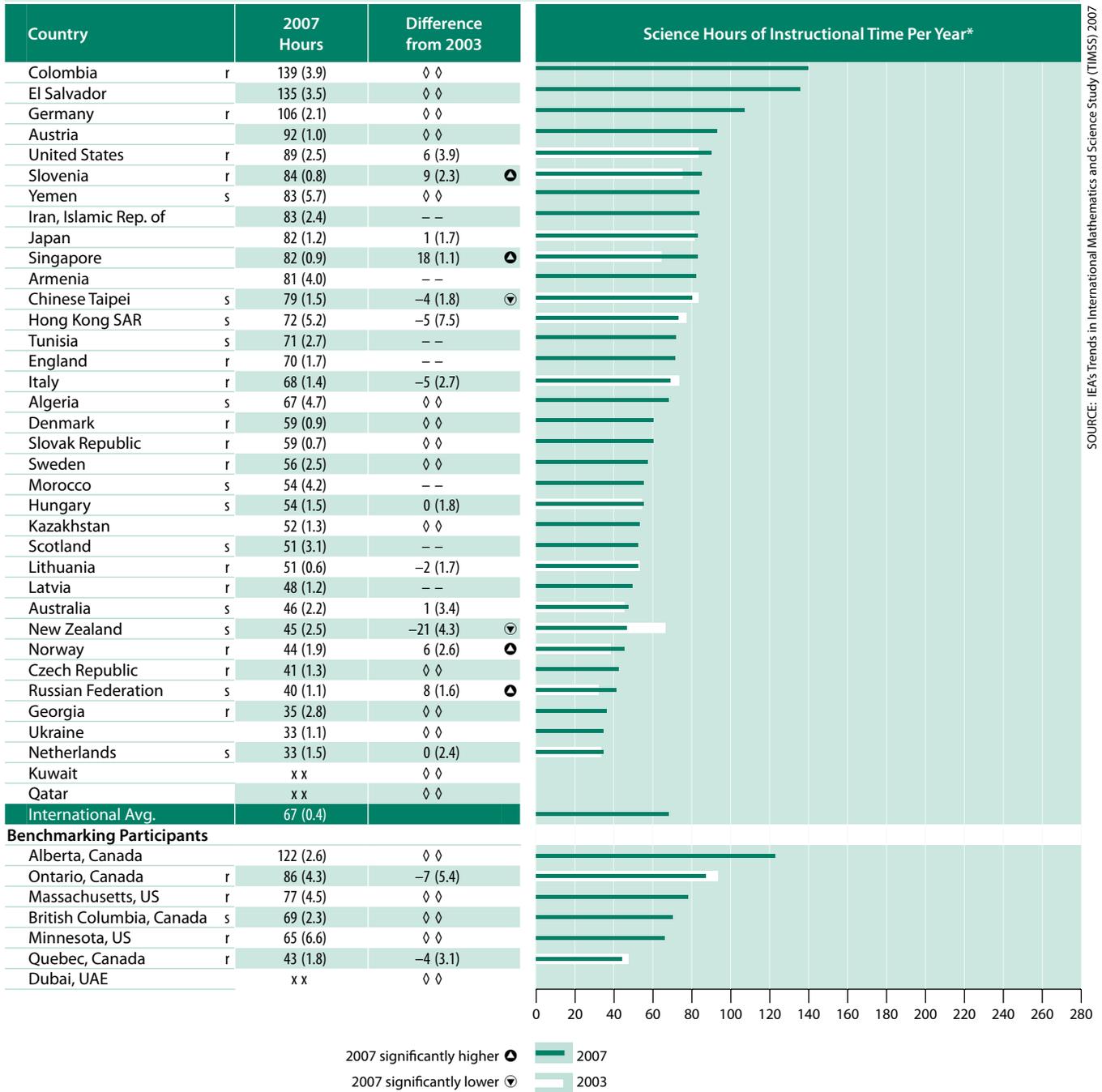
**Physics**

Country	Intended Time Prescribed in the Curriculum		Time Implemented in Schools					
	Total Hours of Instructional Time per Week	Physics Instructional Time as a Percent of Total Instructional Time	Total Hours of Instructional Time per Week			Physics Instructional Time as a Percent of Total Instructional Time		
			2007 Hours	Difference from 2003		2007 Percent	Difference from 2003	
<sup>b</sup> Algeria	30	6	r	36 (0.5)	∅ ∅	s	6 (0.3)	∅ ∅
Armenia	27	6	r	31 (0.6)	–2 (0.7)	▼	6 (0.2)	–
Bosnia and Herzegovina	26	6		29 (0.9)	∅ ∅	r	6 (0.2)	∅ ∅
Bulgaria	32	6		23 (0.4)	–		7 (0.3)	–
Cyprus	26	5	r	26 (0.0)	–1 (0.1)	▼ s	6 (0.1)	0 (0.1)
Czech Republic	23	6		24 (0.3)	∅ ∅	r	6 (0.1)	∅ ∅
Georgia	23	5		24 (0.4)	∅ ∅		8 (0.5)	∅ ∅
Hungary	21	6	r	22 (0.3)	–7 (0.3)	▼ s	5 (0.2)	0 (0.3)
<sup>c</sup> Indonesia	32	–	r	34 (0.6)	0 (0.9)	s	7 (0.4)	0 (0.4)
Lebanon	35	–	r	30 (0.3)	–	s	9 (0.4)	–
Lithuania	23	–		24 (0.3)	–3 (0.4)	▼ r	6 (0.1)	1 (0.1)
<sup>d</sup> Malta	27	11		27 (0.0)	∅ ∅		11 (0.0)	∅ ∅
Mongolia	30	5		–	∅ ∅		–	∅ ∅
Romania	24	7		26 (0.3)	–3 (0.5)	▼ r	8 (0.3)	1 (0.4)
Russian Federation	23	6		26 (0.3)	–1 (0.4)	▼ r	6 (0.1)	0 (0.1)
Serbia	24	7	r	23 (0.3)	–1 (0.4)	s	7 (0.1)	0 (0.3)
Slovenia	23	7		23 (0.1)	–5 (0.2)	▼ r	7 (0.1)	1 (0.1)
<sup>f</sup> Syrian Arab Republic	30	7		24 (0.4)	∅ ∅		8 (0.4)	∅ ∅
Ukraine	25	–		24 (0.2)	∅ ∅		6 (0.1)	∅ ∅
<sup>e</sup> <sup>‡</sup> Morocco	28	7		37 (1.0)	–	r	6 (0.3)	–
International Avg.	28	6		27 (0.1)			7 (0.1)	

▲ 2007 significantly higher  
▼ 2007 significantly lower

**Exhibit 5.3 Yearly Hours of Implemented Instructional Time for Science with Trends**

**TIMSS2007**  
Science **4<sup>th</sup>** Grade



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Implemented instructional time for science provided by teachers, and total instructional time provided by schools.

\* The yearly hours of instructional time for science are computed by multiplying the number of hours per week that teachers teach science by the number of instructional weeks per year. The number of instructional weeks per year was computed by dividing the number of days per year a school is open for instruction by the number of instructional days in a calendar week.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

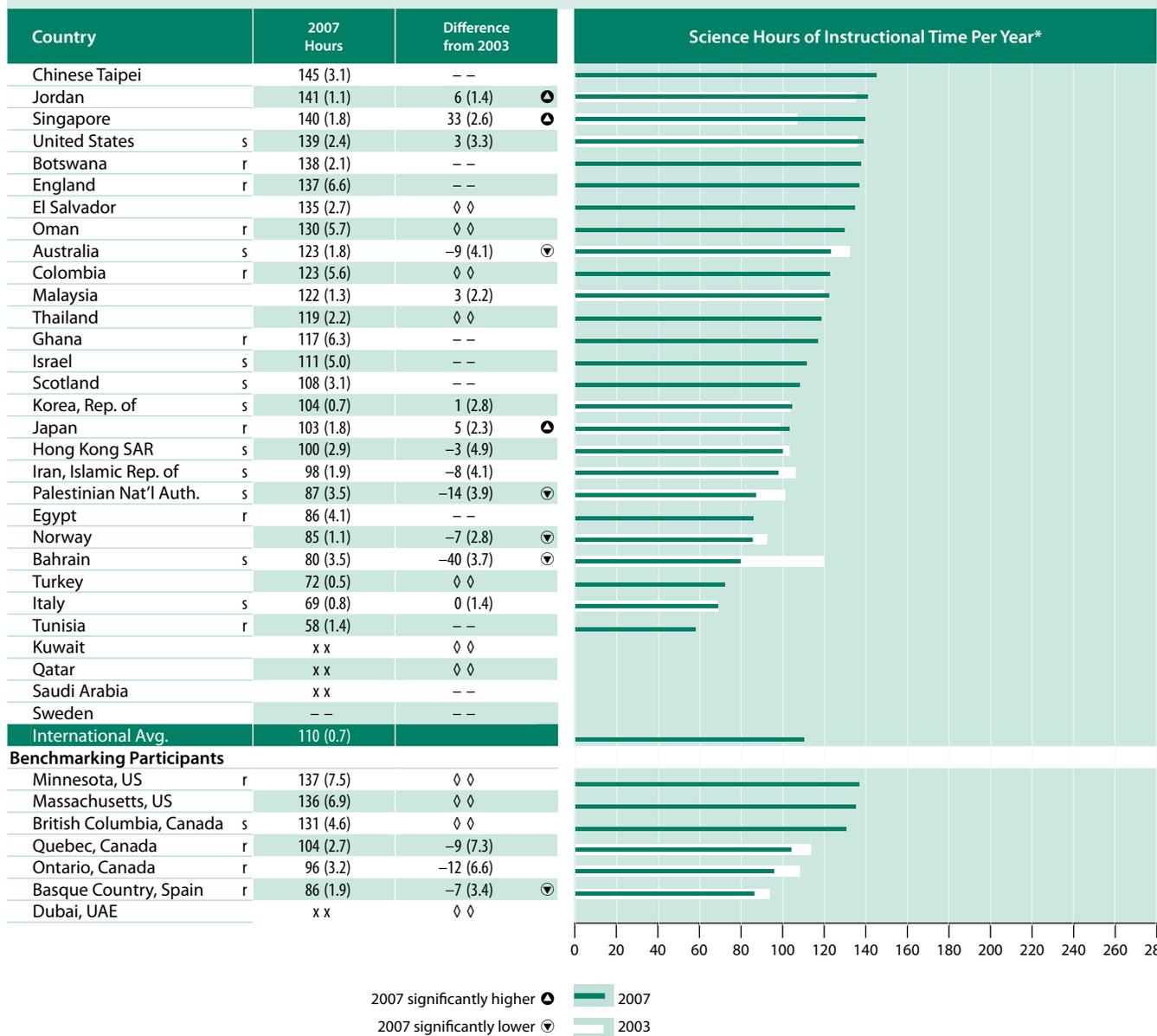
An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

A diamond (0) indicates the country did not participate in the assessment.

**Exhibit 5.3 Yearly Hours of Implemented Instructional Time for Science with Trends (Continued)**

TIMSS2007  
Science 8<sup>th</sup> Grade

**General/Integrated Science**



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Implemented instructional time for science provided by teachers, and total instructional time provided by schools.

\* The yearly hours of instructional time for science are computed by multiplying the number of hours per week that teachers teach science by the number of instructional weeks per year. The number of instructional weeks per year was computed by dividing the number of days per year a school is open for instruction by the number of instructional days in a calendar week.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

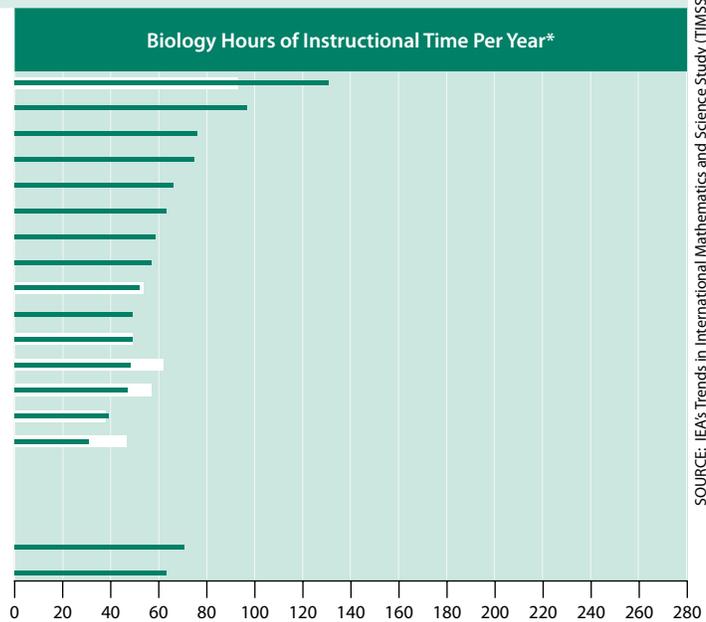
A diamond (0) indicates the country did not participate in the assessment.

**Exhibit 5.3 Yearly Hours of Implemented Instructional Time for Science with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

**Biology**

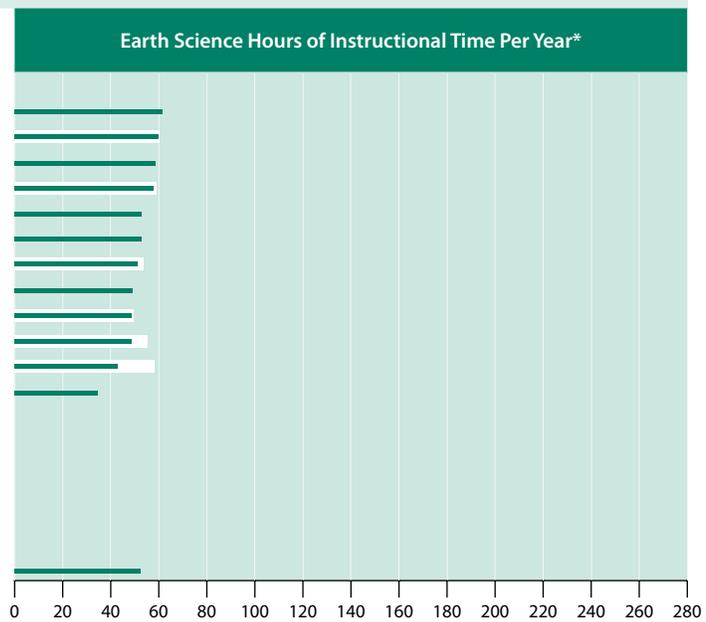
Country	2007 Hours	Difference from 2003
<sup>c</sup> Indonesia	130 (13.8)	37 (14.2) ▲
<sup>d</sup> Malta	96 (0.5)	◇ ◇
Armenia	75 (3.4)	--
Georgia	74 (3.4)	◇ ◇
Bulgaria	66 (4.0)	--
Ukraine	63 (1.4)	◇ ◇
Bosnia and Herzegovina	58 (1.9)	◇ ◇
Czech Republic	57 (0.9)	◇ ◇
Serbia	52 (0.5)	-2 (1.1)
<sup>f</sup> Syrian Arab Republic	49 (2.8)	◇ ◇
Russian Federation	49 (0.4)	0 (0.9)
Hungary	48 (1.2)	-14 (3.0) ▼
Slovenia	47 (1.3)	-10 (1.4) ▼
Romania	39 (2.4)	1 (3.6)
Lithuania	30 (0.6)	-16 (3.6) ▼
<sup>b</sup> Algeria	x x	◇ ◇
Lebanon	x x	--
Cyprus	--	--
<sup>e</sup> <sup>‡</sup> Morocco	70 (2.4)	--
International Avg.	63 (1.0)	



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Earth Science**

Country	2007 Hours	Difference from 2003
Armenia	62 (2.7)	--
Georgia	62 (2.8)	◇ ◇
Romania	60 (1.5)	0 (1.8)
Ukraine	59 (1.0)	◇ ◇
Lithuania	58 (0.6)	-1 (0.7)
Czech Republic	53 (1.2)	◇ ◇
Bulgaria	53 (2.7)	--
Serbia	51 (0.4)	-2 (2.2)
Bosnia and Herzegovina	49 (0.8)	◇ ◇
Russian Federation	49 (0.5)	0 (0.8)
Cyprus	49 (0.4)	-6 (3.0) ▼
Hungary	43 (1.0)	-15 (2.7) ▼
<sup>d</sup> Malta	35 (0.4)	◇ ◇
<sup>b</sup> Algeria	--	◇ ◇
<sup>c</sup> Indonesia	--	--
Lebanon	--	--
Slovenia	--	--
<sup>f</sup> Syrian Arab Republic	--	◇ ◇
<sup>e</sup> <sup>‡</sup> Morocco	--	--
International Avg.	52 (0.4)	



2007 significantly higher ▲  
2007 significantly lower ▼  
2007 2003

<sup>a</sup> Algeria: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.  
<sup>b</sup> Indonesia: Data reported in biology and physics panels include data from integrated/general science teachers.  
<sup>c</sup> Malta: Data reported in earth science panel include data from environmental studies teachers.

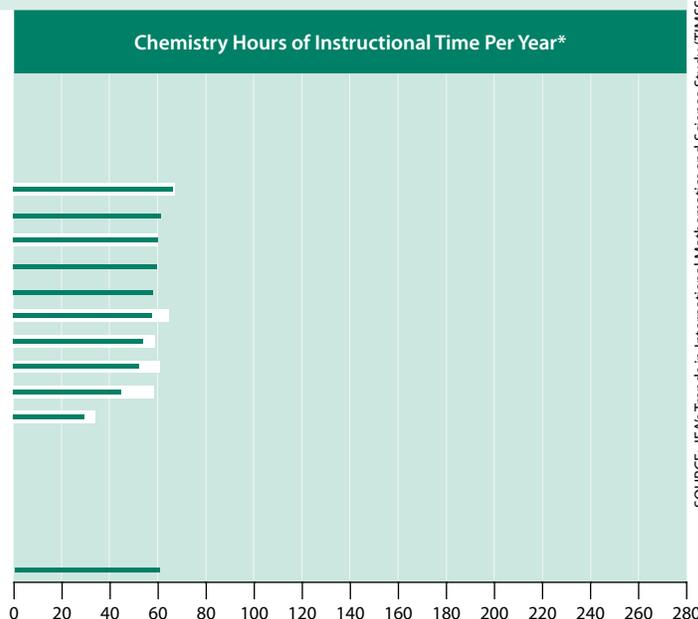
<sup>d</sup> Morocco: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.  
<sup>e</sup> Syrian Arab Republic: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.  
<sup>‡</sup> Did not satisfy guidelines for sample participation rates (see Appendix A).

**Exhibit 5.3 Yearly Hours of Implemented Instructional Time for Science with Trends (Continued)**

TIMSS2007  
Science 8<sup>th</sup> Grade

**Chemistry**

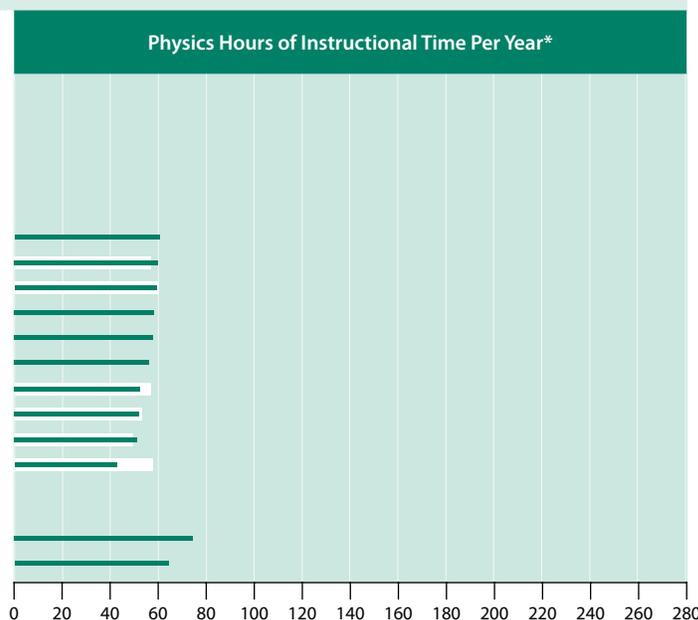
Country	2007 Hours	Difference from 2003
d Malta	90 (0.4)	0 0
Armenia	79 (3.2)	--
Bulgaria	r 69 (3.5)	--
Georgia	67 (3.7)	0 0
Romania	r 66 (2.9)	-1 (3.8)
Ukraine	61 (1.2)	0 0
Slovenia	60 (1.0)	0 (1.5)
Czech Republic	59 (1.0)	0 0
Bosnia and Herzegovina	r 58 (1.8)	0 0
Lithuania	r 58 (0.4)	-7 (1.3) ▼
Russian Federation	r 54 (1.0)	-5 (1.5) ▼
Serbia	s 52 (0.5)	-9 (3.8) ▼
Hungary	s 45 (1.0)	-14 (2.3) ▼
Cyprus	s 29 (0.8)	-5 (1.9) ▼
Lebanon	x x	--
b Algeria	--	0 0
c Indonesia	--	--
f Syrian Arab Republic	--	0 0
e ‡ Morocco	--	--
<b>International Avg.</b>	<b>60 (0.5)</b>	



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Physics**

Country	2007 Hours	Difference from 2003
d Malta	106 (0.1)	0 0
c Indonesia	s 92 (6.3)	-1 (7.0)
Georgia	69 (4.6)	0 0
Romania	r 67 (2.9)	0 (3.8)
Armenia	67 (2.5)	--
f Syrian Arab Republic	r 63 (3.7)	0 0
Bulgaria	59 (3.0)	--
Slovenia	r 59 (0.8)	2 (0.9) ▲
Lithuania	r 58 (0.6)	-2 (1.0)
Czech Republic	57 (0.8)	0 0
Ukraine	57 (0.4)	0 0
Bosnia and Herzegovina	r 55 (1.3)	0 0
Serbia	s 52 (0.4)	-5 (2.5)
Cyprus	s 51 (0.6)	-2 (1.0) ▼
Russian Federation	r 50 (0.6)	1 (1.0)
Hungary	s 42 (1.0)	-16 (2.7) ▼
b Algeria	x x	0 0
Lebanon	x x	--
e ‡ Morocco	s 73 (2.3)	--
<b>International Avg.</b>	<b>63 (0.6)</b>	



2007 significantly higher ▲  
2007 significantly lower ▼

Exhibit 5.4 **Percentage of Time in Science Class Devoted to TIMSS Content Domains During the School Year**

TIMSS2007  
Science **4<sup>th</sup>** Grade

Country	Life Science	Physical Science	Earth Science	Other
Algeria	r 41 (1.2)	r 27 (0.8)	r 21 (0.9)	r 12 (1.1)
Armenia	s 30 (2.0)	s 24 (1.4)	s 25 (1.8)	s 22 (3.9)
Australia	r 40 (1.6)	r 25 (1.4)	r 28 (1.2)	r 7 (1.5)
Austria	33 (0.9)	15 (0.5)	40 (1.1)	12 (1.1)
Chinese Taipei	32 (1.0)	43 (1.2)	21 (0.8)	3 (0.6)
Colombia	42 (1.7)	21 (0.9)	23 (1.0)	14 (2.3)
Czech Republic	62 (1.4)	22 (1.0)	10 (0.6)	6 (0.7)
Denmark	r 37 (1.3)	r 26 (1.3)	r 33 (0.9)	r 5 (0.9)
El Salvador	39 (1.0)	21 (1.0)	31 (1.0)	9 (1.1)
England	37 (0.8)	36 (1.0)	24 (0.8)	3 (0.7)
Georgia	r 31 (1.9)	r 13 (0.9)	r 27 (1.5)	r 30 (2.9)
Germany	36 (0.9)	21 (0.7)	32 (0.8)	11 (1.0)
Hong Kong SAR	39 (1.3)	28 (1.0)	24 (1.1)	9 (1.4)
Hungary	58 (1.2)	11 (0.7)	19 (1.0)	r 13 (1.1)
Iran, Islamic Rep. of	32 (0.8)	26 (0.7)	23 (0.7)	19 (1.2)
Italy	52 (1.1)	26 (1.0)	15 (0.8)	8 (0.8)
Japan	36 (0.8)	42 (0.9)	21 (0.7)	1 (0.3)
Kazakhstan	28 (0.8)	18 (0.8)	32 (1.1)	22 (1.0)
Kuwait	x x	x x	x x	x x
Latvia	40 (1.3)	24 (1.1)	25 (0.9)	11 (1.0)
Lithuania	34 (0.8)	17 (0.6)	32 (0.9)	17 (1.1)
Morocco	r 40 (1.2)	r 36 (1.1)	r 12 (1.1)	r 12 (1.1)
Netherlands	56 (2.1)	16 (1.0)	22 (1.5)	7 (1.3)
New Zealand	r 43 (1.2)	r 26 (1.3)	r 28 (1.0)	r 3 (0.7)
Norway	r 42 (1.1)	r 18 (0.8)	r 36 (1.3)	r 4 (0.9)
Qatar	s 42 (0.1)	s 32 (0.1)	s 16 (0.0)	s 10 (0.1)
Russian Federation	33 (1.2)	12 (0.7)	33 (0.8)	23 (1.6)
Scotland	r 41 (1.5)	r 29 (1.7)	r 26 (1.7)	s 4 (1.1)
Singapore	36 (0.9)	48 (0.9)	13 (0.7)	2 (0.4)
Slovak Republic	56 (1.0)	15 (0.5)	24 (0.7)	5 (0.8)
Slovenia	45 (0.9)	36 (0.9)	13 (0.4)	7 (0.7)
Sweden	34 (1.4)	22 (1.3)	39 (1.7)	5 (1.0)
Tunisia	44 (1.1)	41 (0.9)	7 (0.6)	8 (1.2)
Ukraine	32 (1.3)	16 (0.9)	29 (1.2)	23 (1.6)
United States	r 34 (0.7)	r 28 (0.7)	r 31 (0.7)	r 7 (0.7)
Yemen	r 34 (1.3)	r 30 (1.2)	r 22 (1.0)	r 14 (1.2)
International Avg.	40 (0.2)	25 (0.2)	24 (0.2)	10 (0.2)
<b>Benchmarking Participants</b>				
Alberta, Canada	38 (1.1)	33 (1.8)	19 (1.2)	10 (1.4)
British Columbia, Canada	r 38 (0.9)	r 27 (1.1)	r 28 (0.9)	r 7 (1.0)
Dubai, UAE	x x	x x	x x	x x
Massachusetts, US	r 34 (2.0)	r 27 (2.5)	r 33 (2.2)	r 6 (1.8)
Minnesota, US	r 36 (1.9)	r 29 (2.1)	r 30 (2.1)	r 6 (2.0)
Ontario, Canada	r 31 (1.0)	r 34 (1.3)	r 27 (0.8)	r 8 (1.4)
Quebec, Canada	r 40 (1.8)	r 24 (1.5)	r 27 (1.3)	r 9 (1.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

- (1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



**Exhibit 5.4 Percentage of Time in Science Class Devoted to TIMSS Content Domains During the School Year (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Biology	Chemistry	Physics	Earth Science	Other
Algeria	r 32 (1.6)	r 19 (0.8)	r 29 (1.3)	r 5 (0.7)	r 16 (1.6)
Armenia	r 19 (1.0)	r 22 (1.0)	r 24 (2.1)	r 20 (0.9)	r 14 (1.2)
Australia	29 (0.7)	25 (0.6)	25 (0.6)	17 (0.7)	5 (0.7)
Bahrain	r 24 (0.7)	r 25 (0.4)	r 27 (0.4)	r 19 (0.5)	r 5 (0.6)
Bosnia and Herzegovina	--	--	--	--	--
Botswana	40 (1.6)	19 (0.9)	26 (0.9)	7 (0.7)	r 7 (1.4)
Bulgaria	r 25 (0.9)	r 25 (0.8)	r 24 (1.0)	r 22 (0.9)	r 4 (0.8)
Chinese Taipei	6 (1.0)	49 (1.0)	43 (1.0)	2 (0.4)	1 (0.4)
Colombia	43 (1.9)	23 (1.5)	14 (0.7)	13 (1.2)	6 (0.8)
Cyprus	s 4 (0.3)	r 34 (0.6)	r 34 (0.6)	r 24 (0.6)	s 2 (0.3)
Czech Republic	r 27 (0.8)	r 23 (0.8)	r 24 (0.7)	r 18 (1.0)	r 8 (0.8)
Egypt	26 (0.8)	24 (0.7)	23 (0.6)	19 (0.6)	9 (0.6)
El Salvador	27 (0.6)	24 (0.6)	26 (0.6)	18 (0.6)	6 (0.8)
England	29 (0.8)	r 29 (0.8)	r 28 (0.9)	r 10 (0.4)	r 4 (0.7)
Georgia	s 25 (0.8)	s 22 (1.2)	s 23 (1.1)	s 20 (1.1)	s 10 (1.9)
Ghana	27 (0.6)	24 (0.4)	25 (0.5)	15 (0.6)	8 (0.6)
Hong Kong SAR	29 (1.2)	26 (0.8)	33 (1.0)	9 (0.9)	3 (1.2)
Hungary	--	--	--	--	--
Indonesia	x x	x x	x x	x x	x x
Iran, Islamic Rep. of	26 (0.7)	21 (0.5)	30 (0.6)	18 (0.4)	6 (0.6)
Israel	r 53 (2.7)	r 24 (2.3)	r 15 (1.4)	r 5 (0.8)	s 3 (0.7)
Italy	35 (1.0)	12 (0.7)	23 (1.0)	28 (0.9)	2 (0.4)
Japan	24 (0.4)	27 (0.5)	28 (0.5)	21 (0.7)	1 (0.4)
Jordan	23 (0.6)	25 (0.5)	30 (0.8)	17 (0.4)	6 (0.6)
Korea, Rep. of	26 (0.8)	25 (0.8)	24 (0.4)	22 (0.5)	2 (0.5)
Kuwait	s 23 (1.2)	s 27 (1.0)	s 33 (1.4)	s 14 (1.0)	s 3 (0.7)
Lebanon	s 23 (1.6)	s 28 (1.3)	s 29 (1.4)	s 14 (1.2)	s 7 (1.3)
Lithuania	--	--	--	--	--
Malaysia	33 (0.9)	23 (0.6)	27 (0.6)	13 (0.9)	3 (0.5)
Malta	15 (0.3)	7 (0.1)	47 (0.2)	30 (0.2)	2 (0.0)
Norway	26 (0.7)	24 (0.6)	20 (0.8)	24 (0.7)	6 (0.9)
Oman	26 (0.8)	25 (0.6)	29 (0.7)	16 (0.6)	5 (0.7)
Palestinian Nat'l Auth.	24 (0.7)	25 (0.6)	31 (0.9)	14 (0.6)	6 (0.8)
Qatar	r 25 (0.0)	r 28 (0.0)	r 33 (0.0)	r 10 (0.0)	r 6 (0.0)
Romania	--	--	--	--	--
Russian Federation	--	--	--	--	--
Saudi Arabia	r 36 (1.6)	r 10 (1.1)	r 19 (1.0)	r 24 (1.0)	r 11 (1.5)
Scotland	r 32 (0.9)	r 30 (0.8)	r 31 (0.9)	r 6 (0.5)	s 1 (0.3)
Serbia	s 24 (1.5)	s 20 (1.4)	s 22 (1.4)	s 16 (1.4)	s 21 (2.2)
Singapore	32 (1.0)	26 (0.7)	38 (0.9)	2 (0.4)	2 (0.5)
Slovenia	--	--	--	--	--
Sweden	r 35 (1.0)	r 27 (0.7)	r 31 (1.0)	r 3 (0.4)	s 6 (0.8)
Syrian Arab Republic	r 30 (1.4)	r 23 (0.8)	r 25 (1.0)	r 13 (0.7)	r 10 (0.8)
Thailand	27 (0.7)	22 (0.6)	23 (0.7)	23 (0.7)	5 (0.6)
Tunisia	60 (1.8)	3 (0.5)	2 (0.4)	23 (1.0)	r 13 (1.8)
Turkey	42 (1.3)	25 (0.7)	22 (0.8)	7 (0.6)	5 (0.8)
Ukraine	--	--	--	--	--
United States	15 (1.3)	23 (1.2)	26 (1.2)	32 (2.0)	r 4 (0.6)
‡ Morocco	r 24 (0.8)	r 21 (0.9)	r 23 (0.9)	r 28 (1.1)	r 5 (0.9)
<b>International Avg.</b>	<b>28 (0.2)</b>	<b>24 (0.1)</b>	<b>27 (0.1)</b>	<b>16 (0.1)</b>	<b>6 (0.1)</b>
<b>Benchmarking Participants</b>					
Basque Country, Spain	27 (1.6)	19 (1.2)	31 (1.4)	20 (1.4)	4 (1.0)
British Columbia, Canada	r 31 (0.9)	r 20 (0.9)	r 27 (0.6)	r 18 (0.7)	r 4 (0.6)
Dubai, UAE	s 26 (2.1)	s 26 (0.7)	s 29 (1.6)	s 14 (0.7)	x x
Massachusetts, US	17 (3.1)	24 (2.7)	23 (2.7)	30 (4.1)	7 (1.3)
Minnesota, US	10 (2.5)	10 (1.8)	12 (2.5)	66 (4.3)	r 4 (1.4)
Ontario, Canada	27 (0.6)	20 (0.7)	29 (1.2)	19 (0.9)	5 (1.1)
Quebec, Canada	23 (1.1)	23 (0.9)	23 (0.8)	23 (0.9)	9 (1.1)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



### **Are the TIMSS Science Topics Included in the Intended Curriculum Taught in School?**

The science content and topic areas assessed in TIMSS 2007 are elaborated in the Science Framework, with each topic area for fourth and eighth grade presented as a comprehensive list of objectives. The aim was to cover goals of science education that a significant number of countries regarded as important to assess. Because the topics do not represent the “least common denominator” but rather a forward-looking conception of science instruction, not all TIMSS topics are in all countries’ curriculum.

National Research Coordinators were asked to indicate whether each of the TIMSS 2007 science topics was included in their countries’ intended curriculum through fourth or eighth grade, and if so, whether the topics were intended to be taught to “all or almost all students” or “only the more able students.” At the fourth grade, countries were asked about a total of 35 topics, 11 in life science, 14 in physical science, and 10 in earth science. At the eighth grade, countries were asked about 46 topics in total, with 14 in biology, 8 in chemistry, 10 in physics, and 14 in earth science. The responses for the countries are summarized in this section and the topic-by-topic data follows in the next sections.

Exhibit 5.5 shows that, for most countries, much of the science content assessed by TIMSS is included in their intended curricula. On average across countries at the fourth grade, the majority of the assessment topics (23 out of 35) were intended for all or almost all students. There was variation among participants, with most of the topics (32-35) included in the curriculum for all or almost all students in Armenia, Austria, Denmark, Italy, Mongolia, Qatar, and the Slovak Republic, and less than half of the topics included for El Salvador, Georgia, Hong Kong SAR, Iran, Kuwait, Morocco, Norway, Singapore, Sweden, and Tunisia. On average across countries, 8 out of 11 of topics were included in the life science domain, 9 out of 14 in the physical science domain, and 6 out of 10 in the earth science domain.

On average across countries at the eighth grade, most of the science assessment topics (34 out of 46) were intended for all or almost all students.

Five countries included all 46 topics in their curricula for all students—Bosnia and Herzegovina, the Czech Republic, Italy, Jordan, and Serbia—and Hungary, the Palestinian National Authority, Turkey, and the United States had almost all (43-45 topics). Across content domains, coverage of science topics resembled overall coverage. The inclusion for biology topics was 11 out of 14, for chemistry 6 out of 8 topics, for physics 7 out of 10 topics, and for earth science 10 out of 14 topics.

In addition to asking national coordinators about the science topics in the intended curriculum, TIMSS asked science teachers about the topics actually taught in the science classroom. Teachers of the students assessed in TIMSS were asked to indicate whether each of the TIMSS 2007 science topics was *mostly taught before this year*, *mostly taught this year*, or *not yet taught or just introduced*. Exhibit 5.6 presents, for fourth and eighth grades, teachers' reports on students having been taught the TIMSS science topics either prior to or during the year of the assessment. The exhibit shows, for each TIMSS participant, averaged across science content domains, the percentage of students whose teachers reported that the students had been taught each topic.

At fourth grade, according to their teachers, 61 percent of students, on average across countries, had been taught the science topics, with more than 80 percent in Latvia, the Slovak Republic, and the Ukraine. Across content domains, relatively more students were taught the life science topics (70%, on average), relatively fewer the physical science topics (53%), and about the same as overall for the earth science topics (60%). At eighth grade, an average of 66 percent of students had been taught the science topics overall, and the same or similar percentage in biology (66%) and physics (68%). Seventy-two percent of students were taught the chemistry topics and 57 percent the earth science topics. According to their science teachers, 80 percent, or more, of the students had been taught the TIMSS science topics in Bosnia and Herzegovina, Bulgaria, Egypt, England, Hungary, Romania, Serbia, Turkey, and the Ukraine.

Exhibit 5.5 Summary of TIMSS Science Topics in the Intended Curriculum\*

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Number of TIMSS Science Topics Intended to Be Taught Up to and Including Fourth Grade								
	All Science (35 topics)			Life Science (11 topics)			Physical Science (14 topics)		
	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 4	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 4	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 4
Algeria	28	0	7	10	0	1	10	0	4
Armenia	35	0	0	11	0	0	14	0	0
Australia	24	5	6	8	2	1	9	3	2
Austria	32	0	3	11	0	0	12	0	2
Chinese Taipei	19	0	16	5	0	6	8	0	6
Colombia	27	0	8	9	0	2	14	0	0
Czech Republic	27	0	8	10	0	1	8	0	6
Denmark	34	0	1	11	0	0	13	0	1
El Salvador	15	0	20	11	0	0	2	0	12
England	27	0	8	8	0	3	12	0	2
Georgia	3	0	32	0	0	11	1	0	13
Germany	30	0	5	11	0	0	13	0	1
Hong Kong SAR	17	0	18	5	0	6	6	0	8
Hungary	24	0	11	11	0	0	10	0	4
Iran, Islamic Rep. of	17	0	18	3	0	8	10	0	4
Italy	33	0	2	9	0	2	14	0	0
Japan	19	0	16	4	0	7	11	0	3
Kazakhstan	26	0	9	10	0	1	6	0	8
Kuwait	15	0	19	2	0	8	8	0	6
Latvia	31	0	4	11	0	0	12	0	2
Lithuania	21	0	14	8	0	3	7	0	7
Mongolia	35	0	0	11	0	0	14	0	0
Morocco	10	0	24	3	0	7	7	0	7
Netherlands	np	np	np	np	np	np	np	np	np
New Zealand	22	8	5	7	1	3	9	4	1
Norway	15	0	20	5	0	6	4	0	10
Qatar	32	0	3	11	0	0	13	0	1
Russian Federation	20	0	15	6	0	5	5	0	9
Scotland	18	0	17	5	0	6	11	0	3
Singapore	13	0	22	4	0	7	8	0	6
Slovak Republic	32	0	3	11	0	0	12	0	2
Slovenia	28	0	7	9	0	2	13	0	1
Sweden	17	0	18	5	0	6	8	0	6
Tunisia	15	0	20	5	0	6	7	0	7
Ukraine	19	4	12	6	3	2	3	1	10
United States	30	0	5	10	0	1	11	0	3
Yemen	27	0	8	10	0	1	10	0	4
<b>International Avg.</b>	<b>23</b>	<b>0</b>	<b>11</b>	<b>8</b>	<b>0</b>	<b>3</b>	<b>9</b>	<b>0</b>	<b>4</b>
<b>Benchmarking Participants</b>									
Alberta, Canada	24	0	11	8	0	3	12	0	2
British Columbia, Canada	22	0	13	7	0	4	9	0	5
Dubai, UAE	27	0	8	9	0	2	9	0	5
Massachusetts, US	24	0	11	9	0	2	8	0	6
Minnesota, US	28	0	7	9	0	2	11	0	3
Ontario, Canada	19	0	16	7	0	4	8	0	6
Quebec, Canada	11	7	17	6	2	3	1	3	10

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by National Research Coordinators.

\* See Exhibits 5.7 through 5.9 for data on individual topics.

An "np" indicates not prescribed by the curriculum.

Note: For Sweden number of science topics intended to be taught up to and including fifth grade.



Exhibit 5.5 Summary of TIMSS Science Topics in the Intended Curriculum\* (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Number of TIMSS Science Topics Intended to Be Taught Up to and Including Fourth Grade		
	Earth Science (10 topics)		
	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 4
Algeria	8	0	2
Armenia	10	0	0
Australia	7	0	3
Austria	9	0	1
Chinese Taipei	6	0	4
Colombia	4	0	6
Czech Republic	9	0	1
Denmark	10	0	0
El Salvador	2	0	8
England	7	0	3
Georgia	2	0	8
Germany	6	0	4
Hong Kong SAR	6	0	4
Hungary	3	0	7
Iran, Islamic Rep. of	4	0	6
Italy	10	0	0
Japan	4	0	6
Kazakhstan	10	0	0
Kuwait	5	0	5
Latvia	8	0	2
Lithuania	6	0	4
Mongolia	10	0	0
Morocco	0	0	10
Netherlands	np	np	np
New Zealand	6	3	1
Norway	6	0	4
Qatar	8	0	2
Russian Federation	9	0	1
Scotland	2	0	8
Singapore	1	0	9
Slovak Republic	9	0	1
Slovenia	6	0	4
Sweden	4	0	6
Tunisia	3	0	7
Ukraine	10	0	0
United States	9	0	1
Yemen	7	0	3
<b>International Avg.</b>	<b>6</b>	<b>0</b>	<b>4</b>
<b>Benchmarking Participants</b>			
Alberta, Canada	4	0	6
British Columbia, Canada	6	0	4
Dubai, UAE	9	0	1
Massachusetts, US	7	0	3
Minnesota, US	8	0	2
Ontario, Canada	4	0	6
Quebec, Canada	4	2	4

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.5 Summary of TIMSS Science Topics in the Intended Curriculum\* (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Number of TIMSS Science Topics Intended to Be Taught Up to and Including Eighth Grade									
	All Science (46 topics)			Biology (14 topics)			Chemistry (8 topics)			
	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 8	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 8	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 8	
Algeria	24	0	22	9	0	5	6	0	2	
Armenia	40	0	6	14	0	0	5	0	3	
Australia	25	11	10	10	1	3	5	0	3	
Bahrain	40	0	6	14	0	0	7	0	1	
Bosnia and Herzegovina	46	0	0	14	0	0	8	0	0	
Botswana	16	0	30	7	0	7	1	0	7	
Bulgaria	38	0	8	10	0	4	6	0	2	
Chinese Taipei	41	0	5	14	0	0	8	0	0	
Colombia	38	0	7	12	0	1	5	0	3	
Cyprus	23	2	21	0	0	14	5	0	3	
Czech Republic	46	0	0	14	0	0	8	0	0	
Egypt	17	26	3	5	7	2	2	5	1	
El Salvador	35	0	11	14	0	0	8	0	0	
England	40	0	6	13	0	1	7	0	1	
Georgia	28	0	18	8	0	6	7	0	1	
Ghana	35	0	11	13	0	1	7	0	1	
Hong Kong SAR	32	0	14	11	0	3	4	0	4	
Hungary	43	0	3	14	0	0	8	0	0	
Indonesia	17	0	29	6	0	8	1	0	7	
Iran, Islamic Rep. of	34	0	12	12	0	2	8	0	0	
Israel	35	3	8	13	0	1	8	0	0	
Italy	46	0	0	14	0	0	8	0	0	
Japan	33	0	13	8	0	6	7	0	1	
Jordan	46	0	0	14	0	0	8	0	0	
Korea, Rep. of	27	0	19	7	0	7	4	0	4	
Kuwait	25	0	21	11	0	3	6	0	2	
Lebanon	28	1	17	11	0	3	2	1	5	
Lithuania	35	0	11	11	0	3	6	0	2	
Malaysia	38	0	8	12	0	2	7	0	1	
Malta	29	1	16	10	0	4	7	0	1	
Mongolia	36	5	5	14	0	0	8	0	0	
Morocco	29	0	17	10	0	4	4	0	4	
Norway	29	0	17	10	0	4	5	0	3	
Oman	24	7	15	8	2	4	3	1	4	
Palestinian Nat'l Auth.	45	0	1	14	0	0	7	0	1	
Qatar	25	0	21	12	0	2	4	0	4	
Romania	36	0	10	12	0	2	8	0	0	
Russian Federation	40	0	6	12	0	2	7	0	1	
Saudi Arabia	31	0	14	12	0	1	3	0	5	
Scotland	35	2	9	11	0	3	8	0	0	
Serbia	46	0	0	14	0	0	8	0	0	
Singapore	33	0	13	9	0	5	7	0	1	
Slovenia	38	0	8	10	0	4	6	0	2	
Sweden	40	0	6	11	0	3	7	0	1	
Syrian Arab Republic	35	10	1	14	0	0	8	0	0	
Thailand	32	0	14	10	0	4	6	0	2	
Tunisia	14	0	32	4	0	10	4	0	4	
Turkey	43	0	3	13	0	1	6	0	2	
Ukraine	39	0	7	9	0	5	7	0	1	
United States	43	1	1	14	0	0	6	1	1	
International Avg.	34	1	11	11	0	3	6	0	2	
<b>Benchmarking Participants</b>										
Basque Country, Spain	30	0	16	12	0	2	2	0	6	
British Columbia, Canada	40	0	6	12	0	2	5	0	3	
Dubai, UAE	41	0	5	14	0	0	7	0	1	
Massachusetts, US	23	0	23	8	0	6	3	0	5	
Minnesota, US	41	0	5	12	0	2	7	0	1	
Ontario, Canada	35	0	11	10	0	4	4	0	4	
Quebec, Canada	22	2	22	6	0	8	4	2	2	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by National Research Coordinators.  
\* See Exhibits 5.10 through 5.13 for data on individual topics.

Note: For Sweden number of science topics intended to be taught up to and including ninth grade.

Exhibit 5.5 Summary of TIMSS Science Topics in the Intended Curriculum\* (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Number of TIMSS Science Topics Intended to Be Taught Up to and Including Eighth Grade					
	Physics (10 topics)			Earth Science (14 topics)		
	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 8	Topics for All or Almost All Students	Topics for Only the More Able Students (top track)	Not Included in the Curriculum Through Grade 8
Algeria	7	0	3	2	0	12
Armenia	7	0	3	14	0	0
Australia	5	1	4	5	9	0
Bahrain	9	0	1	10	0	4
Bosnia and Herzegovina	10	0	0	14	0	0
Botswana	4	0	6	4	0	10
Bulgaria	10	0	0	12	0	2
Chinese Taipei	9	0	1	10	0	4
Colombia	7	0	3	14	0	0
Cyprus	7	2	1	11	0	3
Czech Republic	10	0	0	14	0	0
Egypt	4	6	0	6	8	0
El Salvador	10	0	0	3	0	11
England	10	0	0	10	0	4
Georgia	5	0	5	8	0	6
Ghana	7	0	3	8	0	6
Hong Kong SAR	8	0	2	9	0	5
Hungary	9	0	1	12	0	2
Indonesia	5	0	5	5	0	9
Iran, Islamic Rep. of	9	0	1	5	0	9
Israel	7	2	1	7	1	6
Italy	10	0	0	14	0	0
Japan	8	0	2	10	0	4
Jordan	10	0	0	14	0	0
Korea, Rep. of	9	0	1	7	0	7
Kuwait	8	0	2	0	0	14
Lebanon	4	0	6	11	0	3
Lithuania	5	0	5	13	0	1
Malaysia	8	0	2	11	0	3
Malta	8	0	2	4	1	9
Mongolia	0	5	5	14	0	0
Morocco	5	0	5	10	0	4
Norway	6	0	4	8	0	6
Oman	5	2	3	8	2	4
Palestinian Nat'l Auth.	10	0	0	14	0	0
Qatar	4	0	6	5	0	9
Romania	9	0	1	7	0	7
Russian Federation	9	0	1	12	0	2
Saudi Arabia	8	0	2	8	0	6
Scotland	6	1	3	10	1	3
Serbia	10	0	0	14	0	0
Singapore	10	0	0	7	0	7
Slovenia	8	0	2	14	0	0
Sweden	9	0	1	13	0	1
Syrian Arab Republic	0	10	0	13	0	1
Thailand	7	0	3	9	0	5
Tunisia	5	0	5	1	0	13
Turkey	10	0	0	14	0	0
Ukraine	9	0	1	14	0	0
United States	10	0	0	13	0	0
International Avg.	7	1	2	10	0	4
<b>Benchmarking Participants</b>						
Basque Country, Spain	4	0	6	12	0	2
British Columbia, Canada	9	0	1	14	0	0
Dubai, UAE	7	0	3	13	0	1
Massachusetts, US	6	0	4	6	0	8
Minnesota, US	10	0	0	12	0	2
Ontario, Canada	10	0	0	11	0	3
Quebec, Canada	2	0	8	10	0	4

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.6 Summary of Students Taught the TIMSS Science Topics\*

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Average Percentage of Students Taught** the TIMSS Science Topic			
	All Science (35 topics)	Life Science (11 topics)	Physical Science (14 topics)	Earth Science (10 topics)
Algeria	63 (1.9)	68 (2.3)	54 (2.5)	67 (1.8)
Armenia	x x	x x	x x	x x
Australia	53 (1.6)	66 (1.8)	39 (2.1)	53 (2.1)
Austria	68 (1.2)	77 (1.2)	56 (1.6)	70 (1.2)
Chinese Taipei	55 (2.0)	59 (2.1)	60 (2.0)	46 (2.6)
Colombia	76 (1.4)	92 (1.3)	62 (2.6)	75 (1.8)
Czech Republic	62 (1.4)	76 (1.8)	41 (1.3)	68 (1.8)
Denmark	r 55 (1.7)	r 59 (2.1)	r 49 (2.2)	r 57 (2.3)
El Salvador	72 (1.3)	92 (0.9)	50 (2.3)	74 (1.7)
England	72 (1.3)	72 (1.6)	74 (1.5)	70 (2.0)
Georgia	47 (2.3)	49 (2.9)	27 (2.3)	64 (3.1)
Germany	55 (1.4)	61 (1.8)	50 (1.6)	55 (1.6)
Hong Kong SAR	59 (1.5)	69 (2.0)	53 (1.9)	55 (1.8)
Hungary	67 (1.3)	83 (1.4)	53 (1.7)	65 (1.9)
Iran, Islamic Rep. of	68 (1.4)	71 (1.8)	69 (1.5)	64 (2.0)
Italy	64 (1.1)	76 (1.1)	50 (1.5)	66 (1.5)
Japan	36 (1.1)	32 (1.5)	48 (1.1)	27 (1.5)
Kazakhstan	--	--	--	--
Kuwait	r 66 (2.1)	r 74 (2.3)	r 61 (2.1)	r 66 (2.2)
Latvia	81 (1.1)	85 (1.6)	71 (1.6)	88 (1.0)
Lithuania	79 (1.0)	95 (0.6)	61 (1.7)	81 (1.3)
Morocco	47 (1.4)	62 (1.8)	49 (1.3)	31 (1.8)
Netherlands	49 (1.3)	r 61 (1.7)	r 34 (1.7)	50 (1.7)
New Zealand	53 (1.3)	65 (1.3)	43 (1.9)	52 (1.7)
Norway	55 (1.3)	65 (1.7)	37 (1.6)	62 (1.4)
Qatar	r 51 (0.1)	r 60 (0.1)	r 51 (0.1)	r 41 (0.1)
Russian Federation	--	--	--	--
Scotland	r 52 (1.2)	r 59 (1.9)	r 51 (1.9)	r 45 (1.7)
Singapore	55 (0.8)	68 (1.1)	63 (0.7)	36 (1.1)
Slovak Republic	82 (1.0)	90 (1.0)	72 (1.4)	85 (1.2)
Slovenia	61 (1.2)	65 (1.5)	67 (1.7)	51 (1.5)
Sweden	49 (1.5)	56 (1.6)	32 (1.8)	59 (1.9)
Tunisia	51 (1.6)	67 (1.8)	50 (1.7)	37 (2.1)
Ukraine	83 (0.9)	94 (1.0)	59 (1.6)	95 (0.6)
United States	70 (1.1)	73 (1.3)	62 (1.7)	77 (1.3)
Yemen	55 (2.1)	61 (2.2)	58 (2.3)	47 (2.8)
<b>International Avg.</b>	<b>61 (0.2)</b>	<b>70 (0.3)</b>	<b>53 (0.3)</b>	<b>60 (0.3)</b>
<b>Benchmarking Participants</b>				
Alberta, Canada	51 (1.6)	57 (2.2)	45 (1.9)	51 (1.9)
British Columbia, Canada	r 51 (1.5)	r 55 (2.1)	r 40 (1.9)	r 57 (2.1)
Dubai, UAE	s 54 (0.9)	x x	s 46 (1.8)	x x
Massachusetts, US	r 64 (2.3)	r 65 (3.0)	r 54 (4.1)	r 74 (3.5)
Minnesota, US	60 (3.1)	r 64 (4.0)	53 (3.9)	63 (3.6)
Ontario, Canada	50 (1.6)	61 (2.4)	42 (2.4)	46 (2.4)
Quebec, Canada	r 52 (1.4)	r 62 (2.0)	r 37 (1.7)	r 57 (2.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers at the time of testing.

\* See Exhibits 5.7 through 5.9 for data on individual topics.

\*\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students. An “x” indicates data are available for less than 50% of the students.



Exhibit 5.6 Summary of Students Taught the TIMSS Science Topics\* (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Average Percentage of Students Taught** the TIMSS Science Topic				
	All Science (46 topics)	Biology (14 topics)	Chemistry (8 topics)	Physics (10 topics)	Earth Science (14 topics)
Algeria	47 (1.2)	62 (1.8)	57 (2.1)	51 (1.9)	r 15 (1.3)
Armenia	68 (1.4)	71 (2.1)	61 (3.1)	79 (2.2)	61 (3.0)
Australia	51 (1.1)	48 (1.4)	61 (1.5)	52 (1.3)	43 (2.1)
Bahrain	63 (0.7)	64 (0.9)	70 (0.9)	74 (0.9)	43 (0.8)
Bosnia and Herzegovina	92 (0.5)	91 (1.0)	96 (0.9)	95 (0.8)	85 (1.7)
Botswana	28 (1.6)	33 (1.5)	17 (2.5)	41 (1.8)	21 (1.4)
Bulgaria	80 (0.9)	70 (1.7)	77 (1.8)	89 (1.3)	85 (1.3)
Chinese Taipei	65 (1.5)	70 (3.8)	99 (0.6)	67 (1.5)	17 (2.7)
Colombia	65 (1.8)	79 (1.5)	60 (2.6)	46 (2.6)	76 (2.4)
Cyprus	r 56 (0.3)	--	r 50 (0.5)	r 49 (0.4)	r 72 (0.6)
Czech Republic	78 (0.6)	76 (1.2)	74 (1.4)	80 (1.0)	81 (1.4)
Egypt	85 (1.1)	81 (1.4)	87 (1.4)	85 (1.6)	88 (1.2)
El Salvador	71 (1.5)	72 (1.9)	82 (2.0)	79 (1.4)	54 (2.8)
England	84 (0.9)	r 85 (1.1)	r 90 (1.0)	r 94 (0.9)	r 67 (1.7)
Georgia	71 (1.3)	55 (2.6)	88 (1.2)	63 (1.5)	84 (2.2)
Ghana	60 (1.5)	65 (1.9)	78 (1.4)	57 (1.9)	41 (2.3)
Hong Kong SAR	50 (1.6)	56 (2.1)	55 (2.2)	60 (2.5)	28 (1.6)
Hungary	84 (0.8)	80 (1.2)	98 (0.6)	84 (0.8)	75 (2.0)
Indonesia	70 (1.1)	69 (1.6)	59 (5.6)	73 (1.3)	r 56 (6.3)
Iran, Islamic Rep. of	79 (1.0)	64 (1.8)	93 (0.8)	90 (1.2)	67 (1.6)
Israel	54 (1.4)	r 43 (2.0)	r 74 (1.9)	r 55 (1.5)	s 36 (2.5)
Italy	78 (0.9)	89 (0.7)	82 (1.6)	69 (1.5)	71 (1.7)
Japan	56 (0.9)	32 (1.1)	81 (1.2)	67 (1.1)	44 (1.3)
Jordan	78 (1.3)	79 (1.7)	78 (1.5)	83 (1.6)	74 (1.9)
Korea, Rep. of	54 (1.2)	42 (1.6)	47 (1.6)	73 (1.4)	56 (1.3)
Kuwait	r 66 (2.0)	r 64 (2.8)	r 69 (2.5)	r 81 (1.8)	r 50 (3.0)
Lebanon	77 (1.2)	63 (1.9)	90 (1.3)	79 (2.0)	--
Lithuania	65 (0.8)	62 (1.7)	64 (1.5)	51 (1.5)	81 (1.3)
Malaysia	61 (1.1)	66 (1.5)	73 (1.6)	71 (1.2)	36 (1.5)
Malta	51 (0.1)	40 (0.3)	67 (0.3)	46 (0.1)	59 (0.1)
Norway	41 (1.0)	37 (1.5)	44 (1.7)	32 (1.3)	53 (1.8)
Oman	69 (1.3)	73 (1.6)	67 (1.6)	77 (1.7)	58 (2.3)
Palestinian Nat'l Auth.	71 (1.4)	68 (1.8)	79 (1.5)	75 (1.9)	64 (1.8)
Qatar	56 (0.1)	53 (0.1)	70 (0.1)	70 (0.1)	32 (0.1)
Romania	91 (0.5)	89 (1.2)	93 (1.1)	94 (0.9)	88 (1.1)
Russian Federation	--	--	--	--	--
Saudi Arabia	59 (1.1)	79 (1.1)	35 (2.5)	57 (1.9)	63 (1.8)
Scotland	r 60 (1.0)	r 58 (1.5)	r 75 (1.5)	r 70 (1.4)	s 36 (1.9)
Serbia	94 (0.6)	90 (1.2)	95 (0.9)	94 (1.3)	98 (0.7)
Singapore	53 (0.9)	54 (1.2)	67 (1.3)	66 (1.2)	r 17 (1.5)
Slovenia	62 (0.8)	61 (1.2)	74 (1.0)	53 (1.5)	--
Sweden	64 (0.8)	61 (1.4)	65 (1.3)	r 67 (1.6)	r 43 (3.1)
Syrian Arab Republic	69 (1.3)	67 (2.2)	80 (1.4)	68 (1.8)	50 (2.7)
Thailand	67 (1.5)	70 (2.1)	84 (1.9)	52 (2.2)	64 (2.6)
Tunisia	32 (1.3)	53 (1.3)	s 20 (2.7)	s 24 (3.4)	21 (1.5)
Turkey	80 (1.3)	84 (1.6)	93 (1.1)	79 (1.4)	66 (2.6)
Ukraine	82 (0.6)	69 (1.3)	80 (1.2)	85 (0.7)	95 (0.8)
United States	77 (1.3)	84 (1.6)	74 (1.9)	71 (1.7)	81 (1.7)
‡ Morocco	r 57 (1.3)	r 59 (2.2)	r 67 (1.9)	r 58 (1.8)	r 47 (2.5)
International Avg.	66 (0.2)	66 (0.2)	72 (0.3)	68 (0.2)	57 (0.3)
<b>Benchmarking Participants</b>					
Basque Country, Spain	59 (1.6)	54 (2.1)	48 (2.8)	60 (2.6)	73 (1.9)
British Columbia, Canada	r 48 (1.4)	r 53 (1.8)	r 44 (2.4)	r 53 (2.0)	r 42 (2.4)
Dubai, UAE	s 64 (1.9)	s 61 (1.6)	x x	s 70 (2.3)	x x
Massachusetts, US	76 (2.6)	83 (4.0)	71 (3.9)	70 (4.4)	82 (2.7)
Minnesota, US	60 (3.6)	79 (4.7)	39 (4.8)	47 (5.7)	74 (4.2)
Ontario, Canada	67 (1.5)	69 (3.1)	57 (2.7)	68 (1.8)	73 (2.9)
Quebec, Canada	58 (1.6)	59 (2.5)	65 (2.5)	39 (2.0)	70 (2.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers at the time of testing.

For countries that teach science as separate subjects at Grade 8, data are based on teachers who teach the relevant science subject.

\* See Exhibits 5.10 through 5.13 for data on individual topics.

\*\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



### **Fourth Grade: Which TIMSS Science Topics Are in the Intended and Implemented Curriculum?**

For the fourth grade, Exhibit 5.7 provides detailed information about each topic within the life science domain, including the student population to be taught the topic, the grades within which the topics are intended to be taught, and the teachers' reports about the percent of students taught the topics. As shown in the exhibit, all 11 topics were included in the intended curriculum of the majority of TIMSS 2007 participants and were taught to the majority of fourth grade students. On average across countries, teachers reported that 77 percent of students had been taught about types, characteristics, and classification of living things; 79 percent had been taught about major body structures and their function in humans and other organisms; and 74 percent about general steps in the life cycle of familiar organisms.

Not quite so well covered at the fourth grade were plant and animal reproduction (58% of students taught); physical features, behavior, and survival of plants and animals (66%); bodily actions in response to outside conditions and activities (66%); energy requirements of plants and animals (63%); and ways that communicable diseases are transmitted (58%). Students generally were taught about relationships in a living community (70%), changes in environments (76%), and ways of maintaining good health through diet and exercise (81%).

Exhibit 5.8 contains the topic-by-topic results for the fourth grade content domain of physical science. There was considerable variation in the coverage of these topics in the intended curriculum and consequently in the extent to which they were taught. Within the general area of classification and properties of matter, every country included properties and uses of water at fourth grade, and a high percentage of students (82%, on average) were taught the topic. Classification of objects and materials based on physical properties also was in the curriculum of most countries and taught to the majority of students (59%). However, properties and uses of metals and forming and separating mixtures were included in only about half the countries' curricula, and taught to only about one-third of fourth grade students (37% and 31%,

respectively). In the area of physical states and changes of matter, there was good coverage of states of matter and differences in physical properties and changes in state by heating and cooling—in the curricula of most countries and taught to about three-fourths of the students—but less of changes in familiar materials to produce other materials (burning, rusting, cooking, etc.), which were in the curricula of about half the participants and taught to less than half the students (45%).

Topics in energy sources and heat and temperature were covered in about two-thirds of the countries and taught to the majority of students (65% in the case of energy sources and their uses, and 57% for heat flow and temperature). Light and sound topics were covered by about half the countries and taught to less than half the students—45 percent of students were taught about common sources of light, 33 percent about sound as the result of vibrations. Similarly, about half the countries covered topics in electricity and magnetism, with 46 percent of students taught about simple electrical circuits and 54 percent about properties of magnets, and about one-third of countries covered topics in forces and motion, with 40 percent of students taught about forces causing objects to move (gravity, push-pull forces, etc.)

Exhibit 5.7 Intended and Taught\* TIMSS Life Science Topics

TIMSS2007  
Science 4<sup>th</sup> Grade

Life Science (11 topics)	Types, characteristics, and classification of living things			Major body structures and their function in humans and other organisms			General steps in the life cycle of familiar organisms		
	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	1	77 (3.9)	●	1	89 (3.1)	●	4	54 (5.0)
Armenia	●	4	x x	●	4	x x	●	4	x x
Australia	●	3–6	77 (3.6)	●	3–6	67 (3.5)	●	3–4	88 (2.0)
Austria	●	3	61 (3.3)	●	3	92 (1.6)	●	3	88 (2.1)
Chinese Taipei	●	3–5	79 (3.0)	●	3–6	81 (2.9)	●	3–4	85 (2.9)
Colombia	●	4–5	100 (0.0)	●	4–5	95 (2.1)	●	1–3	85 (3.8)
Czech Republic	●	1–3,5–6	92 (2.4)	●	1–4,6–9	83 (3.0)	●	1–3,6–9	68 (3.6)
Denmark	●	3–4	r 60 (4.5)	●	3–4	r 68 (4.4)	●	3–4	r 57 (4.5)
El Salvador	●	3–11	99 (0.6)	●	1–11	99 (0.9)	●	1–9	91 (2.5)
England	●	1,3,5	88 (2.3)	●	K,2–4	79 (3.0)	●	4	87 (2.9)
Georgia	○	5	40 (4.6)	○	6	40 (4.6)	○	8	23 (3.7)
Germany	●	1–4	55 (3.2)	●	3–4	70 (3.1)	●	3–4	70 (2.8)
Hong Kong SAR	●	3	74 (4.0)	●	4	94 (2.2)	○	5	56 (4.0)
Hungary	●	1–3	88 (3.2)	●	4	91 (3.1)	●	4	92 (2.4)
Iran, Islamic Rep. of	○	6	93 (1.5)	●	3	77 (3.5)	●	4	76 (4.1)
Italy	●	3–6	99 (0.5)	●	4–7	72 (2.9)	●	4–7	94 (1.6)
Japan	●	3–12	49 (4.0)	●	3–12	24 (3.4)	●	3–12	87 (3.1)
Kazakhstan	●	1	--	●	1–3	--	●	1	--
Kuwait	●	2,3,5	r 82 (3.7)	–	1,5	r 83 (3.2)	○	5	s 43 (4.9)
Latvia	●	1	92 (2.3)	●	1–2	94 (1.9)	●	2,4–5	86 (2.8)
Lithuania	●	4	84 (2.9)	●	4	98 (1.2)	○	5	96 (1.5)
Mongolia	●	3–5	--	●	3–5	--	●	3–5	--
Morocco	○	7	94 (2.2)	○	9	84 (3.3)	●	4,8	94 (2.1)
Netherlands	np	np	52 (4.0)	np	np	63 (4.4)	np	np	r 72 (3.6)
New Zealand	●	K–4	73 (2.6)	●	K–6	61 (3.0)	●	2–4	77 (2.5)
Norway	●	3–7	59 (4.3)	●	1–7	77 (3.8)	●	3–4	61 (4.1)
Qatar	●	1–6	r 75 (0.2)	●	1–6	r 77 (0.1)	●	2–6	r 61 (0.2)
Russian Federation	●	3–4	--	●	3,6–8	--	○	6–8	--
Scotland	●	3	r 70 (3.8)	●	4	r 64 (3.9)	○	1–2,5,10	r 73 (3.3)
Singapore	●	3	99 (0.7)	●	3–5	97 (1.1)	●	3	94 (1.5)
Slovak Republic	●	1–7,9	96 (1.6)	●	2–6,7,9	100 (0.1)	●	3–7,9	97 (1.3)
Slovenia	●	3–4	64 (3.6)	●	3–4	92 (1.8)	●	4	44 (3.7)
Sweden	○	–	35 (3.7)	●	1–5	53 (3.4)	●	1–5	62 (3.7)
Tunisia	○	7	86 (3.2)	●	–	78 (3.1)	○	6	48 (4.0)
Ukraine	○	6–8,10	91 (2.3)	●	4,8–9	93 (2.2)	●	4,6–7,9,11	87 (2.6)
United States	●	K–4	83 (1.8)	●	K–4,5–8	70 (2.7)	●	K–4	83 (2.1)
Yemen	●	1,2,5–10	62 (4.7)	●	1,5,10,12	92 (2.3)	●	3,6–8,10–12	62 (4.7)
International Avg.			77 (0.5)			79 (0.5)			74 (0.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Alberta, Canada	●	1–7,9–11	47 (4.1)	●	4–7,10–12	38 (4.2)	●	3,5,9,12	71 (3.6)
British Columbia, Canada	●	K–2	r 54 (4.6)	○	5	r 38 (3.7)	●	2	r 60 (4.3)
Dubai, UAE	●	1	x x	●	3	x x	●	4	x x
Massachusetts, US	●	K–5	r 75 (4.4)	●	3–8	r 55 (7.3)	●	3–5	r 83 (4.8)
Minnesota, US	●	3	r 57 (7.6)	●	4	r 65 (7.6)	●	2	r 87 (5.4)
Ontario, Canada	●	1–2	68 (4.5)	●	1–2	34 (4.4)	●	2	71 (4.3)
Quebec, Canada	●	3–4	r 77 (3.7)	●	3–4	r 53 (4.2)	●	3–4	r 68 (4.3)

● All or almost all students    ○ Only the more able students    ○ Not included in the curriculum through fourth grade

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

An "np" indicates not prescribed by the curriculum.

Exhibit 5.7 Intended and Taught\* TIMSS Life Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Life Science (11 topics)	Plant and animal reproduction			Physical features, behavior, and survival of plants and animals			Bodily actions in response to outside conditions and activities		
	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	1	72 (4.1)	●	4	48 (5.1)	●	3	49 (4.6)
Armenia	●	4	x x	●	4	x x	●	4	x x
Australia	●	3–6	35 (4.0)	●	3–6	64 (3.8)	●	3–6	63 (3.3)
Austria	●	3	48 (3.0)	●	1	79 (2.5)	●	1–4	77 (2.8)
Chinese Taipei	○	5–6	38 (4.1)	○	5–6	78 (3.3)	○	5–6	43 (4.3)
Colombia	○	6–7	89 (3.9)	●	4–5	94 (2.9)	●	4–5	91 (2.7)
Czech Republic	○	6–7	42 (4.0)	●	1–4, 6–8	83 (3.4)	●	1–4, 8, 9	72 (3.6)
Denmark	●	3–4	r 21 (4.2)	●	3–4	r 68 (4.9)	●	3–4	r 72 (3.9)
El Salvador	●	K–11	84 (2.8)	●	1–11	88 (2.7)	●	1–11	79 (3.1)
England	○	–	67 (4.2)	●	K–2,5	66 (4.2)	●	3–4	74 (3.7)
Georgia	○	6	45 (5.2)	○	8	49 (5.0)	○	6	44 (4.5)
Germany	●	5–6	42 (3.5)	●	4	65 (3.3)	●	7–9	61 (3.5)
Hong Kong SAR	○	5	48 (4.4)	○	6	57 (4.0)	●	3–6	84 (3.3)
Hungary	●	4	73 (2.8)	●	1–2	76 (3.4)	●	3	70 (3.7)
Iran, Islamic Rep. of	○	8	58 (3.9)	○	9	64 (3.8)	○	9	61 (4.2)
Italy	●	4–7	92 (1.7)	●	4–7	88 (2.2)	●	4–7	53 (3.0)
Japan	○	5,9–12	27 (3.7)	○	9–12	44 (3.8)	●	4,6,8–12	24 (3.5)
Kazakhstan	●	1	–	●	1	–	●	1	–
Kuwait	○	9,12	r 84 (3.6)	○	9	r 60 (4.5)	○	5,7,9	r 73 (3.8)
Latvia	●	3,5	71 (3.3)	●	4–5	84 (2.9)	●	1–4	71 (3.3)
Lithuania	●	4	94 (1.3)	●	4	95 (1.4)	●	4	95 (1.1)
Mongolia	●	4–5	–	●	3–6	–	●	3–6	–
Morocco	●	3–4,8	72 (3.8)	–	–	40 (4.7)	○	9	50 (3.9)
Netherlands	np	np	r 48 (4.6)	np	np	r 59 (4.5)	np	np	58 (4.7)
New Zealand	○	6–11	33 (3.0)	●	4–6	72 (2.3)	●	2–4	59 (2.8)
Norway	○	5–10	37 (4.5)	○	8–10	39 (3.9)	●	3–10	74 (3.5)
Qatar	●	1–6	r 75 (0.2)	●	1–6	r 49 (0.2)	●	1–6	r 46 (0.2)
Russian Federation	○	6–7	–	○	6–7	–	○	8	–
Scotland	○	5	r 26 (4.0)	○	5	r 56 (4.4)	○	11	r 60 (4.4)
Singapore	○	5	47 (2.7)	○	6	50 (2.9)	○	6	74 (2.4)
Slovak Republic	●	3–7,9	85 (2.4)	●	3–6,9	96 (1.5)	●	1,4,7,9	80 (3.0)
Slovenia	●	3–4	42 (3.2)	●	4–5	48 (3.2)	○	6	86 (2.5)
Sweden	●	1–5	51 (3.4)	○	6–9	53 (3.9)	○	6–9	58 (3.7)
Tunisia	●	–	75 (3.4)	○	8	47 (3.9)	○	6	68 (3.3)
Ukraine	○	6–8	89 (2.2)	●	6–7,11	89 (2.5)	●	6–8	96 (1.6)
United States	●	K–4	54 (3.2)	●	K–4	84 (2.1)	○	5–8	62 (2.7)
Yemen	●	2,3,9	54 (4.3)	●	2	33 (4.2)	●	4,7	70 (4.2)
International Avg.			58 (0.6)			66 (0.6)			66 (0.6)
<b>Benchmarking Participants</b>									
Alberta, Canada	●	4,6,9,12	41 (4.3)	●	1–9, 11–12	52 (4.4)	○	8,12	46 (4.0)
British Columbia, Canada	○	9–11	r 26 (3.5)	●	4,6,7	r 71 (3.5)	●	4	r 42 (4.1)
Dubai, UAE	●	3	x x	●	4	x x	●	3	x x
Massachusetts, US	●	K–8	r 52 (6.2)	●	3–8	r 70 (6.7)	●	K–2	r 50 (5.3)
Minnesota, US	●	3	r 44 (8.0)	●	3	r 65 (6.8)	●	2	r 56 (7.3)
Ontario, Canada	○	9–12	36 (4.5)	●	2–3	78 (3.9)	○	5	44 (4.1)
Quebec, Canada	⊙	3–6	r 46 (4.6)	●	3–4	r 59 (4.4)	●	1–2	r 51 (4.2)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.7 Intended and Taught\* TIMSS Life Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Life Science (11 topics)	Energy requirements of plants and animals			Relationships in a living community			Changes in environments		
	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	1	52 (5.0)	●	4	85 (4.6)	●	4	89 (2.7)
Armenia	●	4	x x	●	4	x x	●	4	x x
Australia	●	3-6	61 (4.0)	⊙	4-6	73 (3.9)	●	3-6	75 (3.4)
Austria	●	2	53 (3.3)	●	2	74 (2.5)	●	3	91 (1.7)
Chinese Taipei	○	7-9	36 (4.0)	○	7-9	41 (4.2)	●	3-4	74 (3.5)
Colombia	●	4-5	95 (2.7)	●	4-5	98 (1.2)	●	4-5	93 (3.3)
Czech Republic	●	4,6-7	77 (3.8)	●	4,6,8,9	86 (2.9)	●	1-4, 8-9	83 (3.0)
Denmark	●	3-4	r 69 (4.3)	●	3-4	r 72 (4.4)	●	3-4	r 58 (4.7)
El Salvador	●	3-11	86 (3.2)	●	3-11	97 (1.5)	●	3-11	93 (1.7)
England	○	-	72 (3.7)	●	5	67 (3.9)	●	3,5	57 (4.3)
Georgia	○	8	64 (4.8)	○	8	45 (4.8)	○	6	78 (4.4)
Germany	●	5-6	28 (3.3)	●	3-4	64 (3.3)	●	3-4	77 (2.6)
Hong Kong SAR	○	5-6	61 (4.5)	○	6	26 (3.8)	○	6	77 (4.0)
Hungary	●	4	51 (3.8)	●	4	96 (1.5)	●	4	96 (1.4)
Iran, Islamic Rep. of	○	6	91 (2.3)	○	8	58 (3.8)	○	8	72 (3.8)
Italy	●	4-6	87 (1.8)	○	3-8	89 (2.0)	●	3-8	83 (2.5)
Japan	○	6-8,10-12	14 (2.7)	○	9-12	10 (2.3)	○	9-12	12 (2.5)
Kazakhstan	●	1	--	●	1	--	●	1	--
Kuwait	○	7,9	r 68 (4.8)	○	6	r 93 (2.6)	○	6	r 81 (3.9)
Latvia	●	3	81 (3.2)	●	3	90 (2.3)	●	3,6	91 (2.4)
Lithuania	○	5	99 (1.0)	●	4	99 (0.5)	●	4	96 (1.3)
Mongolia	●	4-5	--	●	3-5	--	●	3-5	--
Morocco	○	7	21 (4.1)	○	5,7	82 (3.8)	●	4,7,9	62 (5.0)
Netherlands	np	np	47 (4.6)	np	np	r 68 (3.9)	np	np	r 66 (4.2)
New Zealand	○	6-8	55 (2.8)	○	6-9	70 (2.4)	⊙	4-6	71 (2.4)
Norway	○	8-10	58 (4.1)	○	8-10	72 (3.7)	○	8-10	67 (4.1)
Qatar	●	2-6	r 39 (0.2)	●	2-6	r 53 (0.2)	●	2-6	r 60 (0.2)
Russian Federation	○	6-7	--	●	3	--	●	3-4	--
Scotland	●	3	r 57 (4.2)	●	3	r 57 (4.0)	○	5	r 56 (4.4)
Singapore	○	5	91 (1.7)	○	6	52 (3.1)	○	6	74 (2.2)
Slovak Republic	●	3-7,9	84 (2.9)	●	3-7,9	99 (0.4)	●	1-9	84 (2.6)
Slovenia	●	4-5	41 (3.1)	○	5	41 (3.1)	●	3	89 (2.0)
Sweden	○	6-9	54 (3.4)	○	6-9	75 (3.0)	●	1-5	57 (4.0)
Tunisia	○	6	48 (4.0)	○	6	35 (3.9)	●	-	88 (2.5)
Ukraine	⊙	6-7	94 (1.8)	⊙	6-7	98 (1.0)	⊙	9,11	98 (1.2)
United States	●	K-4	83 (2.0)	●	K-4	87 (1.9)	●	3-4	r 75 (2.7)
Yemen	●	4-5	53 (4.5)	○	5	46 (4.6)	●	2,5,9	68 (4.4)
International Avg.			63 (0.6)			70 (0.5)			76 (0.6)
<b>Benchmarking Participants</b>									
Alberta, Canada	●	1-2,4-8,10,12	55 (4.1)	●	1,2,4-9,12	65 (3.9)	●	4-12	90 (2.3)
British Columbia, Canada	●	1	r 60 (4.0)	●	4	r 73 (4.2)	●	4	r 68 (4.6)
Dubai, UAE	●	3	x x	●	4	x x	○	5	x x
Massachusetts, US	●	3-8	r 77 (5.8)	●	3-5	r 85 (4.1)	●	3-5	r 61 (7.2)
Minnesota, US	○	-	r 65 (7.9)	●	2	r 64 (8.6)	●	4	r 59 (6.3)
Ontario, Canada	●	2	77 (4.6)	●	4	83 (3.4)	●	4	66 (4.7)
Quebec, Canada	○	5-6	r 66 (4.6)	●	3-4	r 65 (3.8)	⊙	3-6	r 81 (3.1)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.7 Intended and Taught\* TIMSS Life Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Life Science (11 topics)	Ways that common communicable diseases are transmitted			Ways of maintaining good health, including diet and exercise		
	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	5	49 (5.2)	●	3	79 (3.6)
Armenia	●	4	x x	●	4	x x
Australia	○	4-12	30 (3.5)	⊙	3-4	89 (2.1)
Austria	●	1-4	81 (2.2)	●	1	96 (1.1)
Chinese Taipei	○	7-9	33 (3.9)	●	4-6	56 (4.2)
Colombia	○	6-7	77 (4.7)	●	4-5	93 (2.2)
Czech Republic	●	4-5,8-9	67 (3.6)	●	4-5,8-9	80 (2.9)
Denmark	●	3-4	r 26 (4.3)	●	3-4	r 78 (3.8)
El Salvador	●	1-9	97 (1.5)	●	1-9	98 (1.4)
England	○	-	42 (4.2)	●	1-5	90 (2.2)
Georgia	○	9	56 (4.5)	○	6	58 (4.7)
Germany	●	7-9	48 (3.7)	●	6	89 (1.8)
Hong Kong SAR	●	4	89 (3.0)	●	4	98 (1.2)
Hungary	●	4	89 (2.5)	●	3-4	94 (2.0)
Iran, Islamic Rep. of	○	8	51 (4.1)	●	1-4	74 (3.1)
Italy	○	5-8	24 (3.1)	○	5-8	57 (3.4)
Japan	○	-	19 (3.3)	○	-	41 (4.2)
Kazakhstan	○	-	-	●	1	-
Kuwait	●	3,7	r 68 (4.5)	○	7	r 82 (3.9)
Latvia	●	4	r 77 (3.5)	●	1,3-4	95 (2.0)
Lithuania	○	6	90 (1.9)	●	4	97 (1.1)
Mongolia	●	1-5	-	●	1-5	-
Morocco	○	7	19 (3.5)	○	9	62 (4.7)
Netherlands	np	np	50 (4.3)	np	np	90 (2.4)
New Zealand	●	K-12	49 (2.8)	●	K-12	90 (1.8)
Norway	●	3-10	86 (2.7)	○	5-10	87 (2.5)
Qatar	●	3-6	r 52 (0.2)	●	3-6	r 72 (0.2)
Russian Federation	●	3-4	-	●	3-4	-
Scotland	○	11	r 39 (4.6)	●	-	r 93 (2.3)
Singapore	○	6	22 (1.9)	●	1-6	47 (3.0)
Slovak Republic	●	1-4,7,9	88 (2.5)	●	1-4,7	85 (2.9)
Slovenia	●	3	71 (2.8)	●	2,3,6	96 (1.4)
Sweden	○	-	40 (3.6)	●	1-5	78 (3.2)
Tunisia	●	-	92 (2.0)	●	-	79 (3.5)
Ukraine	●	7-8,10	100 (0.4)	●	7-10	99 (0.6)
United States	●	K-4	48 (3.4)	●	K-4	68 (2.9)
Yemen	●	2,6-8	54 (4.4)	●	3,5	74 (3.4)
International Avg.			58 (0.6)			81 (0.5)
<b>Benchmarking Participants</b>						
Alberta, Canada	○	-	46 (4.2)	○	-	77 (3.8)
British Columbia, Canada	○	11	r 30 (4.1)	○	5	r 81 (3.0)
Dubai, UAE	○	7	x x	●	1	x x
Massachusetts, US	○	-	r 39 (7.2)	○	-	r 64 (7.4)
Minnesota, US	●	4	r 63 (7.7)	○	-	r 83 (5.7)
Ontario, Canada	○	-	34 (4.6)	○	5	85 (3.1)
Quebec, Canada	○	9	r 43 (4.3)	○	5-6	r 75 (3.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

Exhibit 5.8 Intended and Taught\* TIMSS Physical Science Topics

TIMSS2007  
Science 4<sup>th</sup> Grade

Physical Science (14 topics)	Classification of objects and materials based on physical properties			Properties and uses of metals			Forming and separating mixtures		
	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	1	66 (5.4)	●	4	40 (4.9)	●	2	41 (4.3)
Armenia	●	4	x x	●	4	x x	●	4	x x
Australia	●	3-4	44 (3.8)	⊙	4-6	14 (3.0)	○	7-8	20 (3.4)
Austria	●	2	57 (3.5)	●	varies	45 (2.9)	●	3	24 (2.9)
Chinese Taipei	●	3-4	40 (4.3)	○	7-9	30 (3.9)	●	3-4	25 (3.9)
Colombia	●	1-3	73 (4.6)	●	-	51 (4.2)	●	4-5	78 (4.2)
Czech Republic	●	1-4,6-7	68 (3.8)	●	4,7	20 (2.7)	○	8-9	11 (2.3)
Denmark	●	3-4	r 46 (4.7)	○	5-6	r 27 (3.3)	●	3-4	r 24 (2.3)
El Salvador	○	5-11	53 (4.0)	○	6-11	26 (3.4)	○	6-11	29 (3.7)
England	●	K-4	94 (1.8)	○	-	75 (3.4)	●	3	67 (4.1)
Georgia	○	6	17 (3.5)	○	7	6 (2.1)	○	6	4 (1.9)
Germany	●	1-2	51 (3.3)	●	1-2	27 (3.3)	○	3-4	24 (3.2)
Hong Kong SAR	●	2	41 (4.6)	○	5	37 (4.3)	○	7	15 (3.2)
Hungary	●	2	74 (3.5)	●	2	36 (3.5)	●	1-4	33 (4.0)
Iran, Islamic Rep. of	○	6	59 (3.9)	○	6	36 (3.9)	●	4	97 (1.3)
Italy	●	3-6	79 (2.9)	●	3-6	47 (3.5)	●	3,6,8	62 (3.4)
Japan	●	3-12	30 (4.0)	●	3-4,6-12	58 (3.7)	○	5-7,10-12	2 (1.1)
Kazakhstan	○	5	--	●	4	--	○	5	--
Kuwait	○	5-8	r 62 (4.7)	○	6,8,10	r 20 (3.8)	○	6-7	r 28 (4.3)
Latvia	●	1	88 (2.8)	●	1	63 (4.2)	○	-	43 (3.9)
Lithuania	●	4	53 (4.3)	○	9	48 (3.7)	○	5	13 (2.6)
Mongolia	●	5	--	●	5	--	●	5	--
Morocco	○	9	68 (4.2)	○	9	r 21 (3.6)	○	5,7	r 10 (2.4)
Netherlands	np	np	r 17 (3.9)	np	np	r 12 (3.0)	np	np	r 6 (2.0)
New Zealand	●	K-6	56 (3.0)	⊙	4-6	23 (2.3)	●	2-6	38 (2.7)
Norway	●	1-10	16 (2.4)	○	-	12 (2.7)	○	8-10	3 (1.3)
Qatar	●	1-4	r 59 (0.2)	●	4-6	r 41 (0.2)	●	4-6	r 15 (0.1)
Russian Federation	●	3-4	--	○	8	--	○	8	--
Scotland	●	1	r 63 (4.2)	○	8	r 25 (3.4)	●	5	r 43 (4.6)
Singapore	●	3,4,6	95 (1.1)	●	3,6	63 (2.7)	○	7	16 (2.4)
Slovak Republic	●	3-4,6	84 (3.0)	●	3,6,8	55 (3.3)	●	3	35 (3.5)
Slovenia	●	4-5	79 (2.5)	●	4	51 (3.1)	●	4	84 (2.8)
Sweden	○	-	29 (3.9)	○	6-9	20 (3.2)	○	-	25 (3.4)
Tunisia	○	7	91 (2.2)	●	4-6	61 (4.1)	○	8	22 (3.5)
Ukraine	○	7	69 (3.6)	○	8-9	42 (3.7)	○	8-9	24 (3.3)
United States	●	K-4	74 (2.5)	○	5-8	39 (3.0)	●	K-4	37 (2.8)
Yemen	●	4,7,9	44 (5.0)	●	4-7	39 (4.5)	○	7-9	24 (4.4)
International Avg.			59 (0.6)			37 (0.6)			31 (0.6)
<b>Benchmarking Participants</b>									
Alberta, Canada	●	1-7,9-10	48 (4.0)	●	2,5,11-12	17 (2.8)	●	1-2,5,7,10	10 (2.4)
British Columbia, Canada	●	K,2	r 41 (4.7)	○	5	r 12 (2.5)	○	7	r 16 (3.4)
Dubai, UAE	●	4	s 59 (4.3)	○	6	x x	●	4	s 28 (4.6)
Massachusetts, US	●	K-5	r 80 (4.1)	●	3-5	r 35 (6.1)	○	6-8	r 27 (6.4)
Minnesota, US	●	1-2	r 56 (8.9)	○	-	16 (5.3)	○	-	30 (7.9)
Ontario, Canada	●	1	50 (5.0)	●	1	23 (4.5)	○	7	15 (3.6)
Quebec, Canada	○	5-6	r 40 (4.7)	○	5-6	r 17 (3.1)	○	7-8	r 37 (4.7)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

(i) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An

"s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

An "np" indicates not prescribed by the curriculum.



Exhibit 5.8 Intended and Taught\* TIMSS Physical Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Physical Science (14 topics)	Properties and uses of water			States of matter and differences in their physical properties			Changes in state of matter by heating and cooling			
	Country	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	4	90 (2.6)	●	1–5	96 (1.6)	●	1	95 (1.9)	
Armenia	●	4	x x	●	4	x x	●	4	x x	
Australia	●	4–8	60 (4.6)	●	3–6	45 (4.0)	●	3–6	59 (4.2)	
Austria	●	3	91 (2.0)	●	3	69 (2.8)	●	3	76 (2.9)	
Chinese Taipei	●	3–4	85 (2.9)	●	3–4	70 (3.3)	●	3–4	68 (3.6)	
Colombia	●	1–3	94 (2.3)	●	1–3	90 (3.3)	●	4–5	78 (3.9)	
Czech Republic	●	1–4	89 (2.5)	●	1–3, 6–7	83 (2.9)	●	4, 6–7	84 (2.7)	
Denmark	●	1–2	r 79 (4.2)	●	3–4	r 50 (4.8)	●	1–2	r 67 (4.5)	
El Salvador	●	1–11	93 (2.2)	○	4–11	86 (3.1)	○	6–11	67 (4.5)	
England	●	K–5	78 (3.4)	●	K–5	90 (2.6)	●	4	91 (2.2)	
Georgia	●	2–3	68 (4.9)	○	7	38 (4.4)	○	6	51 (4.4)	
Germany	●	3–4	86 (2.4)	●	3–4	75 (3.1)	●	3–4	83 (2.8)	
Hong Kong SAR	●	4	95 (1.8)	○	7	84 (3.1)	○	7	82 (3.2)	
Hungary	●	1,3	90 (3.0)	●	3	92 (3.0)	●	3	92 (2.3)	
Iran, Islamic Rep. of	●	3	75 (3.9)	●	2	86 (2.9)	●	3	65 (3.5)	
Italy	●	3–4, 6, 8	95 (1.3)	●	3–4, 6, 8	94 (1.6)	●	3–4, 6, 8	93 (1.5)	
Japan	●	4, 7, 10–12	74 (3.6)	●	4, 7, 10–12	85 (3.1)	●	4, 7, 10–12	86 (2.9)	
Kazakhstan	●	2	--	●	4	--	●	3	--	
Kuwait	●	3–4	r 95 (2.0)	○	5, 7	r 78 (4.2)	○	5, 7, 9	r 93 (2.6)	
Latvia	●	2	98 (1.3)	●	2	96 (1.5)	●	2, 4	58 (3.9)	
Lithuania	●	4	96 (1.5)	●	4	59 (3.8)	○	6	84 (2.5)	
Mongolia	●	3–5	--	●	5	--	●	5–6	--	
Morocco	●	1, 4, 7	91 (2.0)	●	2–3, 7	97 (1.2)	●	4, 7	97 (1.4)	
Netherlands	np	np	r 73 (4.2)	np	np	r 28 (4.5)	np	np	r 53 (4.3)	
New Zealand	●	2–6	58 (3.0)	⊙	2–6	50 (3.4)	●	2–4	58 (3.1)	
Norway	●	1–10	75 (3.7)	○	5–10	34 (4.1)	○	5–10	79 (3.1)	
Qatar	●	1–6	r 59 (0.2)	●	1–6	r 87 (0.1)	●	2–6	r 86 (0.2)	
Russian Federation	●	3–4	--	●	3	--	●	3	--	
Scotland	●	3	r 72 (3.8)	●	4	r 58 (4.5)	●	3	r 70 (4.1)	
Singapore	●	4	95 (1.1)	●	4	100 (0.1)	●	4	99 (0.5)	
Slovak Republic	●	3–4, 6–7	94 (2.0)	●	3, 8	93 (1.7)	●	3, 8	85 (2.8)	
Slovenia	●	2, 5	92 (1.9)	●	2, 4	77 (2.9)	●	4	75 (3.0)	
Sweden	●	1–5	76 (3.5)	●	1–5	49 (3.6)	●	1–5	55 (3.9)	
Tunisia	●	4–6	46 (3.9)	●	4–6	89 (2.4)	●	4–6	86 (2.7)	
Ukraine	●	4–7	99 (0.8)	●	4–5, 7	97 (1.4)	⊙	2–3, 8	88 (2.5)	
United States	●	K–4	72 (2.6)	●	K–4	81 (2.4)	●	K–4	81 (2.4)	
Yemen	●	2, 3, 8	67 (4.4)	●	3, 6–7	94 (2.4)	●	3, 6–7	92 (2.6)	
International Avg.			82 (0.5)			76 (0.5)			78 (0.5)	
<b>Benchmarking Participants</b>										
Alberta, Canada	●	2, 5, 7, 10–11	47 (4.5)	●	1–2, 5, 11	34 (3.5)	●	2, 5, 7, 10	39 (4.2)	
British Columbia, Canada	●	2	r 60 (3.8)	●	2	r 56 (3.9)	●	2	r 62 (4.1)	
Dubai, UAE	○	6	s 58 (5.9)	●	4	s 84 (2.4)	●	3	s 75 (3.7)	
Massachusetts, US	○	9–10	r 57 (7.2)	●	K–5	r 58 (7.2)	●	3–5	r 68 (7.2)	
Minnesota, US	●	3	69 (7.2)	●	2	82 (5.5)	●	4	79 (5.5)	
Ontario, Canada	●	2	38 (4.8)	●	2	43 (5.0)	○	5	38 (4.6)	
Quebec, Canada	⊙	7–8	r 85 (2.9)	●	3–4	r 62 (4.3)	○	9	r 70 (4.3)	

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.8 Intended and Taught\* TIMSS Physical Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Physical Science (14 topics)	Familiar changes in materials			Common energy sources/forms and their practical uses			Heat flow and temperature		
	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	5	32 (4.0)	○	5	47 (4.7)	●	4	42 (4.7)
Armenia	●	4	x x	●	4	x x	●	4	x x
Australia	●	4–8	41 (4.8)	●	3–8	61 (3.4)	●	3–6	34 (3.5)
Austria	●	2	40 (3.2)	●	4	82 (2.4)	●	2	72 (2.7)
Chinese Taipei	○	5–6	48 (3.6)	●	3–4	85 (3.1)	○	5–6	60 (4.1)
Colombia	●	4–5	62 (5.3)	●	4–5	52 (5.3)	●	4–5	63 (4.5)
Czech Republic	●	4,6–7	51 (3.5)	○	5,8–9	48 (4.2)	●	4,8–9	39 (3.9)
Denmark	●	3–4	r 43 (5.4)	●	3–4	r 68 (4.3)	●	1–2	r 58 (4.7)
El Salvador	○	6–11	55 (4.2)	●	1–11	60 (3.7)	○	4–11	56 (4.2)
England	●	1,4	58 (3.5)	○	–	46 (4.0)	●	1,3–5	56 (4.1)
Georgia	○	7	34 (4.2)	○	9	38 (4.8)	○	9	45 (4.7)
Germany	●	3–4	30 (3.2)	●	3–4	62 (3.3)	●	1–4	70 (3.7)
Hong Kong SAR	○	7	67 (3.7)	●	4	56 (4.7)	●	3	55 (4.4)
Hungary	●	3	58 (3.8)	○	5–6	67 (4.3)	●	3–5	67 (3.7)
Iran, Islamic Rep. of	○	5	24 (3.4)	●	3	70 (3.8)	●	3	67 (4.1)
Italy	●	3–8	60 (3.1)	○	4–8	46 (3.3)	●	4–8	44 (3.7)
Japan	●	4–12	5 (1.9)	○	9–12	32 (3.7)	●	4,9–12	81 (3.2)
Kazakhstan	○	8	–	●	3	–	●	3	–
Kuwait	○	6–7	r 45 (4.7)	●	2–4,8	r 76 (4.1)	●	2,5,7	r 43 (4.3)
Latvia	○	5	68 (4.2)	●	3,6	93 (2.3)	●	1	82 (2.9)
Lithuania	●	4	76 (3.0)	●	4	97 (1.1)	○	5–6	87 (2.5)
Mongolia	●	5–6	–	●	5–6	–	●	5–6	–
Morocco	○	9	r 14 (2.9)	○	6,9	42 (4.2)	●	3–4,7	47 (4.1)
Netherlands	np	np	r 35 (4.5)	np	np	r 72 (3.6)	np	np	61 (4.2)
New Zealand	●	K–11	42 (3.0)	○	6–8	52 (3.3)	⊙	4–8	33 (2.6)
Norway	○	5–10	42 (4.5)	○	5–10	59 (4.4)	○	5–10	51 (4.1)
Qatar	●	4–6	r 20 (0.1)	●	2–6	r 51 (0.2)	●	2–6	r 24 (0.2)
Russian Federation	○	6–7	–	○	6–7	–	●	3–4	–
Scotland	○	5	r 37 (4.2)	●	2,5	r 57 (4.1)	○	7	r 21 (3.1)
Singapore	○	8	35 (2.5)	○	6	74 (2.6)	●	4	98 (0.7)
Slovak Republic	●	3–4,8–9	77 (3.2)	●	3–4,6,8	92 (2.1)	●	3,6,8–9	66 (3.9)
Slovenia	●	3,5	46 (3.2)	●	4	81 (2.4)	○	5	49 (3.3)
Sweden	●	1–5	33 (3.7)	○	6–9	43 (4.2)	○	6–9	61 (3.7)
Tunisia	○	8	28 (4.3)	●	4–6	84 (3.0)	●	4–6	66 (4.1)
Ukraine	○	7–9	86 (2.7)	○	7–8	88 (2.4)	●	4,8	79 (3.1)
United States	○	5–8	60 (3.1)	●	K–4	73 (2.8)	●	K–4	52 (3.3)
Yemen	○	6–7	44 (4.1)	●	2,4–7,9	76 (4.0)	○	5–7,9	64 (4.4)
International Avg.			45 (0.7)			65 (0.6)			57 (0.6)
<b>Benchmarking Participants</b>									
Alberta, Canada	●	4–5	60 (4.2)	○	5,9–12	69 (3.8)	●	2,5,7,10–12	31 (4.2)
British Columbia, Canada	●	2	r 28 (3.4)	●	3–5	r 38 (4.6)	○	8	r 45 (4.7)
Dubai, UAE	○	6	x x	●	3	s 48 (4.0)	○	7	s 18 (2.4)
Massachusetts, US	○	6–10	r 49 (7.8)	○	–	r 58 (8.0)	○	6–10	r 29 (6.1)
Minnesota, US	●	4	40 (7.9)	○	–	44 (7.4)	●	4	44 (8.7)
Ontario, Canada	○	5	41 (5.1)	●	1	40 (4.8)	○	7	20 (3.9)
Quebec, Canada	○	5–6	r 22 (3.5)	○	5–6	r 48 (5.1)	⊙	7–8	r 23 (4.2)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.8 Intended and Taught\* TIMSS Physical Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Physical Science (14 topics)	Common sources of light and related phenomena			Production of sound by vibrations			Electrical circuits			
	Country	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	4	30 (4.5)	○	–	17 (3.7)	●	1	93 (2.2)	
Armenia	●	4	x x	●	4	x x	●	4	x x	
Australia	●	3–8	22 (3.4)	⊙	5–8	39 (4.1)	⊙	6–8	25 (3.1)	
Austria	○	–	41 (2.7)	○	–	23 (2.4)	●	3	58 (3.2)	
Chinese Taipei	●	3–4	88 (2.5)	○	5–6	27 (3.8)	●	3–4	80 (3.4)	
Colombia	●	1–3	46 (5.6)	●	1–3	53 (5.3)	●	4–5	21 (4.2)	
Czech Republic	○	6–7	8 (2.7)	○	8–9	2 (1.7)	○	8–9	2 (1.3)	
Denmark	●	3–4	r 32 (5.1)	●	3–4	r 31 (4.5)	●	3–4	r 63 (4.4)	
El Salvador	○	4–11	50 (4.4)	○	6–11	36 (3.7)	○	7–11	23 (3.4)	
England	●	K,2	69 (3.6)	●	K,4–5	81 (3.2)	●	1,3,5	81 (3.2)	
Georgia	○	9	34 (4.2)	○	9	11 (2.6)	○	9	1 (0.9)	
Germany	●	1–2	37 (3.3)	●	3–4	28 (3.1)	●	3–4	54 (3.6)	
Hong Kong SAR	●	4	54 (5.0)	●	4	51 (4.6)	○	5	33 (4.1)	
Hungary	●	1–4	41 (4.1)	○	11	9 (2.3)	○	7–8	5 (1.5)	
Iran, Islamic Rep. of	○	5	73 (3.4)	●	2	58 (3.5)	●	4	98 (0.9)	
Italy	●	5–8	24 (2.7)	●	5–8	22 (3.0)	●	5–8	9 (2.0)	
Japan	●	3,7,10–12	28 (4.1)	●	3,7,10–12	6 (1.8)	●	3–4,8,10–12	87 (2.7)	
Kazakhstan	○	5	–	○	5	–	○	8	–	
Kuwait	●	2,5,8,12	r 49 (4.2)	●	2,7,12	r 31 (4.4)	●	3,7,12	r 52 (4.8)	
Latvia	●	3–4	80 (3.4)	●	4	73 (3.3)	●	3	26 (4.0)	
Lithuania	○	6	58 (4.2)	○	5	45 (3.7)	●	4	82 (2.6)	
Mongolia	●	5–6	–	●	4–6	–	●	6	–	
Morocco	●	1,3,5,7–8	32 (4.0)	●	2,12	38 (4.0)	●	3–4,6–8	92 (2.7)	
Netherlands	np	np	r 29 (4.3)	np	np	r 29 (3.4)	np	np	r 11 (2.8)	
New Zealand	●	2–6	38 (3.1)	●	2–6	38 (3.4)	●	2–6	44 (3.0)	
Norway	●	1–10	54 (4.7)	●	3–7	24 (3.3)	○	8–10	2 (0.8)	
Qatar	●	2–6	r 45 (0.2)	●	2–6	r 45 (0.2)	●	3–6	r 69 (0.2)	
Russian Federation	○	8	–	○	9	–	○	8	–	
Scotland	●	4	r 56 (3.5)	●	4	r 60 (4.1)	●	3,5	r 52 (4.1)	
Singapore	●	4	77 (2.6)	○	8	8 (1.7)	○	5	10 (1.7)	
Slovak Republic	○	8	35 (3.7)	○	9	9 (2.3)	●	4,6,8	95 (1.7)	
Slovenia	●	3	47 (3.4)	●	3	25 (3.1)	●	4	84 (2.8)	
Sweden	●	1–5	10 (2.3)	●	1–5	12 (2.6)	●	1–5	19 (3.5)	
Tunisia	○	5	19 (3.2)	○	8	16 (2.8)	○	5	23 (3.2)	
Ukraine	○	8,11	57 (3.8)	○	8	16 (2.8)	○	8	13 (2.7)	
United States	●	K–4	42 (3.0)	●	K–4	49 (2.8)	○	5–8	67 (3.0)	
Yemen	●	2,4,6–8	65 (4.7)	●	4,7	71 (4.6)	○	8–9	30 (4.4)	
International Avg.			45 (0.7)			33 (0.6)			46 (0.5)	
<b>Benchmarking Participants</b>										
Alberta, Canada	●	4,8,12	81 (3.3)	●	3,11	75 (3.3)	○	5,9,12	7 (2.1)	
British Columbia, Canada	●	4	r 64 (4.5)	●	4	r 67 (4.1)	○	6	r 10 (2.5)	
Dubai, UAE	●	4	s 39 (3.1)	○	8	s 23 (2.7)	●	4	s 33 (2.7)	
Massachusetts, US	●	3–5	r 31 (6.9)	●	3–5	r 54 (8.0)	●	3–5	r 73 (6.5)	
Minnesota, US	●	3	33 (8.8)	●	3	r 44 (6.9)	●	4	71 (7.3)	
Ontario, Canada	●	4	74 (4.0)	○	6	76 (4.3)	○	6	12 (3.2)	
Quebec, Canada	○	–	r 22 (3.9)	⊙	3–4	r 30 (4.6)	○	5–6	r 8 (2.2)	

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.8 Intended and Taught\* TIMSS Physical Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Physical Science (14 topics)	Magnets			Forces that cause objects to move		
	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	4	39 (5.1)	○	–	31 (4.7)
Armenia	●	4	x x	●	4	x x
Australia	○	4	36 (3.3)	●	3–4	54 (3.8)
Austria	●	3	79 (2.6)	●	3	32 (3.1)
Chinese Taipei	○	5–6	73 (3.6)	○	5–6	59 (4.1)
Colombia	●	1–3	38 (5.2)	●	4–5	65 (4.9)
Czech Republic	●	4–5,8–9	56 (4.4)	○	6–7	17 (2.6)
Denmark	●	3–4	r 61 (4.1)	●	1–2	r 43 (4.0)
El Salvador	○	7–11	25 (3.9)	○	6–11	40 (3.9)
England	●	2	80 (2.9)	●	K–5	71 (3.9)
Georgia	○	8	21 (4.3)	○	8	9 (2.6)
Germany	●	1–2	53 (3.7)	○	9	20 (2.9)
Hong Kong SAR	○	8	44 (5.1)	○	6	27 (4.1)
Hungary	●	3	70 (4.3)	○	7–8	12 (2.5)
Iran, Islamic Rep. of	●	4	98 (1.2)	●	2	65 (3.8)
Italy	●	5–8	11 (2.3)	●	6–8	21 (2.8)
Japan	●	3	93 (1.9)	○	5,7,9–12	5 (1.6)
Kazakhstan	○	5	–	○	7	–
Kuwait	●	3,5,7,12	r 93 (2.6)	●	2,7–8	r 93 (2.6)
Latvia	●	3–4	88 (2.9)	●	3	33 (3.7)
Lithuania	●	4	32 (3.5)	○	5	19 (2.9)
Mongolia	●	5–6	–	●	5–6	–
Morocco	○	8	20 (3.2)	○	9	7 (2.4)
Netherlands	np	np	r 26 (4.3)	np	np	r 25 (3.8)
New Zealand	●	K–6	33 (2.7)	⊙	2–6	43 (2.9)
Norway	○	5–10	19 (3.2)	○	8–10	49 (4.2)
Qatar	●	3–6	r 71 (0.2)	○	1–3	r 48 (0.2)
Russian Federation	○	8	–	○	7	–
Scotland	●	3	r 52 (4.8)	●	2,6	r 55 (4.4)
Singapore	●	3	92 (1.6)	○	6	14 (1.8)
Slovak Republic	●	4,6,8	91 (2.2)	●	4,6–8	94 (1.5)
Slovenia	●	4	83 (2.8)	●	4	68 (3.0)
Sweden	●	1–5	16 (3.1)	○	–	9 (2.3)
Tunisia	○	6	21 (3.4)	●	4–6	54 (3.9)
Ukraine	○	8	41 (3.8)	○	7	27 (3.6)
United States	●	K–4	71 (3.0)	●	K–4	68 (2.9)
Yemen	●	3,9	54 (4.4)	●	3,6,8	43 (4.7)
International Avg.			54 (0.6)			40 (0.6)
<b>Benchmarking Participants</b>						
Alberta, Canada	●	2,5,9,12	52 (4.3)	●	2,7–8,10–12	63 (4.4)
British Columbia, Canada	●	2,6	r 36 (4.1)	○	5	r 26 (3.4)
Dubai, UAE	●	3	s 43 (3.3)	●	3	s 56 (4.2)
Massachusetts, US	●	3–5	r 74 (5.8)	○	6–8	r 59 (5.6)
Minnesota, US	●	1	74 (7.3)	●	1,4	61 (8.6)
Ontario, Canada	●	3	68 (3.7)	●	3	52 (4.3)
Quebec, Canada	○	5–6	r 25 (4.1)	○	5–6	r 37 (3.9)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



In earth science at the fourth grade (Exhibit 5.9), about two-thirds of the countries included topics on Earth's structure, physical characteristics, and resources, and within this area, 45 percent of students were taught about rocks, minerals, and soil; 66 percent about water on earth; 68 percent about air; 60 percent about common features of Earth's landscape; and 58 percent about the use and conservation of Earth's natural resources. Topics on Earth's processes and cycles were covered by about three-fourths of the countries, with 79 percent of students taught about the water cycle and 73 percent about weather conditions from day to day or over the seasons. Earth's history was less well covered—animal and plant fossils were in the curriculum of only about one-fourth of the countries and taught to 24 percent of students. About two-thirds of the countries included topics on Earth in the solar system and Earth's rotation on its axis, and these topics were taught to 59 percent and 67 percent of students, respectively.

Exhibit 5.9 Intended and Taught\* TIMSS Earth Science Topics

TIMSS2007  
Science 4<sup>th</sup> Grade

Earth Science (10 topics)	Rocks, minerals, sand, and soil			Water on earth			Air		
	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	3	76 (3.9)	●	4	80 (3.8)	●	4	85 (3.2)
Armenia	●	4	x x	●	4	x x	●	4	x x
Australia	●	3–5	31 (4.6)	●	3–5	61 (4.4)	○	5–6	33 (4.3)
Austria	●	4	43 (3.2)	●	varies	92 (1.6)	●	3	71 (2.6)
Chinese Taipei	○	5–6	16 (3.5)	○	5–6	47 (4.3)	●	3–6	59 (4.3)
Colombia	○	6–7	67 (4.7)	○	6–7	64 (4.7)	○	6–7	76 (4.5)
Czech Republic	●	1–4,8,9	86 (2.6)	●	1–4, 8, 9	91 (2.3)	●	1–4, 8–9	90 (2.0)
Denmark	●	3–4	r 35 (4.3)	●	1–2	r 66 (4.3)	●	3–4	r 62 (4.9)
El Salvador	○	6–9	73 (4.0)	○	–	61 (4.5)	○	–	70 (3.7)
England	●	2	77 (3.6)	●	2,4	66 (3.9)	●	4	68 (3.5)
Georgia	○	6	60 (5.0)	○	6	78 (4.5)	○	7	74 (4.4)
Germany	○	10	28 (3.1)	●	1–2	78 (3.1)	○	1–4	70 (3.4)
Hong Kong SAR	●	4	28 (4.3)	●	4	50 (4.7)	○	5	91 (2.2)
Hungary	○	5	46 (3.9)	●	4–6	71 (4.1)	○	5	62 (4.3)
Iran, Islamic Rep. of	●	4	84 (3.1)	○	6	58 (4.3)	○	6	62 (4.1)
Italy	●	4–8	51 (3.0)	○	3–6	84 (2.5)	●	4–6,7	81 (2.4)
Japan	○	6,7,10–12	1 (0.7)	○	5,8,10–12	36 (3.5)	●	4,7,10–12	19 (3.1)
Kazakhstan	●	3	–	●	2	–	●	4	–
Kuwait	○	5–6,9,11	r 28 (4.1)	○	11	r 83 (3.5)	●	1,7	r 86 (3.4)
Latvia	●	1	95 (2.1)	●	1	93 (2.2)	●	3	92 (2.3)
Lithuania	○	8	48 (3.7)	●	4	91 (2.0)	○	6	84 (3.2)
Mongolia	●	3–4,6	–	●	5–6	–	●	5–6	–
Morocco	○	7–8	10 (2.2)	○	7	57 (4.5)	○	6	r 75 (4.1)
Netherlands	np	np	32 (4.4)	np	np	69 (4.1)	np	np	43 (4.6)
New Zealand	⊙	2–6	31 (2.8)	●	2–6	52 (3.4)	⊙	4–9	31 (2.6)
Norway	○	5–10	17 (2.6)	○	–	49 (4.0)	●	3–7	53 (3.7)
Qatar	○	5–6	r 15 (0.1)	●	1,2,6	r 49 (0.2)	●	1,2,4	r 59 (0.2)
Russian Federation	●	2–4	–	●	2–4	–	●	3,6	–
Scotland	○	6	r 16 (2.9)	○	–	r 46 (3.9)	○	8	r 28 (3.4)
Singapore	○	7	3 (1.0)	○	7,9	48 (2.9)	○	7	88 (1.9)
Slovak Republic	●	3–4,6,8–9	91 (2.3)	●	3–4,5–9	91 (2.5)	●	4,6,9	99 (0.8)
Slovenia	○	6	40 (3.7)	●	4–5	63 (3.0)	●	3,5	67 (2.9)
Sweden	○	6–9	24 (2.9)	○	6–9	68 (3.9)	○	6–9	56 (4.1)
Tunisia	○	7	17 (2.8)	○	7	28 (3.4)	●	–	84 (3.1)
Ukraine	●	4–7	99 (0.7)	●	4–7	99 (0.8)	●	4–7	95 (1.5)
United States	●	K–4	79 (2.2)	●	K–4	83 (1.9)	○	5–8	63 (2.7)
Yemen	●	3,5–6,11	50 (4.4)	○	5,8	38 (4.8)	●	4,7	79 (3.7)
International Avg.			45 (0.6)			66 (0.6)			68 (0.6)
<b>Benchmarking Participants</b>									
Alberta, Canada	●	3,7,11	78 (3.3)	○	8,10	38 (3.6)	○	5–6,11–12	28 (3.4)
British Columbia, Canada	●	K, 2	r 38 (4.4)	●	K,2	r 60 (4.7)	●	2	r 54 (4.2)
Dubai, UAE	●	4	x x	●	3	s 55 (5.0)	●	1	s 47 (4.9)
Massachusetts, US	●	3–5	r 81 (6.5)	●	3–5	r 75 (4.5)	○	–	r 42 (7.0)
Minnesota, US	●	2	62 (7.1)	●	3	67 (8.4)	○	–	50 (9.4)
Ontario, Canada	●	4	69 (4.6)	○	8	40 (4.9)	●	4,6	35 (4.4)
Quebec, Canada	○	5–6	r 39 (4.7)	●	3–4	r 50 (4.8)	⊙	3–4	r 49 (4.3)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

(i) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students. An “x” indicates data are available for less than 50% of the students.

An “np” indicates not prescribed by the curriculum.

Exhibit 5.9 Intended and Taught\* TIMSS Earth Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Earth Science (10 topics)	Common features of Earth's landscape and relationship to human use			Use and conservation of Earth's natural resources			Earth's water cycle			
	Country	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	3-4	79 (3.7)	○	5	62 (4.5)	●	2	89 (2.7)	
Armenia	●	4	x x	●	4	x x	●	4	x x	
Australia	●	3-4	57 (3.8)	●	3-6	56 (4.2)	○	5-6	73 (3.7)	
Austria	●	3	61 (3.1)	○	-	57 (3.1)	●	3	95 (1.3)	
Chinese Taipei	●	3-4	34 (4.4)	●	3-6	71 (3.1)	●	3-4	58 (3.6)	
Colombia	●	4-5	81 (4.4)	○	6-7	93 (2.3)	○	6-7	88 (3.4)	
Czech Republic	●	1-4, 8-9	65 (3.9)	●	4-5, 8-9	69 (3.8)	●	4, 8-9	81 (2.9)	
Denmark	●	3-4	r 53 (5.5)	●	3-4	r 50 (5.1)	●	1-2	r 71 (3.9)	
El Salvador	○	-	86 (2.9)	●	1-11	99 (1.0)	○	6-9	73 (3.8)	
England	○	-	55 (4.1)	●	1, 5	42 (4.1)	●	2, 4	88 (2.6)	
Georgia	●	2-3	77 (4.3)	○	6	56 (5.0)	○	6	75 (4.5)	
Germany	●	3-4	53 (3.5)	●	3-4	28 (3.3)	●	3-4	88 (2.2)	
Hong Kong SAR	●	4	77 (3.7)	●	4	64 (4.0)	●	4	89 (2.9)	
Hungary	●	4-6	90 (2.9)	○	5-6	55 (3.9)	○	5	97 (1.3)	
Iran, Islamic Rep. of	○	6	81 (3.2)	●	4	72 (3.9)	○	6	78 (3.1)	
Italy	●	4-8	79 (2.9)	●	4, 7-8	71 (3.3)	●	3-6	97 (1.0)	
Japan	●	4, 7, 10-12	11 (2.6)	○	9-12	4 (1.5)	○	5, 8, 10-12	41 (4.0)	
Kazakhstan	●	4	--	●	4	--	●	4	--	
Kuwait	○	9	r 49 (4.9)	○	5-6, 11	r 60 (4.4)	●	4, 9	r 89 (3.2)	
Latvia	○	7-9	87 (3.0)	●	3-4	87 (2.8)	●	1-2	97 (1.5)	
Lithuania	●	4	85 (2.9)	●	4	74 (3.2)	●	4	97 (1.2)	
Mongolia	●	3-4	--	●	5-6	--	●	4-5	--	
Morocco	○	7	17 (3.2)	○	7	r 41 (4.2)	○	7	r 52 (4.8)	
Netherlands	np	np	62 (3.9)	np	np	34 (4.4)	np	np	84 (3.3)	
New Zealand	●	2-4	55 (3.0)	○	8-10	61 (2.9)	●	4-6	64 (2.7)	
Norway	○	5-10	66 (3.7)	○	8-10	51 (4.2)	●	3-7	78 (3.3)	
Qatar	●	2, 5	r 23 (0.1)	●	2, 4-6	r 33 (0.2)	●	4	r 63 (0.2)	
Russian Federation	●	3-4	--	●	3-4	--	●	3-4	--	
Scotland	○	-	r 51 (4.3)	○	6	r 51 (4.2)	○	8	r 69 (3.6)	
Singapore	○	7-10	11 (1.6)	○	6	49 (3.2)	●	4	95 (1.2)	
Slovak Republic	●	4, 5-7	85 (3.2)	●	3, 8	74 (3.2)	●	3-5, 7-9	96 (1.7)	
Slovenia	●	3, 5	27 (3.0)	○	5	39 (3.2)	○	5	72 (2.9)	
Sweden	●	1-5	50 (4.2)	○	6-9	40 (4.2)	○	6-9	83 (3.2)	
Tunisia	○	7	30 (3.2)	●	-	43 (4.2)	●	-	53 (4.0)	
Ukraine	●	4-8	97 (1.2)	●	4-8	95 (1.7)	●	4-6	100 (0.4)	
United States	●	K-4	82 (2.6)	●	K-4	79 (2.2)	●	K-4	85 (2.2)	
Yemen	●	3, 6	49 (4.4)	●	3-7	43 (4.7)	●	3-4	52 (5.1)	
International Avg.			60 (0.6)			58 (0.6)			79 (0.5)	
<b>Benchmarking Participants</b>										
Alberta, Canada	○	5-8, 10	68 (4.0)	●	2, 4, 7-12	92 (2.0)	●	2, 5, 8, 10	48 (4.1)	
British Columbia, Canada	○	7	r 53 (3.9)	○	5	r 57 (4.3)	○	8	r 77 (4.1)	
Dubai, UAE	●	2	x x	●	4	x x	●	2	x x	
Massachusetts, US	○	-	r 88 (4.9)	○	-	r 75 (7.2)	●	3-5	r 81 (6.2)	
Minnesota, US	○	-	r 65 (8.6)	●	4	62 (7.8)	●	1, 3, 4	78 (6.5)	
Ontario, Canada	○	7	68 (4.5)	○	5	60 (5.0)	○	5	48 (5.3)	
Quebec, Canada	○	5-6	r 62 (4.4)	⊙	3-4	r 67 (3.8)	●	3-4	r 80 (3.7)	

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.9 Intended and Taught\* TIMSS Earth Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Earth Science (10 topics)	Weather conditions from day to day or over the seasons			Fossils of animals and plants			Earth in the solar system		
	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	5	75 (5.0)	○	–	11 (2.6)	●	4	25 (4.1)
Armenia	●	4	x x	●	4	x x	●	4	x x
Australia	●	1–2	72 (3.3)	○	5–6	21 (3.7)	●	3–5	66 (3.3)
Austria	●	2	90 (2.1)	●	3	29 (2.7)	●	2	76 (2.9)
Chinese Taipei	●	3–4	59 (3.8)	○	7–9	17 (3.2)	○	7–9	54 (4.3)
Colombia	●	4–5	85 (3.8)	○	6–7	26 (3.8)	●	4–5	85 (4.1)
Czech Republic	●	1–4, 8–9	68 (3.7)	○	6–7	20 (3.4)	●	4, 8–9	47 (3.8)
Denmark	●	3–4	r 80 (3.7)	●	3–4	r 16 (3.1)	●	3–4	r 60 (4.5)
El Salvador	○	–	87 (3.0)	○	6–11	29 (3.7)	○	7–9	79 (3.5)
England	○	–	80 (3.2)	○	–	45 (4.0)	●	4	91 (2.5)
Georgia	●	2–3	55 (4.8)	○	7	17 (3.3)	○	6	70 (4.6)
Germany	●	3–4	90 (2.2)	○	9	18 (2.8)	○	6	40 (3.4)
Hong Kong SAR	●	4	92 (2.2)	○	7	8 (2.2)	○	6	21 (3.9)
Hungary	●	1	95 (1.6)	○	9	12 (2.8)	○	8	53 (4.4)
Iran, Islamic Rep. of	○	6	63 (4.1)	○	5	20 (3.0)	●	4	60 (3.7)
Italy	●	3–5	82 (2.7)	○	3–5	59 (3.2)	●	5–8	23 (2.8)
Japan	○	5, 8, 10–12	46 (4.3)	○	6–7, 10–12	2 (1.1)	●	4, 9–12	64 (4.0)
Kazakhstan	●	1	–	●	4	–	●	4	–
Kuwait	●	3, 6	r 85 (3.7)	○	11	r 11 (2.9)	●	4, 8	r 80 (3.8)
Latvia	●	1	95 (1.6)	○	7–9	39 (3.5)	●	1–3	99 (1.0)
Lithuania	●	2	95 (1.5)	○	6	49 (3.8)	●	4	94 (1.7)
Mongolia	●	3–5	–	●	4–5	–	●	5–6	–
Morocco	○	7	35 (4.3)	○	–	9 (2.2)	○	6	4 (1.5)
Netherlands	np	np	80 (3.2)	np	np	24 (3.8)	np	np	24 (3.5)
New Zealand	●	2–6	64 (2.8)	●	2–8	31 (2.5)	●	K–6	70 (2.5)
Norway	●	3–7	94 (1.6)	●	3–10	19 (3.0)	●	1–10	98 (0.9)
Qatar	●	2–4	r 42 (0.2)	○	9	r 11 (0.1)	●	3–6	r 52 (0.2)
Russian Federation	●	2–3	–	●	3–4	–	●	3–4	–
Scotland	●	1	r 75 (3.6)	○	6	r 14 (2.6)	○	2, 5	r 45 (4.7)
Singapore	○	7, 9	21 (2.5)	○	8	6 (1.3)	○	5	16 (2.1)
Slovak Republic	●	1–5, 7	85 (2.7)	○	8	31 (3.1)	●	4–5, 8–9	100 (0.0)
Slovenia	●	3	68 (3.1)	○	6	10 (1.9)	●	3, 6	43 (3.3)
Sweden	●	1–5	72 (3.1)	○	–	48 (4.3)	●	1–5	81 (2.6)
Tunisia	○	7	41 (3.7)	○	–	14 (2.6)	○	7	20 (3.0)
Ukraine	●	3–6	99 (0.9)	●	4–7	63 (3.8)	●	4–6, 10	99 (0.8)
United States	●	K–4	83 (2.1)	●	K–4	62 (2.8)	●	K–4	74 (2.8)
Yemen	○	5	50 (4.8)	○	12	16 (3.3)	●	3, 5, 7	36 (4.2)
International Avg.			73 (0.6)			24 (0.5)			59 (0.6)
<b>Benchmarking Participants</b>									
Alberta, Canada	●	1–2, 5, 10	34 (4.1)	○	7, 11	64 (4.4)	○	6, 9, 11	14 (2.8)
British Columbia, Canada	●	4	r 78 (3.6)	○	7	r 26 (3.7)	●	3	r 58 (4.0)
Dubai, UAE	●	4	x x	○	7	x x	●	4	x x
Massachusetts, US	●	3–5	r 72 (7.6)	●	6–8	r 61 (6.2)	●	3–5	r 80 (5.6)
Minnesota, US	●	1, 3, 4	78 (6.5)	●	2	41 (8.5)	●	4	62 (8.2)
Ontario, Canada	○	5	45 (5.0)	●	4	60 (4.8)	○	6	11 (2.3)
Quebec, Canada	○	5–6	r 68 (4.7)	●	3–4	r 30 (4.4)	●	3–4	r 66 (4.7)

● All or almost all students    ○ Only the more able students    ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit 5.9 Intended and Taught\* TIMSS Earth Science Topics (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Earth Science (10 topics)	Earth's rotation on its axis			
	Country	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●		4	93 (2.1)
Armenia	●		4	x x
Australia	●		3–6	60 (3.6)
Austria	●		2	87 (2.2)
Chinese Taipei	●		3–6	43 (4.1)
Colombia	●		4–5	84 (4.5)
Czech Republic	●		4,8–9	62 (3.7)
Denmark	●		1–2	r 72 (4.0)
El Salvador	●		3–9	89 (2.8)
England	●		4	90 (2.6)
Georgia	○		6	76 (4.4)
Germany	○		6	61 (3.6)
Hong Kong SAR	○		6	29 (4.3)
Hungary	○		5–6	71 (3.5)
Iran, Islamic Rep. of	●		4	58 (4.1)
Italy	●		5–8	31 (3.0)
Japan	●		3,4,9–12	48 (4.3)
Kazakhstan	●		4	--
Kuwait	●		2,6,8	r 90 (3.1)
Latvia	●		2	97 (1.3)
Lithuania	○		6	96 (1.4)
Mongolia	●		3–6	--
Morocco	○		6	13 (3.3)
Netherlands	np		np	r 50 (4.1)
New Zealand	⊙		2–8	58 (2.7)
Norway	●		1–10	96 (1.4)
Qatar	●		3–6	r 60 (0.2)
Russian Federation	○		6–8	--
Scotland	●		2,5	r 55 (5.2)
Singapore	○		5	25 (2.3)
Slovak Republic	●		4–5,9	99 (0.6)
Slovenia	●		4	79 (2.9)
Sweden	●		1–5	75 (3.3)
Tunisia	○		5	36 (3.5)
Ukraine	●		4–6,10	100 (0.0)
United States	●		K–4	76 (2.6)
Yemen	●		2–3	53 (4.9)
<b>International Avg.</b>				<b>67 (0.6)</b>
<b>Benchmarking Participants</b>				
Alberta, Canada	○		6	42 (4.3)
British Columbia, Canada	●		3	r 65 (4.1)
Dubai, UAE	●		4	x x
Massachusetts, US	●		3–5	r 83 (3.9)
Minnesota, US	●		4	61 (8.4)
Ontario, Canada	●		1	23 (3.8)
Quebec, Canada	○		5–6	r 58 (4.8)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through fourth grade

### **Eighth Grade: Which TIMSS Science Topics Are in the Intended and Implemented Curriculum?**

For the eighth grade, Exhibit 5.10 provides detailed information about each topic within the biology domain, including the student population to be taught the topic, the grades within which the topics are intended to be taught, and the teachers' reports about the percent of students taught the topics. Almost all of the TIMSS participants included topics on characteristics, classification, and life processes of organisms in their eighth grade biology curricula, and taught these topics to the majority of students, including classification of organisms (79% of students), major organ systems in human and other organisms (79%), and how organ systems maintain stable bodily conditions (sweating, shivering, etc., 67%). Topics on cell structure and function and on photosynthesis and respiration also were included in the curricula of almost all participants and taught to more than 80 percent of students. There was widespread coverage of life cycles of organisms (taught to 68% of students), reproduction and heredity (57%), and the role of variation and adaptation in the survival of species (53%). Some aspects of ecosystems, including interaction of living things and the cycling of materials in nature, were covered in almost all curricula and taught to the majority of students (70% and 63%, respectively), but others such as trends in human populations and the impact of natural hazards (earthquakes, landslides, floods, etc.) on humans and the environment were less commonly covered and taught to fewer students (48% and 51%, respectively). Topics on human health were in most curricula and taught to the majority of students, including common infectious diseases (taught to 60% of students) and preventive medicine methods (57% of students).

Exhibit 5.11 contains the information about the chemistry topics in the intended and implemented curricula at the eighth grade. Of the eight chemistry topics, topics in classification and composition of matter and properties of matter were widely covered in the intended curriculum and widely taught to eighth grade students—classification and composition of matter (taught to 88% of students), particulate structure of matter (83%),

solutions (77%), properties and uses of water (78%), and properties and uses of common acids and bases (68%). Within the general area of chemical change, the nature of chemical change and common oxidation reactions were widely covered and taught to the majority of students (70% and 61%, respectively), whereas the classification of familiar chemical transformations was in the curriculum of about half the participants and taught to just 47 percent of students.

Exhibit 5.10 Intended and Taught\* TIMSS Biology Topics

TIMSS2007  
Science 8<sup>th</sup> Grade

Biology (14 topics)	Classification of organisms			Major organ systems in humans and other organisms			How organ systems maintain stable bodily conditions		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	8	87 (2.7)	●	7	67 (4.1)	●	7,9	60 (4.4)
Armenia	●	7	70 (4.2)	●	8	90 (3.2)	●	8	87 (2.8)
Australia	●	3-9	84 (2.3)	●	4-9	62 (3.2)	●	4-12	46 (3.6)
Bahrain	●	7	80 (2.4)	●	5	92 (1.9)	●	5	88 (2.0)
Bosnia and Herzegovina	●	5-7	95 (1.6)	●	6-9	97 (1.4)	●	8-9	94 (1.7)
Botswana	●	5-8	83 (3.4)	●	5-12	65 (4.0)	●	9	29 (4.0)
Bulgaria	●	7	73 (3.9)	●	5,7-8	100 (0.0)	●	5,8	97 (1.9)
Chinese Taipei	●	5-6	72 (3.9)	●	5-9	73 (4.0)	●	5-9	72 (4.1)
Colombia	●	8-9	69 (4.7)	●	8-9	96 (1.6)	●	8-9	91 (2.5)
Cyprus	○	9	--	○	9	--	○	9-12	--
Czech Republic	●	5-8,10-12	97 (1.3)	●	6-9	99 (0.7)	●	1-4,8-9	95 (2.2)
Egypt	●	1-6	73 (3.9)	⊙	2-6	92 (2.2)	⊙	4-6	84 (2.9)
El Salvador	●	3-11	63 (3.9)	●	3-11	85 (3.1)	●	3-11	75 (3.8)
England	●	6	r 95 (1.1)	●	6-7	r 95 (1.5)	●	6-7	r 69 (3.1)
Georgia	●	5	87 (2.8)	○	9	61 (5.3)	○	9	65 (5.1)
Ghana	●	7-9	62 (3.8)	●	6-9	79 (3.7)	●	7-9	60 (4.8)
Hong Kong SAR	●	7	76 (4.4)	●	K-12	73 (4.1)	○	10-12	40 (4.6)
Hungary	●	7	r 87 (3.2)	●	7-8	97 (1.4)	●	7-8	91 (2.5)
Indonesia	●	7	92 (3.0)	●	8	100 (0.4)	●	8	81 (4.1)
Iran, Islamic Rep. of	●	3-5	86 (2.5)	●	3-5	85 (3.0)	●	4	72 (3.7)
Israel	●	1-6	r 47 (4.4)	●	1-6	r 53 (3.9)	●	7-9	r 47 (4.4)
Italy	●	3-6	98 (0.9)	●	4-7	99 (0.7)	●	6-7	95 (1.2)
Japan	●	3-12	99 (0.9)	●	6,8,10-12	98 (1.1)	●	8,10-12	71 (3.7)
Jordan	●	4-10	83 (3.0)	●	5-9	80 (3.1)	●	5-10	67 (3.8)
Korea, Rep. of	●	6	35 (3.7)	●	6-7	88 (2.4)	●	8	86 (2.5)
Kuwait	●	7,10	r 57 (5.0)	●	5,10-11	r 77 (4.0)	●	7,9,12	r 66 (4.9)
Lebanon	●	4	59 (4.4)	●	5	75 (4.3)	●	5	52 (4.9)
Lithuania	●	6	91 (2.6)	●	6	75 (3.5)	●	8	63 (3.7)
Malaysia	●	8	95 (1.7)	●	7	81 (3.2)	●	7	70 (3.7)
Malta	●	7	98 (0.1)	○	10	26 (0.8)	○	10	10 (0.6)
Mongolia	●	7-11	--	●	7-11	--	●	7-11	--
Norway	●	5-10	27 (3.3)	●	3-10	19 (2.8)	●	8-10	11 (2.2)
Oman	●	3,6-7	78 (3.4)	○	9	93 (2.3)	●	7	75 (3.8)
Palestinian Nat'l Auth.	●	4,6,11-12	94 (2.3)	●	4-7,9-11	74 (4.1)	●	7,10-11	64 (4.2)
Qatar	●	7	r 49 (0.2)	●	7	r 79 (0.1)	●	7-8	r 59 (0.2)
Romania	●	1-5,9	94 (2.1)	●	3,7,10	98 (1.1)	●	7,11	97 (1.3)
Russian Federation	●	6-7	--	●	7-8	--	●	8	--
Saudi Arabia	●	8	90 (2.7)	●	8	97 (1.4)	●	8	93 (2.8)
Scotland	●	7	r 80 (2.5)	●	6-7	r 76 (2.7)	○	10	s 40 (3.0)
Serbia	●	5-6	89 (2.4)	●	5-6,8	98 (1.2)	●	8	95 (1.8)
Singapore	●	7-8	61 (2.7)	●	7-8	84 (1.9)	○	9-10	59 (3.2)
Slovenia	●	7-8	81 (3.1)	○	9	11 (2.1)	●	7-8	22 (3.3)
Sweden	○	--	80 (3.2)	●	6-9	82 (3.0)	●	6-9	64 (3.7)
Syrian Arab Republic	●	5-8,10	87 (3.5)	●	3-12	68 (4.7)	●	4-12	56 (5.0)
Thailand	●	4-6	73 (4.3)	●	7-9	95 (1.6)	○	10-12	92 (2.2)
Tunisia	●	7	85 (3.0)	○	9	35 (3.9)	○	9	8 (2.3)
Turkey	●	4-5	74 (4.0)	●	6,11-12	88 (2.5)	●	6	87 (2.7)
Ukraine	●	6-7,10	93 (2.3)	●	8-9	99 (0.7)	●	8-9	99 (1.1)
United States	●	5-8	88 (1.9)	●	5-8	85 (1.9)	●	5-8	84 (2.0)
‡ Morocco	●	7	r 82 (4.6)	●	9	r 55 (4.1)	●	9	r 32 (6.0)
International Avg.			79 (0.5)			79 (0.4)			67 (0.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Basque Country, Spain	●	7	79 (4.0)	●	8	66 (4.9)	●	8	51 (4.4)
British Columbia, Canada	●	6,11	r 43 (3.7)	●	5-7,10,12	r 88 (2.7)	●	5,8,11-12	r 80 (3.7)
Dubai, UAE	●	8	s 57 (2.8)	●	7	s 85 (3.5)	●	7	x x
Massachusetts, US	●	3-8	s 91 (3.8)	●	6-8	85 (4.8)	○	9-10	83 (4.6)
Minnesota, US	●	7	81 (6.1)	●	7	79 (6.2)	●	7	80 (6.0)
Ontario, Canada	●	4,6	72 (4.9)	●	5	77 (4.6)	●	5	71 (4.7)
Quebec, Canada	●	7-8	59 (5.1)	○	9	34 (5.0)	○	9	20 (3.1)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.  
For countries that teach science as separate subjects at Grade 8, data are based on biology teachers only.

\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

(l) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 5.10 Intended and Taught\* TIMSS Biology Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Biology (14 topics)	Cell structures and functions			Photosynthesis and respiration			Life cycles of organisms, including humans, plants, birds, insects		
	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	7,9	52 (4.5)	●	7-9	83 (3.5)	○	—	84 (2.9)
Armenia	●	8	73 (4.2)	●	8	60 (4.3)	●	7	59 (4.8)
Australia	●	7-12	80 (3.2)	●	7-12	70 (3.3)	●	3-8	48 (3.2)
Bahrain	●	7	89 (1.8)	●	7	89 (2.3)	●	5	57 (2.8)
Bosnia and Herzegovina	●	5-6	99 (0.6)	●	5-6	98 (1.1)	●	6-7	95 (1.8)
Botswana	●	8	97 (1.4)	●	8	25 (4.0)	○	9	10 (3.4)
Bulgaria	●	5	91 (2.4)	○	9	75 (3.7)	●	6-8	81 (3.8)
Chinese Taipei	●	7-9	72 (4.1)	●	7-9	74 (4.0)	●	3-4	68 (4.1)
Colombia	●	6-7	99 (0.5)	○	10-11	97 (1.4)	●	8-9	72 (5.8)
Cyprus	○	9,11	--	○	9,11-12	--	○	9	--
Czech Republic	●	6-9	98 (1.1)	●	6-7,10-11	98 (1.3)	●	6-12	89 (2.7)
Egypt	●	4-6	95 (1.9)	●	4-6	77 (3.4)	●	7-9	61 (4.4)
El Salvador	●	4-11	91 (2.6)	●	4-6,9-10	85 (3.2)	●	3-6	78 (3.7)
England	●	6	r 97 (0.9)	●	8	r 96 (1.0)	●	6	r 81 (2.6)
Georgia	●	8	68 (5.4)	○	10	83 (3.5)	●	4,8	79 (4.3)
Ghana	●	7-10	97 (1.4)	●	6-9	93 (1.9)	●	6-10	52 (4.6)
Hong Kong SAR	●	7-12	74 (4.0)	●	8	95 (2.1)	●	5-12	32 (4.2)
Hungary	●	8	86 (3.0)	●	8	78 (3.1)	●	8	81 (3.3)
Indonesia	●	7	95 (2.4)	●	7	97 (1.7)	○	9	75 (4.0)
Iran, Islamic Rep. of	●	4	91 (2.3)	●	4	75 (3.8)	●	4	54 (3.7)
Israel	●	7-9	r 67 (4.5)	●	7-9	r 38 (3.8)	●	1-9	r 46 (4.4)
Italy	●	6	99 (0.6)	●	4-7	100 (0.2)	●	4-7	96 (1.3)
Japan	○	9-12	15 (3.1)	●	6-8,10-12	80 (3.2)	●	3-12	36 (3.6)
Jordan	●	5-10	77 (3.4)	●	5-10	88 (2.9)	●	3-12	79 (3.4)
Korea, Rep. of	●	7	86 (2.8)	●	8	95 (1.5)	●	3-4	26 (2.8)
Kuwait	●	8-9,12	r 75 (4.0)	○	9-10,12	r 57 (4.9)	●	5-6	r 64 (4.9)
Lebanon	○	—	68 (4.8)	●	5	83 (3.0)	●	—	73 (4.0)
Lithuania	●	8	82 (3.1)	●	8	82 (3.0)	●	8	83 (3.3)
Malaysia	●	7	95 (1.8)	●	8	93 (2.3)	●	5	48 (4.2)
Malta	●	7	100 (0.0)	●	8	43 (1.3)	●	7	56 (0.9)
Mongolia	●	7-11	--	●	7-11	--	●	7-11	--
Norway	○	8-10	55 (4.4)	○	8-10	66 (3.8)	●	3-10	37 (3.8)
Oman	●	7	86 (3.1)	●	6-8	89 (2.0)	●	5,7	75 (3.8)
Palestinian Nat'l Auth.	●	5,11-12	93 (2.4)	●	5-7,9,12	96 (1.6)	●	3,5,7,9-12	63 (4.1)
Qatar	●	7	81 (0.1)	●	8	r 62 (0.2)	●	7	r 51 (0.2)
Romania	●	5,9	97 (1.4)	●	5,10-11	97 (1.3)	●	4-5,8-9,12	95 (2.1)
Russian Federation	●	6-8	--	●	6,9-10	--	●	6-8	--
Saudi Arabia	●	8	90 (3.3)	●	8	97 (1.4)	●	8	78 (3.5)
Scotland	●	7	r 93 (1.6)	●	8	r 84 (2.5)	●	7	r 56 (3.6)
Serbia	●	5-6	99 (0.5)	●	5	93 (1.8)	●	5-6,8	95 (1.7)
Singapore	●	7-8	79 (2.0)	●	7-8	80 (1.8)	●	3-6	46 (2.6)
Slovenia	○	9	63 (4.2)	●	5-8	99 (0.6)	●	6-7	81 (3.3)
Sweden	●	6-9	76 (3.3)	●	6-9	88 (2.9)	●	1-5	74 (3.3)
Syrian Arab Republic	●	6-7,10-11	93 (2.6)	●	6-7,9-10	94 (2.5)	●	6-7,9-10,12	82 (4.2)
Thailand	●	7-9	87 (2.6)	●	7-9	80 (3.1)	●	7-9	72 (3.3)
Tunisia	○	11	71 (4.0)	●	7	99 (0.6)	●	7	93 (2.3)
Turkey	●	6,8	92 (2.4)	●	8	99 (1.0)	●	6-7	87 (2.9)
Ukraine	○	10	95 (1.7)	●	6-8,10	81 (3.1)	●	6-7,9,11	87 (2.8)
United States	●	5-8	93 (1.5)	●	5-8	91 (1.7)	●	5-8	87 (2.4)
‡ Morocco	●	7,9	r 49 (6.5)	●	7,9	r 82 (4.2)	●	4,8	r 87 (3.5)
International Avg.			83 (0.4)			83 (0.4)			68 (0.5)
<b>Benchmarking Participants</b>									
Basque Country, Spain	○	9-10	63 (4.8)	○	9-10	83 (3.1)	●	8	51 (5.3)
British Columbia, Canada	●	8,11-12	r 91 (2.6)	●	3,8,12	r 62 (4.4)	●	7,10	r 35 (4.1)
Dubai, UAE	●	5	s 91 (1.7)	●	7	s 74 (3.8)	●	8	s 44 (3.3)
Massachusetts, US	●	6-10	95 (3.5)	○	9-10	93 (3.9)	○	—	85 (4.2)
Minnesota, US	●	7	84 (6.6)	●	7	80 (6.8)	●	7	84 (5.6)
Ontario, Canada	●	8	83 (4.2)	○	9-12	75 (4.8)	●	2-3	74 (4.5)
Quebec, Canada	○	9	72 (4.8)	○	10	74 (4.8)	●	7-8	66 (4.7)

● All or almost all students    ○ Only the more able students    ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.10 Intended and Taught\* TIMSS Biology Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Biology (14 topics)	Reproduction and heredity			Role of variation and adaptation in survival/extinction of species			Interaction of living organisms in an ecosystem		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	7,9	40 (4.5)	●	8	90 (2.5)	●	8	89 (2.7)
Armenia	●	7	70 (4.1)	●	8	59 (4.6)	●	8	55 (4.2)
Australia	⊙	8–12	27 (2.8)	●	4–12	36 (3.4)	●	6–12	63 (3.4)
Bahrain	●	8	30 (2.4)	●	6	22 (2.8)	●	6	73 (2.5)
Bosnia and Herzegovina	●	8–9	86 (3.0)	●	6–7	78 (3.3)	●	6–7	97 (1.3)
Botswana	●	8,11–12	38 (4.0)	○	9,11–12	4 (1.2)	○	9	10 (2.9)
Bulgaria	●	6,8	59 (5.0)	○	9	35 (4.7)	●	6,8	51 (4.5)
Chinese Taipei	●	7–9	73 (4.0)	●	7–9	72 (4.1)	●	7–9	74 (3.9)
Colombia	●	6–7	81 (3.2)	●	6–7	70 (3.9)	●	8–9	97 (1.6)
Cyprus	○	9–12	--	○	9,11	--	○	9,11	--
Czech Republic	●	8–12	50 (3.5)	●	8–12	66 (3.4)	●	6,8–12	77 (3.6)
Egypt	⊙	7–12	81 (3.2)	●	4–9	61 (3.6)	⊙	7–9	95 (2.0)
El Salvador	●	6–8	56 (4.4)	●	6–10	57 (4.4)	●	6–11	87 (3.0)
England	●	6,8	r 93 (1.8)	●	8	r 89 (2.1)	●	6	r 96 (0.7)
Georgia	○	9	48 (5.0)	●	4–5,7–8	28 (4.0)	●	6–8	35 (4.6)
Ghana	●	7–12	89 (2.4)	○	10–12	34 (4.1)	●	7–12	32 (3.5)
Hong Kong SAR	●	7	67 (4.2)	●	6–12	46 (4.7)	●	7–12	79 (3.8)
Hungary	●	7–8	37 (3.6)	●	3,7	66 (3.7)	●	7	99 (0.7)
Indonesia	○	9	25 (4.1)	○	9	37 (4.6)	○	10	96 (1.5)
Iran, Islamic Rep. of	○	9	48 (4.2)	○	9	67 (3.3)	●	6	53 (3.7)
Israel	●	1–9	r 73 (3.6)	●	5–9	r 43 (4.7)	●	5–9	r 32 (3.7)
Italy	●	8	87 (2.2)	●	7–8	74 (2.8)	●	4–7	88 (1.9)
Japan	●	5,9–12	4 (1.4)	○	9–12	5 (1.7)	○	9–12	5 (1.8)
Jordan	●	7–12	92 (2.3)	●	8–12	90 (2.4)	●	7–12	98 (1.1)
Korea, Rep. of	○	9	12 (2.4)	○	9	13 (2.5)	●	6	24 (3.0)
Kuwait	●	8–10	r 68 (4.8)	○	9	r 50 (5.2)	●	6	r 74 (4.5)
Lebanon	●	6,9	55 (4.4)	●	--	45 (4.2)	●	5,7	64 (4.3)
Lithuania	●	8	68 (3.7)	○	10	27 (3.7)	●	8	75 (3.8)
Malaysia	○	9	10 (2.4)	○	10	54 (4.2)	●	8	99 (1.0)
Malta	●	7	11 (0.6)	●	8	36 (0.8)	●	8	33 (1.0)
Mongolia	●	7–11	--	●	7–11	--	●	7–11	--
Norway	○	8–10	12 (2.4)	●	8–10	57 (4.0)	●	8–10	41 (4.2)
Oman	○	9	56 (4.4)	⊙	6	64 (3.9)	●	7–8	83 (3.0)
Palestinian Nat'l Auth.	●	3,7,10–12	66 (4.2)	●	3–5,7	47 (4.4)	●	4	65 (3.9)
Qatar	●	7	51 (0.2)	●	7	r 36 (0.2)	●	7	r 60 (0.1)
Romania	●	5–12	78 (3.6)	●	2–10,12	76 (4.1)	●	4,8,12	98 (1.1)
Russian Federation	○	9	--	●	6–9	--	●	6–9	--
Saudi Arabia	●	8	46 (3.9)	●	8	88 (2.9)	●	8	96 (1.3)
Scotland	●	8,10	r 80 (3.0)	●	8	r 57 (3.4)	●	7	r 78 (2.6)
Serbia	●	5–8	84 (3.2)	●	7	85 (2.9)	●	7	95 (1.8)
Singapore	●	7–8	79 (2.0)	○	9–10	36 (2.3)	●	7–8	58 (2.5)
Slovenia	●	6–8	24 (3.4)	●	8	80 (3.3)	●	7–8	98 (1.0)
Sweden	●	6–9	38 (3.4)	●	6–9	26 (3.2)	●	6–9	72 (3.8)
Syrian Arab Republic	●	5–7,9,11–12	36 (5.3)	●	5,8,10,12	46 (5.3)	●	5–10	56 (4.5)
Thailand	●	4–6	66 (4.2)	○	10–12	55 (4.3)	●	4–6	51 (4.3)
Tunisia	○	9	40 (4.0)	○	10	64 (3.6)	○	10	94 (2.0)
Turkey	●	8	94 (2.1)	●	8	99 (0.7)	●	7	87 (2.9)
Ukraine	○	9,11	56 (3.7)	○	11	11 (2.5)	●	6,7,11	35 (4.2)
United States	●	5–8	86 (2.1)	●	5–8	87 (2.0)	●	5–8	89 (1.8)
‡ Morocco	●	8	r 95 (1.1)	○	--	r 43 (6.8)	●	3,7	r 89 (3.0)
International Avg.			57 (0.5)			53 (0.5)			70 (0.4)

Benchmarking Participants

Basque Country, Spain	●	8	44 (4.8)	●	8	52 (5.3)	●	8	57 (4.6)
British Columbia, Canada	○	9,12	r 14 (3.2)	●	6–7,10–11	r 25 (3.7)	●	7,10	r 54 (3.3)
Dubai, UAE	●	7	s 41 (3.5)	●	5	s 41 (2.9)	●	6	s 57 (3.9)
Massachusetts, US	●	3–8	93 (3.9)	●	6–8	82 (5.0)	●	6–8	86 (5.0)
Minnesota, US	●	7	84 (5.5)	●	7	86 (6.0)	●	7	87 (5.1)
Ontario, Canada	○	9–12	34 (4.7)	●	6	71 (5.0)	●	7	87 (3.5)
Quebec, Canada	●	7–8	71 (4.7)	●	7–8	71 (4.7)	○	10	79 (4.5)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.10 Intended and Taught\* TIMSS Biology Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Biology (14 topics)	Cycling of materials in nature			Trends in human population and its effects on the environment			Impact of natural hazards on humans, wildlife and the environment		
	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	9	37 (4.5)	○	–	68 (3.9)	●	8	30 (4.1)
Armenia	●	8	62 (4.4)	●	8	60 (4.2)	●	8	69 (4.0)
Australia	●	7–12	49 (2.9)	○	9–12	21 (2.6)	●	4–12	38 (3.3)
Bahrain	●	6	66 (2.7)	●	6	23 (2.7)	●	6	18 (2.8)
Bosnia and Herzegovina	●	7–8	96 (1.7)	●	8–9	83 (3.2)	●	8–9	76 (3.2)
Botswana	○	9	20 (3.3)	○	11–12	3 (1.2)	○	10	6 (1.9)
Bulgaria	○	9	56 (4.1)	○	9	25 (4.5)	●	7–8	37 (4.3)
Chinese Taipei	●	7–9	76 (4.0)	●	5–9	71 (4.1)	●	5–9	70 (4.2)
Colombia	●	6–7	77 (4.1)	●	6–7	48 (4.9)	–	–	74 (5.0)
Cyprus	○	9,11	–	○	9,11	–	○	9,11	–
Czech Republic	●	8–12	56 (4.2)	●	8–9,12	43 (4.0)	●	8–12	27 (3.6)
Egypt	○	4–9	92 (2.4)	○	7–8	69 (3.8)	⊙	7–8	78 (3.2)
El Salvador	●	7–9	56 (4.0)	●	6–9,11	71 (4.0)	●	5–9	70 (4.1)
England	●	6,8	r 68 (2.8)	○	–	r 60 (3.2)	●	6,8	r 69 (3.0)
Georgia	●	5	36 (4.2)	●	5–7	33 (5.1)	●	4	45 (5.2)
Ghana	●	7–12	46 (4.4)	●	7–12	45 (4.6)	●	4–12	50 (4.1)
Hong Kong SAR	●	4–12	69 (4.1)	○	10–12	33 (4.5)	○	9–12	54 (5.0)
Hungary	●	8	93 (2.2)	●	4,7	52 (4.4)	●	7–8	79 (3.6)
Indonesia	○	12	74 (3.8)	○	9	65 (4.3)	○	9	61 (4.4)
Iran, Islamic Rep. of	●	6	76 (3.2)	●	6	52 (3.8)	●	5	36 (3.3)
Israel	●	5–9	r 52 (4.0)	●	5–9	r 33 (4.2)	○	–	r 36 (3.8)
Italy	●	4–8	90 (1.8)	●	7–8	49 (3.6)	●	8	78 (2.3)
Japan	●	6,9–12	15 (3.1)	○	–	4 (1.2)	●	6,9–12	8 (1.9)
Jordan	●	6–10	96 (1.6)	●	7–12	83 (3.3)	●	7–12	74 (3.8)
Korea, Rep. of	○	12	27 (3.1)	○	11–12	17 (2.8)	○	–	21 (3.5)
Kuwait	●	6,9	r 58 (4.9)	○	–	r 53 (4.2)	●	–	r 51 (4.4)
Lebanon	●	2	55 (4.5)	○	–	44 (4.9)	○	–	52 (4.9)
Lithuania	○	10	50 (4.0)	●	8	42 (4.0)	○	10	37 (4.2)
Malaysia	●	8	92 (2.2)	●	8	53 (4.3)	●	5	73 (4.2)
Malta	○	10	23 (0.8)	○	10	37 (0.9)	●	8	19 (0.5)
Mongolia	●	7–11	–	●	7–11	–	●	7–11	–
Norway	●	8–10	49 (3.6)	●	8–10	22 (2.6)	○	–	39 (3.5)
Oman	●	5–7	69 (4.3)	○	10	56 (4.5)	⊙	6	51 (3.8)
Palestinian Nat'l Auth.	●	2–3,6–7	61 (4.3)	●	3–4,7,10	46 (4.3)	●	5	47 (3.9)
Qatar	○	9	47 (0.2)	●	8	r 23 (0.1)	○	1–9	30 (0.2)
Romania	●	3,8–9,12	96 (1.7)	○	11	77 (3.4)	○	8–9,12	61 (4.3)
Russian Federation	●	6–9	–	●	6	–	○	9	–
Saudi Arabia	●	8	98 (0.8)	○	–	89 (3.1)	–	–	98 (0.9)
Scotland	●	7	r 46 (3.1)	●	8	r 23 (2.9)	○	10	r 29 (3.4)
Serbia	●	5–6	95 (1.8)	●	8	75 (3.5)	●	8	85 (2.9)
Singapore	●	7–8	50 (2.4)	●	7–8	18 (2.1)	○	–	33 (2.3)
Slovenia	●	6–8	97 (1.4)	●	7–8	70 (3.9)	●	7–8	72 (3.7)
Sweden	●	6–9	77 (3.4)	●	6–9	19 (3.3)	○	–	24 (3.5)
Syrian Arab Republic	●	3,6–7,10	58 (5.0)	●	6–7,10	55 (5.1)	●	3–10	62 (5.3)
Thailand	●	7–9	55 (4.1)	●	7–9	55 (4.6)	○	10–12	63 (4.4)
Tunisia	○	10	18 (3.3)	○	–	51 (4.4)	○	–	21 (3.3)
Turkey	●	7	89 (2.7)	●	7	74 (4.2)	●	7	68 (4.5)
Ukraine	○	11	37 (4.2)	○	9,11	40 (4.0)	●	6–7,9,11	39 (4.3)
United States	●	5–8	86 (2.1)	●	5–8	75 (2.7)	●	5–8	78 (2.7)
‡ Morocco	●	7	r 71 (4.0)	○	9	r 61 (4.9)	●	5,7	r 60 (4.9)
<b>International Avg.</b>			<b>63 (0.5)</b>			<b>48 (0.6)</b>			<b>51 (0.5)</b>
<b>Benchmarking Participants</b>									
Basque Country, Spain	●	8	48 (4.8)	●	8	41 (5.6)	●	8	57 (5.3)
British Columbia, Canada	○	10	r 54 (4.2)	●	7	r 24 (4.4)	●	8,10	r 43 (4.1)
Dubai, UAE	●	6	s 65 (4.1)	●	8	s 39 (2.9)	●	8	s 54 (4.8)
Massachusetts, US	●	3–5,6–8	87 (5.6)	○	–	74 (7.2)	●	6–8	78 (6.0)
Minnesota, US	●	7	81 (5.7)	○	–	72 (4.8)	●	7	73 (6.4)
Ontario, Canada	●	7	77 (4.3)	○	9–12	60 (4.9)	○	9–12	72 (5.0)
Quebec, Canada	○	10	75 (3.7)	○	10	61 (5.3)	●	7–8	67 (4.6)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.10 Intended and Taught\* TIMSS Biology Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Biology (14 topics)	Common infectious diseases			Preventive medicine methods			
	Country	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	9	29 (3.9)	○	9	47 (4.7)	
Armenia	●	7	87 (3.5)	●	7	92 (2.3)	
Australia	○	9–12	17 (3.2)	○	9–12	26 (3.8)	
Bahrain	●	5	93 (1.4)	●	5	74 (2.3)	
Bosnia and Herzegovina	●	8–9	92 (2.0)	●	8–9	85 (2.9)	
Botswana	○	9	37 (4.9)	●	8	45 (3.8)	
Bulgaria	●	7–8	96 (2.0)	●	5–8	98 (1.6)	
Chinese Taipei	●	5–6	59 (4.3)	●	5–6	62 (4.1)	
Colombia	●	6–7	61 (5.5)	●	6–7	75 (4.0)	
Cyprus	○	9–12	--	○	9–12	--	
Czech Republic	●	8–10,12	88 (2.5)	●	8–9,12	85 (2.7)	
Egypt	⊙	4–9	93 (2.0)	⊙	8–9	77 (3.1)	
El Salvador	●	2–9,11	68 (4.0)	●	1–11	67 (4.0)	
England	●	7	r 88 (2.6)	●	7	r 89 (2.2)	
Georgia	○	9	55 (5.0)	○	9	54 (4.8)	
Ghana	●	3–9	82 (3.2)	●	7–9	83 (3.1)	
Hong Kong SAR	●	4–12	19 (3.8)	●	3–9	32 (4.6)	
Hungary	●	5–8	83 (3.1)	●	1–4,8	95 (1.8)	
Indonesia	○	10	37 (4.7)	●	8	25 (4.1)	
Iran, Islamic Rep. of	●	5	55 (4.2)	●	5	50 (3.8)	
Israel	●	5–9	r 20 (3.3)	●	5–9	r 16 (3.5)	
Italy	●	5–8	92 (1.9)	●	5–8	96 (1.2)	
Japan	○	--	5 (1.8)	○	--	3 (1.4)	
Jordan	●	6–10	48 (4.2)	●	6–10	52 (4.6)	
Korea, Rep. of	○	11–12	21 (3.6)	○	--	42 (4.2)	
Kuwait	●	7,11	r 84 (3.4)	●	4	r 61 (4.3)	
Lebanon	●	7	87 (3.7)	●	3–5	64 (3.9)	
Lithuania	●	8	54 (4.4)	●	8	45 (3.9)	
Malaysia	●	5	22 (3.7)	●	8	37 (3.7)	
Malta	●	8	41 (0.8)	●	8	22 (0.7)	
Mongolia	●	1–11	--	●	1–11	--	
Norway	●	8–10	52 (4.0)	●	8–10	30 (3.5)	
Oman	○	11	81 (3.3)	●	3–7	62 (4.1)	
Palestinian Nat'l Auth.	●	5–6,9–12	81 (2.8)	●	5–7	54 (4.2)	
Qatar	●	7–9	66 (0.2)	●	7	50 (0.2)	
Romania	●	7,9–12	91 (2.4)	●	1–3,7,10–11	88 (3.1)	
Russian Federation	●	8	--	●	8	--	
Saudi Arabia	●	10–12	24 (3.7)	●	8	24 (3.9)	
Scotland	○	10	r 35 (3.3)	●	8	r 37 (2.9)	
Serbia	●	8	88 (2.7)	●	8	91 (3.0)	
Singapore	○	9–10	38 (2.5)	○	10	33 (2.5)	
Slovenia	○	9	25 (3.1)	○	9	34 (3.3)	
Sweden	○	--	54 (4.3)	●	6–9	76 (3.3)	
Syrian Arab Republic	●	3–12	92 (3.0)	●	1–11	58 (5.5)	
Thailand	○	7–9	66 (4.3)	●	7–9	71 (4.0)	
Tunisia	●	7	44 (4.5)	○	--	20 (3.3)	
Turkey	●	6	76 (3.8)	○	9	56 (4.0)	
Ukraine	●	6–7,9,11	99 (0.7)	●	7–10	100 (0.0)	
United States	●	5–8	73 (2.9)	●	5–8	72 (3.2)	
‡ Morocco	○	9	r 11 (3.7)	○	9	r 14 (3.9)	
<b>International Avg.</b>			<b>60 (0.5)</b>			<b>57 (0.5)</b>	
<b>Benchmarking Participants</b>							
Basque Country, Spain	●	8	15 (3.3)	●	8	50 (4.8)	
British Columbia, Canada	●	5,8,11–12	r 71 (3.4)	●	5,8	r 56 (4.7)	
Dubai, UAE	●	7	s 77 (2.8)	●	7	s 63 (3.1)	
Massachusetts, US	○	--	60 (7.4)	○	--	69 (6.8)	
Minnesota, US	●	7	72 (6.4)	○	--	68 (5.9)	
Ontario, Canada	●	8	43 (5.3)	●	5	65 (5.5)	
Quebec, Canada	○	9	38 (4.7)	●	5–6	39 (5.0)	

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit 5.11 Intended and Taught\* TIMSS Chemistry Topics

TIMSS2007  
Science 8<sup>th</sup> Grade

Chemistry (8 topics)	Classification and composition of matter			Particulate structure of matter			Solutions		
	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	8–9	81 (3.3)	●	8–9	67 (4.4)	●	7	83 (3.0)
Armenia	●	7	66 (3.9)	●	8	59 (4.4)	○	9	54 (4.4)
Australia	●	7–12	94 (1.7)	●	7–12	79 (2.8)	●	7–12	84 (2.9)
Bahrain	●	6	89 (0.7)	●	6	98 (0.0)	●	8	93 (1.3)
Bosnia and Herzegovina	●	7–8	98 (1.1)	●	7–8	99 (0.6)	●	7–8	95 (1.7)
Botswana	○	10	16 (3.5)	○	10	9 (2.9)	○	9	16 (3.4)
Bulgaria	●	6–8	96 (1.9)	●	6–7	99 (1.0)	○	10	53 (4.2)
Chinese Taipei	●	7–9	100 (0.4)	●	7–9	100 (0.4)	●	5–6	98 (1.1)
Colombia	●	6–7	88 (2.8)	●	6–7	92 (2.3)	●	8–9	39 (4.8)
Cyprus	●	8,10	r 99 (0.0)	●	8,10	r 99 (0.1)	●	8,11	r 72 (1.3)
Czech Republic	●	8–10	100 (0.0)	●	8–10	100 (0.0)	●	8–10	97 (1.7)
Egypt	●	4–6	90 (2.5)	⊙	4–9	100 (0.0)	⊙	10–12	90 (2.1)
El Salvador	●	7–8,10	95 (1.9)	●	7–10	91 (2.7)	●	8–10	82 (3.3)
England	●	7	r 98 (0.7)	●	6–7	r 75 (3.3)	●	6	r 97 (0.9)
Georgia	●	6–7	98 (1.0)	●	8	99 (0.6)	●	7–8	93 (2.3)
Ghana	●	7–12	98 (1.2)	●	7–12	97 (1.6)	●	7–12	94 (1.8)
Hong Kong SAR	●	7–8	46 (5.0)	○	9–10	51 (5.2)	●	7	80 (3.7)
Hungary	●	7	100 (0.0)	●	7	100 (0.0)	●	7	98 (0.9)
Indonesia	○	10	95 (5.0)	○	10	76 (10.3)	○	10	55 (11.8)
Iran, Islamic Rep. of	●	6	98 (0.9)	●	6,9	99 (0.5)	●	6	100 (0.1)
Israel	●	7–9	r 94 (2.0)	●	7–9	r 97 (1.2)	●	7–9	r 83 (2.9)
Italy	●	6	97 (1.4)	●	6–7	94 (1.3)	●	6–7	90 (1.8)
Japan	●	3–12	97 (1.4)	●	8,10–12	77 (3.6)	●	5–7,10–12	99 (0.8)
Jordan	●	6–12	92 (2.1)	●	4–12	98 (1.0)	●	4–12	78 (3.5)
Korea, Rep. of	●	8	96 (1.3)	○	12	54 (4.0)	●	8	98 (0.8)
Kuwait	●	7–8,10–11	r 85 (3.3)	●	8–10	r 91 (2.0)	●	7,11	r 72 (4.0)
Lebanon	●	7,10	99 (0.8)	○	7,10	98 (1.0)	○	7,10	92 (2.3)
Lithuania	●	5–6	98 (0.7)	●	6,8	99 (0.5)	●	5	93 (2.1)
Malaysia	●	7	89 (2.6)	○	10	38 (4.4)	●	8	99 (1.0)
Malta	●	7	100 (0.0)	●	9	99 (0.2)	●	7,9	85 (0.6)
Mongolia	●	8–11	--	●	8–11	--	●	8–11	--
Norway	●	5–10	47 (4.0)	●	5–10	52 (3.5)	○	8–10	44 (4.0)
Oman	⊙	6,9	97 (1.5)	○	9–10	80 (3.6)	○	10	75 (3.6)
Palestinian Nat'l Auth.	●	3,5–7,9–12	93 (1.9)	●	7,9–12	99 (0.9)	●	5,10–12	89 (2.6)
Qatar	●	7–9	94 (0.1)	●	7–8	96 (0.0)	●	7	r 65 (0.2)
Romania	●	4,7	100 (0.0)	●	7,9	100 (0.0)	●	7,9	98 (0.9)
Russian Federation	●	8	--	●	7–9	--	○	9	--
Saudi Arabia	●	8	34 (4.6)	○	9	61 (4.2)	○	9	19 (3.9)
Scotland	●	8	r 92 (1.6)	●	8	r 81 (2.0)	●	7	r 86 (2.5)
Serbia	●	7	100 (0.5)	●	7	100 (0.5)	●	7–8	97 (1.3)
Singapore	●	7–8	82 (1.8)	●	7–8	83 (1.7)	●	7–8	78 (1.8)
Slovenia	●	4,5,7	99 (0.9)	●	8	98 (1.0)	○	9	32 (3.5)
Sweden	●	6–9	91 (2.0)	●	6–9	73 (3.8)	●	6–9	84 (2.7)
Syrian Arab Republic	●	4–12	87 (3.1)	●	4–12	99 (0.7)	●	7,10–12	88 (3.1)
Thailand	●	4–6	91 (2.1)	●	7–9	85 (3.1)	●	7–9	87 (2.5)
Tunisia	●	--	s 26 (4.6)	●	--	s 16 (4.0)	●	--	s 29 (4.9)
Turkey	●	7	97 (1.5)	●	7	96 (1.6)	●	7,9	93 (2.2)
Ukraine	●	8	100 (0.0)	●	8–9	63 (4.4)	○	9	19 (3.4)
United States	●	5–8	89 (2.0)	●	5–8	90 (1.9)	●	5–8	72 (2.9)
‡ Morocco	●	7,10	r 96 (0.7)	○	9–10	r 84 (4.2)	○	9–10	r 94 (3.1)
International Avg.			88 (0.3)			83 (0.4)			77 (0.5)

**Benchmarking Participants**

Basque Country, Spain	●	7	78 (3.7)	○	9–10	75 (4.5)	○	9–10	48 (4.7)
British Columbia, Canada	●	7	r 56 (3.9)	●	7,9–10	r 51 (4.4)	●	7–8	r 46 (4.2)
Dubai, UAE	●	6	x x	●	6	x x	●	7	x x
Massachusetts, US	●	6–8	89 (5.0)	●	--	90 (4.6)	○	9–10	62 (6.4)
Minnesota, US	●	6	52 (6.8)	○	6	61 (7.5)	●	6	39 (6.6)
Ontario, Canada	●	5,7	84 (3.5)	○	9–12	48 (5.2)	●	7	86 (3.1)
Quebec, Canada	●	7–8	89 (3.1)	●	7–8	62 (5.2)	⊙	9	87 (3.1)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

For countries that teach science as separate subjects at Grade 8, data are based on chemistry teachers only.

\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students. An “x” indicates data are available for less than 50% of the students.



Exhibit 5.11 Intended and Taught\* TIMSS Chemistry Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Chemistry (8 topics)	Properties and uses of water			Properties and uses of common acids and bases			Nature of chemical change		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	8	79 (3.5)	○	–	12 (3.0)	●	8–9	r 65 (4.3)
Armenia	●	7	56 (4.1)	○	9	63 (3.9)	●	8	58 (4.2)
Australia	●	7–12	74 (3.3)	○	9–12	40 (3.0)	●	8–12	61 (3.6)
Bahrain	●	4	34 (2.4)	●	8	96 (0.6)	●	8	61 (2.1)
Bosnia and Herzegovina	●	7–8	96 (1.6)	●	7–8	96 (1.6)	●	7–8	99 (0.8)
Botswana	●	9	72 (4.5)	○	10	7 (2.8)	○	10	8 (2.8)
Bulgaria	●	6	70 (4.8)	●	8	99 (0.9)	●	6,8	77 (4.3)
Chinese Taipei	●	7–9	100 (0.0)	●	7–9	98 (1.0)	●	7–9	100 (0.4)
Colombia	●	8–9	70 (4.9)	●	8–9	44 (5.4)	○	10–11	63 (4.6)
Cyprus	●	8	r 57 (1.4)	●	8–11	r 10 (1.2)	○	11	r 39 (1.7)
Czech Republic	●	8–10	96 (2.1)	●	8–10,12	52 (4.0)	●	8–11	77 (3.7)
Egypt	⊙	7–9	91 (2.4)	⊙	7–9	87 (2.8)	⊙	7–9	73 (3.5)
El Salvador	●	3–7,10–11	84 (3.4)	●	7–8,10	76 (3.6)	●	8,10	81 (3.7)
England	●	6–7	r 89 (2.2)	●	6	r 97 (0.9)	●	8	r 95 (1.2)
Georgia	●	5,7	95 (2.7)	●	8	98 (1.1)	●	6–7	92 (2.0)
Ghana	●	7–9	93 (2.2)	●	7–9	85 (3.1)	●	7–12	84 (3.1)
Hong Kong SAR	●	7	82 (3.5)	●	8	97 (1.4)	○	9	21 (3.8)
Hungary	●	3,8	100 (0.0)	●	8	97 (1.5)	●	8	97 (1.5)
Indonesia	●	–	83 (9.2)	○	11	41 (11.6)	○	11	46 (12.1)
Iran, Islamic Rep. of	●	6	93 (1.9)	●	8	95 (1.8)	●	7	95 (1.5)
Israel	●	5–9	r 90 (2.3)	●	7–9	r 50 (4.6)	●	7–9	r 71 (3.8)
Italy	●	6–8	96 (1.7)	●	6–8	70 (3.3)	●	6–8	71 (3.1)
Japan	●	4,7,10–12	98 (1.2)	●	6–7,10–12	94 (1.8)	●	5–12	97 (1.5)
Jordan	●	1–12	78 (3.4)	●	6–12	69 (3.5)	●	2–12	81 (3.3)
Korea, Rep. of	●	7	52 (4.2)	●	5	10 (2.0)	○	9	18 (3.0)
Kuwait	●	4,10	r 73 (4.1)	●	8,12	r 77 (3.9)	●	6–7	r 51 (4.5)
Lebanon	○	10	86 (3.4)	●	10–12	88 (2.8)	⊙	7,12	97 (1.5)
Lithuania	●	8	30 (4.3)	○	9	5 (1.9)	●	8	79 (3.1)
Malaysia	●	8	99 (0.8)	●	9	97 (1.4)	●	8	36 (3.9)
Malta	●	7	65 (1.1)	●	7,9	51 (1.1)	●	8–10	71 (0.9)
Mongolia	●	8–11	–	●	8–11	–	●	9–11	–
Norway	●	5–10	73 (3.1)	●	8–10	77 (3.5)	●	5–10	37 (4.1)
Oman	●	6,8	67 (4.0)	●	7	90 (2.2)	○	9	66 (4.3)
Palestinian Nat'l Auth.	●	7,10–12	83 (3.6)	●	7,12	96 (1.5)	●	9–12	73 (4.1)
Qatar	●	7	r 58 (0.2)	○	9	r 82 (0.1)	○	9	62 (0.2)
Romania	●	3,7,9	82 (3.5)	●	8–10	100 (0.2)	●	4,7–12	97 (1.5)
Russian Federation	●	7–8	–	●	8	–	●	8	–
Saudi Arabia	○	9	36 (4.4)	○	9	13 (3.9)	●	8	38 (4.3)
Scotland	●	8	s 77 (2.4)	●	7	r 84 (3.2)	●	7	r 80 (2.5)
Serbia	●	7	97 (1.3)	●	7–8	96 (1.7)	●	7–8	99 (0.8)
Singapore	●	7–8	64 (2.2)	●	7–8	68 (1.7)	●	7–8	66 (2.2)
Slovenia	●	5,7–8	85 (3.2)	○	9	4 (1.6)	●	7–8	89 (2.5)
Sweden	●	6–9	92 (1.8)	●	6–9	81 (3.5)	●	6–9	47 (4.3)
Syrian Arab Republic	●	4–12	91 (2.4)	●	6–12	84 (3.3)	●	5–12	80 (3.7)
Thailand	●	7–9	88 (2.6)	●	7–9	88 (2.7)	●	7–9	81 (3.3)
Tunisia	●	–	s 32 (4.9)	○	10	s 8 (2.8)	○	10	s 14 (3.5)
Turkey	○	9	87 (2.8)	●	8	100 (0.0)	●	8	100 (0.0)
Ukraine	●	8	91 (2.3)	●	8–10	97 (1.5)	●	8	97 (1.4)
United States	●	5–8	79 (2.4)	●	5–8	62 (3.1)	●	5–8	80 (2.6)
‡ Morocco	●	7	r 94 (2.8)	○	9–10,12	r 11 (4.2)	●	8–12	r 84 (4.6)
International Avg.			78 (0.5)			68 (0.5)			70 (0.5)

## Benchmarking Participants

Basque Country, Spain	●	7	79 (4.1)	○	9–10	5 (2.0)	○	9–10	42 (5.2)
British Columbia, Canada	●	2,7–8	r 77 (3.5)	●	7,10–12	r 29 (4.4)	○	9–11	r 41 (3.9)
Dubai, UAE	●	6	x x	○	10	x x	●	5	x x
Massachusetts, US	○	9–10	88 (4.6)	○	9–10	40 (6.4)	●	6–8	78 (5.9)
Minnesota, US	●	6	51 (7.7)	○	6	29 (6.3)	●	6	39 (8.3)
Ontario, Canada	●	5,8	85 (3.5)	○	9–12	38 (4.4)	●	5	42 (5.1)
Quebec, Canada	○	9	85 (3.3)	●	7–8	54 (5.4)	●	7–8	62 (5.2)

● All or almost all students   ⊙ Only the more able students   ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit 5.11 Intended and Taught\* TIMSS Chemistry Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Chemistry (8 topics)	Common oxidation reactions			Classification of familiar chemical transformations		
	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	8–9	33 (4.1)	○	–	33 (4.3)
Armenia	○	9	81 (3.2)	●	8	52 (4.3)
Australia	○	9–12	28 (3.3)	○	9–12	29 (2.8)
Bahrain	●	8	58 (3.3)	○	11	32 (2.7)
Bosnia and Herzegovina	●	7–8	97 (1.5)	●	7–8	90 (2.3)
Botswana	○	10	6 (2.7)	○	11–12	5 (2.1)
Bulgaria	●	6,8	86 (3.4)	○	10	37 (4.8)
Chinese Taipei	●	7–9	99 (0.8)	●	7–9	95 (2.4)
Colombia	○	10–11	37 (4.5)	○	10–11	42 (5.1)
Cyprus	○	11	r 5 (1.1)	○	11	r 14 (0.7)
Czech Republic	●	8–10	38 (4.0)	●	8–10	30 (3.7)
Egypt	●	8–9	79 (3.6)	○	10–12	86 (2.8)
El Salvador	●	7–8,10	77 (3.6)	●	7–8,10	69 (3.8)
England	●	8	r 93 (1.6)	○	–	r 74 (2.9)
Georgia	●	7–8	88 (3.6)	○	9	40 (5.1)
Ghana	●	9–12	33 (3.7)	○	10–12	40 (4.2)
Hong Kong SAR	○	10–12	42 (5.1)	○	10–11	21 (4.1)
Hungary	●	8	94 (1.9)	●	7	99 (0.7)
Indonesia	○	11	39 (11.5)	○	10	34 (11.3)
Iran, Islamic Rep. of	●	7	94 (1.5)	●	6	69 (3.6)
Israel	●	7–9	r 72 (4.0)	●	7–9	r 31 (3.4)
Italy	●	6–8	75 (2.7)	●	6–8	62 (3.2)
Japan	●	6,8–12	65 (4.0)	○	9–12	24 (3.7)
Jordan	●	3–12	96 (1.6)	●	3–12	34 (4.2)
Korea, Rep. of	○	11	16 (2.6)	○	12	31 (3.8)
Kuwait	○	12	r 58 (4.9)	○	11	r 45 (5.3)
Lebanon	○	9,11–12	84 (3.1)	○	10–12	78 (3.7)
Lithuania	●	8	61 (4.6)	○	9	49 (3.7)
Malaysia	●	8	67 (3.6)	●	8	59 (3.9)
Malta	●	8–9	60 (0.9)	○	10	3 (0.4)
Mongolia	●	9–11	–	●	8–11	–
Norway	○	–	13 (2.8)	○	–	8 (2.0)
Oman	○	9	35 (4.4)	●	7	23 (3.5)
Palestinian Nat'l Auth.	●	7,9,11–12	68 (4.0)	○	11	27 (3.8)
Qatar	○	9	67 (0.1)	○	9	34 (0.1)
Romania	●	4,7–10,12	87 (3.2)	●	7,10,12	79 (3.8)
Russian Federation	●	8	–	●	8	–
Saudi Arabia	●	8	61 (4.4)	○	10,12	18 (3.6)
Scotland	●	7	r 61 (3.1)	●	8	r 38 (3.0)
Serbia	●	8	96 (1.6)	●	7–8	78 (3.4)
Singapore	●	7–8	46 (2.2)	○	9–10	45 (2.6)
Slovenia	●	8	85 (3.1)	●	8	96 (1.6)
Sweden	●	6–9	36 (3.6)	○	–	19 (3.4)
Syrian Arab Republic	●	7–12	83 (3.4)	●	10–12	31 (4.3)
Thailand	○	7–9	73 (3.6)	○	10–12	81 (3.4)
Tunisia	○	10	s 23 (4.5)	○	10	s 8 (2.8)
Turkey	○	10–11	70 (3.9)	●	8	98 (1.2)
Ukraine	●	8	87 (2.7)	●	8–9	84 (2.9)
United States	⊙	5–12	54 (3.0)	○	9–12	64 (2.9)
‡ Morocco	●	8–9	r 41 (5.5)	○	10	r 27 (5.7)
<b>International Avg.</b>			<b>61 (0.5)</b>			<b>47 (0.5)</b>
<b>Benchmarking Participants</b>						
Basque Country, Spain	○	9–10	23 (4.5)	○	9–10	30 (4.8)
British Columbia, Canada	○	11	r 22 (3.9)	○	10–12	r 27 (3.4)
Dubai, UAE	●	6	x x	●	7	x x
Massachusetts, US	○	9–10	52 (6.6)	○	9–10	66 (5.7)
Minnesota, US	○	–	15 (4.8)	●	6	26 (6.0)
Ontario, Canada	○	9–12	24 (4.4)	○	9–12	50 (4.7)
Quebec, Canada	○	9	48 (5.2)	⊙	10	31 (5.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

Exhibit 5.12 shows that all ten eighth-grade physics topics featured in the curricula of most countries, and that the majority of students were taught each of the topics, on average. The highest percentages of students were taught about physical states and changes in matter (83%) and the processes of melting, freezing, evaporation, and condensation (84%). About two-thirds of the students were taught each of the other physics topics, including energy forms, transformations, heat, and temperature (74%); temperature changes (63%); properties and behavior of light (66%); properties of sound (60%); electric circuits and the relationship between voltage and current (61%); properties of magnets (55%); forces and motion (67%); and the effects of density and pressure (67%).

Exhibit 5.13 provides the intended and taught results for the 14 earth science topics at the eighth grade. In the general area of Earth's structure and physical features, the three topics—Earth's structure and physical characteristics, water on Earth, and Earth's atmosphere—were in the curriculum of most participants and taught to 61 to 64 percent of students, on average. There also was good coverage of the six topics on Earth's processes, cycles, and history, with the water cycle in the curriculum of practically all participants, and the other topics in the curricula of about two-thirds. Sixty-nine percent of students, on average, were taught about the water cycle; the percentages taught the other topics ranged from 48 to 63 percent. Earth's resources featured in the curriculum of almost all participants, but were taught to just over half the students (57%). The relationship of land management to human use and the supply and demand of fresh water resources were less frequently taught (to 39% and 47% of students, respectively). Finally, topics on Earth in the solar system were intended to be taught by one-half to two-thirds of the TIMSS participants, and actually taught to just over half the students—explaining Earth phenomena in relation to other bodies in the solar system (day and night, tides, phases of the moon, etc.) to 61 percent and physical features of Earth compared with other planets to 55 percent of students.



Exhibit 5.12 Intended and Taught\* TIMSS Physics Topics

TIMSS2007  
Science 8<sup>th</sup> Grade

Physics (10 topics)	Physical states and changes in matter			Processes of melting, freezing, evaporation, and condensation			Energy forms, transformations, heat and temperature, including heat transfer		
	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	7–8	65 (3.8)	●	7	91 (2.2)	●	9	46 (4.5)
Armenia	●	7	75 (3.9)	●	8	93 (1.5)	●	7	87 (2.1)
Australia	●	8–12	78 (3.0)	●	7–12	88 (2.2)	●	7–12	70 (2.9)
Bahrain	●	6	52 (3.0)	●	6	57 (2.3)	●	4	58 (2.1)
Bosnia and Herzegovina	●	7–8	99 (0.8)	●	7–8	98 (1.1)	●	7–8	98 (1.1)
Botswana	●	8	95 (1.9)	●	8	96 (1.8)	●	–	53 (4.6)
Bulgaria	●	6,8	96 (2.0)	●	6,8	98 (1.1)	●	6,8	99 (0.6)
Chinese Taipei	●	7–9	95 (1.3)	●	7–9	98 (1.3)	●	5–9	85 (2.9)
Colombia	●	8–9	80 (3.9)	●	6–7	68 (4.5)	●	8–9	64 (4.5)
Cyprus	●	8	r 100 (0.0)	●	8	r 96 (0.8)	●	8	r 100 (0.0)
Czech Republic	●	6–7,10	97 (1.4)	●	6–7,11	85 (3.3)	●	6–12	90 (2.3)
Egypt	●	4–6	86 (3.1)	⊙	7–9	91 (2.2)	⊙	10–12	89 (2.6)
El Salvador	●	7–11	94 (2.1)	●	7–11	78 (3.4)	●	7–8,10	94 (2.2)
England	●	6–7	r 96 (0.9)	●	6–7	r 96 (0.9)	●	6,8	r 94 (1.5)
Georgia	●	5–7	94 (2.4)	○	9	92 (3.0)	○	9	91 (3.0)
Ghana	●	7–12	91 (2.4)	●	4–12	97 (1.4)	●	8–12	79 (3.5)
Hong Kong SAR	●	7	71 (4.4)	●	7	77 (3.5)	●	7	71 (4.0)
Hungary	●	5	100 (0.4)	●	7,10	98 (1.3)	●	7	98 (1.0)
Indonesia	●	7	88 (3.0)	●	7	93 (2.4)	●	8	95 (1.9)
Iran, Islamic Rep. of	●	6	97 (1.1)	●	6	98 (0.9)	●	7	99 (0.7)
Israel	●	7–9	r 97 (1.2)	●	5–9	r 97 (1.2)	●	7–9	r 41 (3.9)
Italy	●	6–7	98 (0.8)	●	6	98 (0.7)	●	4–8	94 (1.5)
Japan	○	10–12	57 (4.4)	●	7,10–12	92 (2.1)	○	9–12	12 (2.6)
Jordan	●	1–12	81 (3.4)	●	1–11	84 (3.2)	●	4–12	70 (4.1)
Korea, Rep. of	●	7	64 (3.7)	●	7	95 (1.7)	●	5	36 (4.1)
Kuwait	●	4–7	r 86 (3.5)	●	3,5	r 84 (3.2)	●	8	r 92 (2.7)
Lebanon	○	7,9,11	89 (2.8)	○	7,9,11	86 (2.7)	○	7,9,11	90 (2.8)
Lithuania	●	8	64 (4.2)	○	9	9 (2.4)	○	9	42 (4.4)
Malaysia	●	8	87 (2.9)	●	8	98 (1.3)	●	8	86 (3.2)
Malta	●	9	78 (0.2)	●	7	19 (0.3)	●	7,9	56 (0.4)
Mongolia	⊙	7–9	–	○	9–10	–	○	9–10	–
Norway	●	5–10	72 (3.6)	●	5–10	85 (2.9)	○	8–10	36 (3.6)
Oman	●	6–9	90 (2.5)	●	4–7	92 (2.2)	●	8,10	89 (2.6)
Palestinian Nat'l Auth.	●	1,5,7	81 (2.9)	●	3,5,7,11	92 (2.5)	●	3,5,7,10–12	83 (3.6)
Qatar	●	7	74 (0.1)	○	4–8	78 (0.1)	○	9	90 (0.1)
Romania	●	3,6–8,10	92 (2.6)	●	3,8,10	100 (0.0)	●	7–10	99 (1.0)
Russian Federation	●	7–10	–	●	8,10	–	●	8,10	–
Saudi Arabia	●	8	75 (4.0)	●	8	78 (3.8)	○	9	29 (3.9)
Scotland	●	8	r 84 (2.1)	●	7	r 88 (2.1)	●	8	r 89 (1.7)
Serbia	●	6	94 (2.1)	●	10	89 (2.8)	●	7	94 (2.1)
Singapore	●	7–8	79 (2.2)	●	7–8	70 (2.5)	●	7–8	69 (2.4)
Slovenia	●	5,8	86 (3.0)	●	5,8	30 (3.9)	●	5,8	57 (4.0)
Sweden	●	6–9	r 78 (3.2)	●	6–9	r 90 (2.9)	●	6–9	r 68 (3.5)
Syrian Arab Republic	⊙	7–12	65 (4.4)	⊙	7–12	88 (3.1)	⊙	7–12	27 (4.2)
Thailand	●	4–6	64 (4.0)	●	4–6	83 (3.4)	●	7–9	69 (3.5)
Tunisia	○	10	s 30 (4.6)	○	10	s 40 (5.2)	○	10	s 27 (4.7)
Turkey	●	4	97 (1.3)	●	4	93 (2.1)	●	4–8	91 (2.3)
Ukraine	●	7–8,10	99 (0.8)	●	8,10	100 (0.3)	●	7–9	100 (0.0)
United States	●	5–8	86 (2.2)	●	5–8	87 (1.9)	●	5–8	78 (2.6)
‡ Morocco	●	7–8,10	r 85 (4.9)	●	7–8	r 96 (2.7)	○	9,11	r 67 (5.2)
International Avg.			83 (0.4)			84 (0.4)			74 (0.4)
<b>Benchmarking Participants</b>									
Basque Country, Spain	●	8	80 (4.0)	●	7	79 (4.4)	●	8	85 (3.5)
British Columbia, Canada	●	2,7,10–11	r 83 (3.2)	●	2,7–8,11	r 84 (2.9)	●	8,10	r 55 (4.8)
Dubai, UAE	○	10	s 73 (2.5)	○	9	s 81 (3.7)	●	7	s 82 (4.0)
Massachusetts, US	●	6–8	93 (3.3)	●	6–10	90 (4.4)	●	3–8	82 (4.8)
Minnesota, US	●	6	56 (6.9)	●	6	58 (6.2)	●	6	55 (9.0)
Ontario, Canada	●	5,7	77 (4.3)	●	5	90 (2.5)	●	7	92 (2.1)
Quebec, Canada	●	7–8	75 (3.4)	○	9	88 (2.9)	●	7–8	64 (4.6)

● All or almost all students   ⊙ Only the more able students   ○ Not included in the curriculum through eighth grade

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

For countries that teach science as separate subjects at Grade 8, data are based on physics teachers only.

\* Includes the TIMSS topics mostly taught during or before the year of the assessment.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 5.12 Intended and Taught\* TIMSS Physics Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Physics (10 topics)	Temperature changes related to volume, pressure, and particle movement or speed			Basic properties/behavior of light			Properties of sound					
	Country	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic		
Algeria	●	7,9	r	41 (4.6)	○	9	17 (2.9)	○	–	8 (2.6)		
Armenia	●	8		78 (3.0)	○	9	77 (5.9)	●	8	77 (5.7)		
Australia	○	9–10		57 (2.7)	○	9–12	20 (3.2)	○	9–12	29 (3.8)		
Bahrain	○	9		34 (2.8)	●	5	98 (1.0)	●	7	98 (0.0)		
Bosnia and Herzegovina	●	7–8		97 (1.4)	●	–	78 (3.3)	●	8–9	94 (2.0)		
Botswana	○	11–12		38 (4.5)	○	9	8 (3.0)	●	8	78 (3.4)		
Bulgaria	●	8		99 (0.8)	●	7	83 (2.8)	●	7	77 (3.0)		
Chinese Taipei	●	7–9		77 (3.7)	●	3–9	96 (1.8)	●	7–9	96 (1.7)		
Colombia	●	8–9		35 (4.6)	●	8–9	35 (4.1)	●	8–9	42 (4.6)		
Cyprus	●	8	r	88 (1.8)	●	8	r	52 (1.6)	○	12	r	4 (0.1)
Czech Republic	●	6–7,11		87 (2.9)	●	6–7,12	66 (4.0)	●	8–9,11	23 (3.4)		
Egypt	●	10–12		87 (2.8)	●	7–8	86 (2.8)	○	7–9	86 (2.8)		
El Salvador	●	8,10		70 (4.0)	●	7–8,11	87 (3.0)	●	8,10	93 (1.9)		
England	●	6–8	r	83 (2.4)	●	7	r	98 (0.8)	●	7	r	97 (0.9)
Georgia	●	8		71 (5.4)	○	9	7 (2.8)	○	9	14 (2.8)		
Ghana	●	8–12		52 (4.4)	○	9–12	28 (3.8)	○	9–12	24 (3.5)		
Hong Kong SAR	●	7		47 (4.4)	○	9	11 (3.1)	●	8	58 (5.0)		
Hungary	●	7,10		87 (2.7)	●	5,8	39 (4.5)	○	11	18 (3.2)		
Indonesia	○	10		84 (3.5)	●	8	79 (4.4)	●	8	96 (1.6)		
Iran, Islamic Rep. of	●	6		94 (2.2)	●	7	98 (1.1)	●	7	81 (3.3)		
Israel	●	7–9	r	88 (2.5)	○	5–6,10–12	r	15 (2.8)	○	5–6	r	8 (2.0)
Italy	●	6–8		81 (2.7)	●	8	39 (3.3)	●	8	37 (3.2)		
Japan	●	4,7,10–12		24 (3.6)	●	3,7,10–12	100 (0.3)	●	3,7,10–12	99 (0.9)		
Jordan	●	4–11		57 (4.1)	●	4–11	99 (0.7)	●	4–8	100 (0.3)		
Korea, Rep. of	○	9		71 (3.5)	●	7	87 (2.4)	●	7	84 (3.1)		
Kuwait	○	–	r	63 (4.2)	●	8,12	r	88 (3.1)	●	7,12	r	88 (3.1)
Lebanon	○	11		71 (4.6)	●	8–11	67 (4.3)	●	8,11	78 (3.9)		
Lithuania	○	9		44 (4.3)	●	8	65 (4.5)	●	8	90 (2.5)		
Malaysia	●	7		87 (2.8)	●	8,10–11	96 (1.7)	●	8	72 (3.1)		
Malta	●	9		22 (0.3)	●	9	78 (0.4)	●	9	60 (0.4)		
Mongolia	○	10		–	○	8–9	–	○	8–9	–		
Norway	○	–		49 (3.9)	●	8–10	7 (2.1)	○	–	5 (2.0)		
Oman	○	10		75 (3.7)	●	2,5,7	98 (1.1)	○	4,10	87 (3.2)		
Palestinian Nat'l Auth.	●	3,7,10–12		66 (4.2)	●	4,11–12	98 (1.3)	●	4	96 (2.1)		
Qatar	●	8	r	49 (0.2)	●	8	77 (0.1)	●	8	60 (0.2)		
Romania	●	6,8,10		68 (4.1)	●	4,6–7,9	99 (0.7)	●	7,11	93 (2.1)		
Russian Federation	●	7,10		–	●	8,11	–	○	9	–		
Saudi Arabia	○	10		31 (3.7)	●	8	85 (3.7)	●	8	86 (4.0)		
Scotland	○	10	r	52 (3.6)	●	7	r	69 (4.0)	●	7–8	r	66 (3.7)
Serbia	●	7		86 (2.9)	●	8	92 (2.7)	●	8	95 (1.9)		
Singapore	●	7–8		53 (2.7)	●	7–8	80 (1.9)	●	7–8	62 (2.0)		
Slovenia	●	8		33 (4.1)	●	4,7	76 (3.4)	●	3,7	67 (3.9)		
Sweden	●	6–9	r	63 (3.5)	●	6–9	r	52 (3.7)	●	6–9	r	51 (3.8)
Syrian Arab Republic	○	8–12		48 (4.7)	○	4–6,8,10	90 (2.7)	○	6,8–9,12	67 (3.9)		
Thailand	○	10–12		60 (4.0)	●	7–9	77 (3.6)	●	4–6	25 (3.8)		
Tunisia	○	11	s	21 (4.5)	●	–	s	19 (4.5)	○	–	s	3 (1.7)
Turkey	●	4,6,8		78 (3.6)	●	5–7	56 (4.1)	●	4–5,8	56 (3.9)		
Ukraine	●	8,10		81 (3.4)	●	8,11	94 (1.9)	○	11	5 (1.6)		
United States	●	5–8		74 (2.7)	●	5–8	59 (2.9)	●	5–12	57 (3.0)		
‡ Morocco	○	11	r	47 (6.0)	○	11–12	r	60 (6.0)	○	12	r	9 (4.3)
International Avg.				63 (0.5)			66 (0.5)			60 (0.4)		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Benchmarking Participants

Basque Country, Spain	○	9–10		57 (4.6)	○	9–10	66 (4.2)	○	9–10	64 (4.7)		
British Columbia, Canada	○	11	r	67 (4.9)	●	4,8–9,11	r	77 (3.7)	●	4,11	r	39 (4.2)
Dubai, UAE	○	11	s	52 (3.7)	●	8	s	82 (3.1)	●	7	s	70 (4.0)
Massachusetts, US	●	6–10		83 (4.5)	●	3–5	53 (8.1)	○	9–10	42 (7.3)		
Minnesota, US	●	6		45 (7.4)	●	6	44 (7.5)	●	6	31 (8.1)		
Ontario, Canada	●	7–8		84 (3.7)	●	4,8	64 (4.4)	●	4	35 (3.5)		
Quebec, Canada	○	9		37 (4.5)	○	9	31 (5.4)	○	9	10 (3.0)		

● All or almost all students    ○ Only the more able students    ○ Not included in the curriculum through eighth grade

Exhibit 5.12 Intended and Taught\* TIMSS Physics Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Physics (10 topics)	Electric circuits and relationship between voltage and current			Properties of permanent magnets and electromagnets			Forces and motion, use of distance/time graphs		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	7,9	67 (3.7)	●	8–9	89 (2.4)	●	8–9	63 (4.1)
Armenia	○	9	88 (5.7)	○	9	88 (5.8)	●	8	65 (4.3)
Australia	○	9–12	37 (3.7)	●	8–12	56 (3.1)	●	8–12	53 (3.8)
Bahrain	●	6	88 (0.8)	●	6	98 (1.2)	●	7	85 (2.2)
Bosnia and Herzegovina	●	8–9	99 (0.8)	●	8–9	99 (1.0)	●	7–8	99 (0.8)
Botswana	○	10	9 (3.0)	○	11–12	5 (1.4)	○	9	10 (2.4)
Bulgaria	●	7	89 (2.5)	●	6	85 (3.8)	●	8	92 (2.9)
Chinese Taipei	●	7–9	18 (3.2)	●	7–9	12 (2.8)	●	5–6,7–9	29 (3.5)
Colombia	○	10–11	22 (3.8)	○	10–11	25 (3.8)	○	10–11	42 (4.7)
Cyprus	⊙	9,11	r 4 (0.1)	⊙	9,11	r 8 (0.6)	●	8,10–11	r 6 (0.3)
Czech Republic	●	8–9,12	78 (3.9)	●	4–5,8–9,12	71 (3.5)	●	6–7,10	99 (0.6)
Egypt	⊙	7–8	93 (2.1)	●	5–6	79 (3.5)	⊙	10–12	72 (4.0)
El Salvador	●	9,11	39 (4.3)	●	9,11	52 (3.6)	●	8,10	94 (2.0)
England	●	6,8	r 97 (1.0)	●	7	r 95 (1.3)	●	6	r 95 (1.1)
Georgia	○	11	60 (5.3)	●	8	21 (4.6)	●	5,7–8	79 (3.8)
Ghana	●	7–12	31 (3.7)	○	9–12	36 (4.1)	●	7–12	63 (3.7)
Hong Kong SAR	●	8	89 (2.8)	●	8	43 (4.6)	○	10–11	76 (4.1)
Hungary	●	8	100 (0.0)	●	8	96 (1.6)	●	7	100 (0.0)
Indonesia	○	9	14 (3.1)	○	9	13 (3.1)	○	10	92 (2.6)
Iran, Islamic Rep. of	●	8	89 (2.5)	●	6	83 (2.8)	●	6	85 (2.9)
Israel	●	5–9	r 74 (3.6)	●	5–9	r 46 (4.1)	●	7–9	r 33 (4.4)
Italy	●	8	52 (3.4)	●	8	49 (3.5)	●	6–8	81 (2.7)
Japan	●	3,4,8,10–12	98 (1.0)	●	3,6,8,10–12	90 (2.3)	●	5,7,9–12	10 (2.6)
Jordan	●	8–12	97 (1.2)	●	1–12	76 (3.4)	●	3–11	95 (1.9)
Korea, Rep. of	●	8	97 (1.1)	●	6	22 (2.8)	●	8	93 (1.8)
Kuwait	○	10	r 61 (4.4)	●	7,12	r 88 (2.9)	●	7,11	r 79 (3.7)
Lebanon	○	7,9	82 (3.7)	●	7	63 (5.1)	●	8,10–11	93 (2.1)
Lithuania	○	9	10 (2.3)	○	9	3 (1.4)	●	8	98 (1.1)
Malaysia	○	9	3 (1.4)	○	9	12 (2.9)	●	8	80 (3.4)
Malta	●	7,10	2 (0.1)	○	10	3 (0.1)	●	9–10	75 (0.4)
Mongolia	○	11	--	○	10–11	--	⊙	8–11	--
Norway	●	8–10	4 (1.6)	●	5–10	4 (1.5)	●	8–10	30 (3.8)
Oman	⊙	6,9	59 (4.3)	●	6,8	65 (4.0)	○	9	59 (4.4)
Palestinian Nat'l Auth.	●	4–6,9,12	34 (4.3)	●	4,7,12	78 (3.8)	●	6,10–12	44 (4.2)
Qatar	○	9	76 (0.1)	○	6	70 (0.1)	○	6	59 (0.1)
Romania	●	4,6,8,10–11	99 (0.7)	●	4,6,8,10	97 (1.4)	●	4,6–7,9	97 (1.3)
Russian Federation	●	8,10	--	●	8,10	--	●	7,9–10	--
Saudi Arabia	●	8	11 (2.4)	●	8	53 (3.8)	●	8	73 (4.2)
Scotland	●	8	r 87 (2.5)	○	10	r 55 (3.9)	○	10	r 63 (3.2)
Serbia	●	8	99 (0.5)	●	8	99 (1.0)	●	6–7	97 (1.7)
Singapore	●	7–8	87 (1.3)	●	3–6	45 (2.6)	●	7–8	57 (2.3)
Slovenia	○	9	10 (2.5)	○	9	6 (2.0)	●	4,8	70 (3.4)
Sweden	●	6–9	r 82 (2.8)	●	6–9	57 (4.5)	○	--	r 67 (3.9)
Syrian Arab Republic	⊙	5,7–12	95 (1.8)	⊙	5,9,11–12	75 (4.0)	⊙	1–12	41 (4.7)
Thailand	○	7–9	12 (2.8)	○	10–12	20 (3.2)	●	1–9	62 (3.5)
Tunisia	●	--	s 34 (5.2)	●	--	s 30 (5.0)	●	--	s 15 (3.9)
Turkey	●	4–7	87 (3.0)	●	4,8	35 (4.2)	●	4–5,7	96 (1.6)
Ukraine	●	8,10	100 (0.0)	●	8,10	99 (0.7)	●	7,9	79 (3.5)
United States	●	5–8	54 (2.8)	●	5–12	56 (2.6)	●	5–8	80 (2.9)
‡ Morocco	●	7–8,10	r 91 (2.7)	●	8,11	r 85 (4.1)	○	9–12	r 9 (2.8)
<b>International Avg.</b>			<b>61 (0.4)</b>			<b>55 (0.5)</b>			<b>67 (0.4)</b>
<b>Benchmarking Participants</b>									
Basque Country, Spain	●	8	26 (4.0)	○	9–10	18 (3.8)	○	9–10	75 (4.5)
British Columbia, Canada	●	6,9,12	r 12 (3.1)	●	1,11	r 13 (2.8)	●	1,5,10–11	r 31 (4.2)
Dubai, UAE	●	8	s 61 (4.0)	●	8	s 69 (3.9)	●	7	s 68 (3.6)
Massachusetts, US	○	9–10	45 (8.2)	○	--	46 (7.6)	●	6–8	82 (5.5)
Minnesota, US	●	6	33 (8.6)	●	6	32 (7.4)	●	6	52 (8.2)
Ontario, Canada	●	6	53 (5.1)	●	6	55 (4.7)	●	5,7,8	57 (4.7)
Quebec, Canada	○	10	5 (2.1)	○	10	8 (2.9)	○	10	44 (4.2)

● All or almost all students   ⊙ Only the more able students   ○ Not included in the curriculum through eighth grade

Exhibit 5.12 Intended and Taught\* TIMSS Physics Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Physics (10 topics)	Effects of density and pressure		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	–	23 (4.2)
Armenia	●	8	63 (4.5)
Australia	◉	8–12	31 (3.0)
Bahrain	●	7	70 (2.8)
Bosnia and Herzegovina	●	7,9	96 (1.8)
Botswana	○	11–12	15 (3.0)
Bulgaria	●	6	73 (4.1)
Chinese Taipei	○	10–12	67 (4.1)
Colombia	●	8–9	47 (5.5)
Cyprus	●	8	r 35 (1.9)
Czech Republic	●	6–7,10	100 (0.0)
Egypt	◉	7–9	77 (3.8)
El Salvador	●	8,11	88 (2.6)
England	●	8	r 86 (2.6)
Georgia	●	7	94 (2.0)
Ghana	●	10–12	68 (3.7)
Hong Kong SAR	●	7–11	56 (4.5)
Hungary	●	7	98 (1.0)
Indonesia	○	10	78 (3.6)
Iran, Islamic Rep. of	○	10	82 (2.8)
Israel	◉	7–9	r 52 (3.9)
Italy	●	6–8	66 (3.2)
Japan	●	4,7,10–12	87 (2.9)
Jordan	●	4–11	68 (3.8)
Korea, Rep. of	●	8	78 (3.2)
Kuwait	●	7–9	r 75 (4.1)
Lebanon	○	7,9	62 (4.6)
Lithuania	●	8	84 (3.1)
Malaysia	●	7	87 (2.9)
Malta	○	10	63 (0.4)
Mongolia	◉	8–11	–
Norway	○	–	24 (3.4)
Oman	○	10	55 (4.3)
Palestinian Nat'l Auth.	●	7,10–11	77 (3.5)
Qatar	○	6	60 (0.2)
Romania	○	10	90 (2.3)
Russian Federation	●	6–8	–
Saudi Arabia	●	8	44 (4.2)
Scotland	◉	8	r 44 (3.2)
Serbia	●	7	92 (2.2)
Singapore	●	7–8	52 (2.5)
Slovenia	●	8	93 (2.1)
Sweden	●	6–9	60 (3.9)
Syrian Arab Republic	◉	7–8,10	81 (3.4)
Thailand	●	7–9	47 (4.2)
Tunisia	●	–	s 24 (4.3)
Turkey	●	4,8	96 (1.6)
Ukraine	●	7,10	97 (1.3)
United States	●	5–12	79 (2.5)
‡ Morocco	●	7	r 25 (4.7)
<b>International Avg.</b>			<b>67 (0.5)</b>

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Basque Country, Spain	○	9–10	44 (4.3)
British Columbia, Canada	●	8,11–12	r 68 (4.2)
Dubai, UAE	●	8	s 61 (3.4)
Massachusetts, US	○	–	86 (4.7)
Minnesota, US	●	8	64 (6.0)
Ontario, Canada	●	8	76 (3.9)
Quebec, Canada	○	10	24 (4.4)

● All or almost all students    ◉ Only the more able students    ○ Not included in the curriculum through eighth grade

Exhibit 5.13 Intended and Taught\* TIMSS Earth Science Topics

TIMSS2007  
Science 8<sup>th</sup> Grade

Earth Science (14 topics)	Earth's structure and physical characteristics			Water on Earth			Earth's atmosphere		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	9	r 6 (2.5)	○	9	r 6 (2.2)	○	–	r 5 (1.6)
Armenia	●	7	70 (4.4)	●	7	66 (4.2)	●	8	65 (4.2)
Australia	●	7–12	56 (3.6)	○	7–12	41 (3.3)	●	5–12	56 (3.6)
Bahrain	●	8	83 (1.9)	●	8	69 (2.9)	●	8	87 (1.7)
Bosnia and Herzegovina	●	5–6	94 (2.2)	●	5–6	93 (2.3)	●	5–6	93 (2.3)
Botswana	○	–	2 (0.9)	○	–	15 (3.2)	○	–	5 (1.5)
Bulgaria	●	5	99 (1.0)	●	5	100 (0.5)	●	5	100 (0.5)
Chinese Taipei	●	7–9	14 (3.2)	●	7–9	20 (3.6)	●	7–9	27 (4.0)
Colombia	●	6–7	86 (2.8)	●	8–9	86 (3.6)	●	8–9	86 (3.8)
Cyprus	●	8,11	r 95 (0.7)	○	11	r 42 (1.9)	○	11	r 26 (1.9)
Czech Republic	●	8–10	97 (1.0)	●	8–10	97 (1.0)	●	6–7,10	97 (1.1)
Egypt	●	7–9	96 (1.7)	●	7–8	79 (3.0)	○	7–8	98 (1.2)
El Salvador	○	9	49 (4.5)	○	–	63 (4.3)	○	9	62 (4.2)
England	●	7–8	r 53 (4.0)	○	–	r 44 (3.6)	●	8	r 67 (3.7)
Georgia	●	7	94 (2.8)	●	5,8	94 (2.7)	●	5,7	96 (2.5)
Ghana	○	9–12	26 (3.6)	○	9–12	40 (4.1)	○	10–12	23 (3.6)
Hong Kong SAR	○	10–11	5 (2.0)	●	7	26 (3.8)	●	8	51 (4.5)
Hungary	●	6	71 (3.9)	●	6	83 (3.0)	●	7	50 (4.6)
Indonesia	●	7	r 48 (13.0)	○	10	r 60 (13.1)	○	10	r 66 (12.8)
Iran, Islamic Rep. of	○	12	97 (1.2)	○	11	67 (4.0)	●	6	46 (3.7)
Israel	○	9	s 27 (4.4)	●	5–9	s 72 (4.8)	●	5–9	s 51 (4.7)
Italy	●	8	81 (2.6)	●	6–8	86 (2.2)	●	4,6–7	86 (2.2)
Japan	●	7,10–12	76 (3.6)	●	5–6,10–12	50 (4.1)	●	7,10–12	68 (3.8)
Jordan	●	9–12	91 (2.5)	●	4–8	73 (3.7)	●	7–12	83 (3.4)
Korea, Rep. of	●	7	92 (2.1)	●	7	80 (3.3)	●	7	81 (2.7)
Kuwait	○	–	r 43 (4.5)	○	–	r 49 (5.4)	○	–	r 55 (4.7)
Lebanon	●	8	–	●	8	–	●	8	–
Lithuania	●	6	96 (1.6)	●	8	96 (1.5)	●	8	93 (2.1)
Malaysia	●	7	5 (2.0)	●	7	51 (4.0)	●	7	26 (3.6)
Malta	●	9	82 (0.4)	●	–	85 (0.3)	○	–	58 (0.4)
Mongolia	●	7–11	–	●	8–11	–	●	7–8,10	–
Norway	○	–	77 (3.3)	○	8–10	49 (3.8)	○	8–10	69 (3.8)
Oman	●	7	53 (4.3)	●	7	57 (4.0)	●	8	58 (4.6)
Palestinian Nat'l Auth.	●	3,5,7	73 (3.3)	●	3–4,6–7	61 (4.2)	●	6,9	93 (2.2)
Qatar	●	5,8	34 (0.1)	●	6,8	33 (0.2)	●	8	35 (0.2)
Romania	○	9	96 (1.8)	●	3–5,9	97 (1.4)	●	5,9	98 (1.4)
Russian Federation	●	6–8	–	●	6–8	–	●	6–8	–
Saudi Arabia	●	8	98 (1.0)	●	8	68 (4.1)	●	8	98 (1.1)
Scotland	●	6	s 29 (4.3)	○	8	s 20 (2.4)	●	6	s 53 (3.6)
Serbia	●	5	99 (0.6)	●	5	98 (1.2)	●	5	99 (0.6)
Singapore	○	9–10	r 12 (1.8)	●	7–8	r 13 (1.8)	○	9–10	r 16 (2.2)
Slovenia	●	6,9	–	●	6	–	●	6	–
Sweden	●	6–9	r 33 (4.1)	●	6–9	r 47 (5.9)	●	6–9	r 62 (4.8)
Syrian Arab Republic	●	4,9–11	42 (5.3)	●	3,6,9–10	r 43 (5.4)	●	4,9	40 (4.9)
Thailand	○	10–12	85 (2.6)	●	7–9	73 (3.4)	●	7–9	60 (3.9)
Tunisia	○	10	29 (3.6)	○	10	8 (2.2)	○	10	6 (1.9)
Turkey	●	4,6	63 (3.7)	●	5	63 (4.1)	●	8	74 (4.1)
Ukraine	●	6–8	97 (1.4)	●	2,5–7	98 (1.1)	●	5–6	99 (0.8)
United States	●	5–8	91 (1.8)	●	5–8	84 (2.4)	●	5–8	84 (2.7)
‡ Morocco	●	8	r 97 (0.3)	●	7	r 47 (5.0)	○	–	r 22 (3.6)
International Avg.			64 (0.5)			61 (0.6)			62 (0.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Basque Country, Spain	●	8	83 (3.1)	●	8	89 (3.2)	●	8	91 (2.9)
British Columbia, Canada	●	7,10–12	r 46 (3.6)	●	2,8	r 57 (4.7)	●	4,10	r 42 (3.9)
Dubai, UAE	●	6	x x	●	7	x x	●	8	x x
Massachusetts, US	●	6–8	95 (3.2)	○	9–10	85 (4.5)	○	–	86 (4.3)
Minnesota, US	●	8	90 (3.8)	●	8	81 (5.1)	○	8	76 (6.5)
Ontario, Canada	●	7	85 (3.4)	●	8	73 (4.3)	○	9–12	r 73 (5.0)
Quebec, Canada	●	7–8	83 (4.0)	●	7–8	85 (3.5)	●	7–8	80 (3.9)

● All or almost all students    ○ Only the more able students    ○ Not included in the curriculum through eighth grade

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.  
For countries that teach science as separate subjects at Grade 8, data are based on earth science teachers only.

\* Includes the TIMSS topics mostly taught during or before the year of the assessment.  
‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

(l) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
A dash (–) indicates comparable data are not available.  
An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students. An “x” indicates data are available for less than 50% of the students.

Exhibit 5.13 Intended and Taught\* TIMSS Earth Science Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Earth Science (14 topics)	Earth's water cycle			Processes in the rock cycle and the formation of rocks			Weather data/maps, and changes in weather patterns		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	9	r 10 (3.0)	○	9	r 2 (1.2)	○	–	r 16 (3.7)
Armenia	●	7	62 (4.3)	●	8	54 (4.8)	●	7	62 (4.3)
Australia	⊙	7–12	59 (3.0)	●	7–12	51 (4.0)	⊙	7–12	20 (3.0)
Bahrain	●	3	71 (2.9)	○	9	14 (2.1)	●	4	14 (1.5)
Bosnia and Herzegovina	●	5–6	93 (2.0)	●	5–6	94 (2.2)	●	5–6	94 (2.2)
Botswana	●	7	66 (3.7)	○	10	6 (2.8)	○	10	1 (0.4)
Bulgaria	●	8	99 (1.0)	●	8	99 (1.1)	●	8	99 (1.0)
Chinese Taipei	●	5–9	25 (3.9)	○	10	12 (3.0)	●	7–9	11 (2.9)
Colombia	●	6–7	90 (2.9)	●	6–7	56 (5.7)	●	6–7	68 (4.3)
Cyprus	●	8,11	r 51 (2.2)	●	8,11	r 71 (1.7)	●	7,11	r 97 (1.0)
Czech Republic	●	9–10	94 (1.3)	●	6–10	63 (3.9)	●	6–7,10	94 (1.5)
Egypt	●	5–6	97 (1.5)	●	7–8	97 (1.5)	⊙	7–8	78 (3.3)
El Salvador	○	9	76 (4.0)	○	9	28 (3.8)	●	7,9	53 (4.1)
England	●	8	r 68 (3.5)	●	7	r 94 (1.0)	○	–	r 23 (2.8)
Georgia	●	5	93 (2.8)	○	10	95 (2.6)	●	2	96 (2.4)
Ghana	●	7–12	40 (3.7)	●	7–12	38 (4.3)	●	7–12	30 (3.8)
Hong Kong SAR	●	7	57 (4.6)	○	10–11	1 (0.9)	○	–	4 (2.0)
Hungary	●	5	91 (2.3)	●	5	89 (2.5)	●	6,8	96 (1.6)
Indonesia	●	7	r 73 (11.8)	○	10	r 79 (10.9)	○	11	r 46 (13.5)
Iran, Islamic Rep. of	●	6	87 (2.6)	●	7	98 (1.2)	○	11	34 (4.1)
Israel	●	5–9	s 71 (4.6)	○	9	s 19 (3.7)	●	5–9	s 18 (3.4)
Italy	●	3–6	89 (1.9)	●	8	56 (3.4)	●	8	55 (3.6)
Japan	●	8,10–12	54 (4.5)	●	7,10–12	97 (1.4)	●	5,8,10–12	82 (3.1)
Jordan	●	7–12	79 (3.3)	●	4–12	77 (3.7)	●	9–12	40 (4.0)
Korea, Rep. of	○	9	53 (3.5)	●	7	88 (2.4)	○	9	24 (3.4)
Kuwait	○	–	r 60 (4.5)	○	–	r 42 (4.8)	○	–	r 47 (5.0)
Lebanon	●	2–9	–	●	8	–	○	–	–
Lithuania	●	6	96 (1.5)	●	8	96 (1.7)	●	8	95 (1.5)
Malaysia	●	8	56 (4.4)	○	9	4 (1.6)	○	10	5 (1.9)
Malta	●	9	91 (0.2)	○	11	49 (0.4)	○	11	86 (0.3)
Mongolia	●	8,10	–	●	8,10	–	●	7–9	–
Norway	●	5–10	61 (3.6)	○	–	37 (3.7)	●	5–10	38 (3.8)
Oman	●	6–8	78 (3.6)	●	7	50 (4.5)	○	10	42 (4.4)
Palestinian Nat'l Auth.	●	6	66 (4.1)	●	3,5–6	86 (2.7)	●	4,6,9	34 (4.2)
Qatar	●	8	47 (0.2)	○	5,9	r 38 (0.1)	○	9	r 21 (0.1)
Romania	●	4–5,9	95 (1.8)	○	9	89 (2.4)	●	1–2,4–5,9	93 (2.1)
Russian Federation	●	6	–	●	6	–	●	6–8	–
Saudi Arabia	●	8	76 (3.8)	●	8	94 (2.8)	○	11–12	22 (2.8)
Scotland	●	7	s 66 (3.2)	●	6	s 33 (4.2)	○	–	s 6 (1.5)
Serbia	●	5	99 (1.0)	●	5	99 (0.6)	●	5–7	99 (0.6)
Singapore	●	7–8	r 23 (2.2)	●	7–8	r 11 (1.7)	○	9–10	r 12 (1.7)
Slovenia	●	7	–	●	6	–	●	6–8	–
Sweden	●	6–9	r 58 (4.9)	●	6–9	r 24 (3.8)	○	–	r 29 (5.3)
Syrian Arab Republic	●	6–7,9–10	50 (5.2)	●	3–4,7,11	92 (2.7)	●	5,7,11	r 31 (4.5)
Thailand	●	4–6	67 (4.1)	●	7–9	80 (3.5)	●	7–9	49 (4.1)
Tunisia	○	10	14 (2.8)	●	–	72 (3.6)	○	–	12 (2.9)
Turkey	●	7	84 (3.3)	●	6	45 (4.3)	●	8	38 (4.1)
Ukraine	●	5–6	93 (2.0)	●	5–8	98 (1.1)	●	5–6,8	100 (0.0)
United States	●	5–8	87 (2.1)	●	5–8	87 (1.8)	●	5–8	77 (2.7)
‡ Morocco	●	7	r 65 (5.5)	●	7	r 87 (4.9)	○	–	r 19 (4.0)
<b>International Avg.</b>			<b>69 (0.5)</b>			<b>61 (0.5)</b>			<b>48 (0.5)</b>
<b>Benchmarking Participants</b>									
Basque Country, Spain	●	8	86 (3.2)	●	8	76 (3.9)	●	8	60 (5.1)
British Columbia, Canada	●	4,10	r 65 (4.1)	●	2,7,10	r 44 (3.9)	●	1,4	r 23 (3.8)
Dubai, UAE	●	8	x x	●	8	x x	●	7	x x
Massachusetts, US	○	9–10	92 (2.8)	●	6–10	96 (1.8)	●	3–8	82 (5.0)
Minnesota, US	●	8	78 (6.7)	●	8	82 (5.3)	●	8	65 (7.0)
Ontario, Canada	●	8	77 (4.3)	●	4,7	82 (3.4)	●	5	74 (4.3)
Quebec, Canada	●	7–8	93 (2.4)	●	7–8	76 (4.2)	○	–	35 (4.7)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.13 Intended and Taught\* TIMSS Earth Science Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Earth Science (14 topics)	Geological processes occurring over millions of years			Formation of fossils and fossil fuels			Environmental concerns		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	○	9	r 5 (2.0)	●	8	r 61 (4.5)	○	—	r 49 (4.9)
Armenia	●	8	54 (4.9)	●	8	47 (4.8)	●	8	57 (4.0)
Australia	⊙	7–12	29 (3.1)	●	7–12	38 (4.0)	⊙	7–12	49 (3.4)
Bahrain	○	9	8 (0.5)	○	9	5 (0.9)	○	9	15 (1.8)
Bosnia and Herzegovina	●	5–6	95 (2.0)	●	5–6	82 (3.2)	●	—	69 (4.0)
Botswana	○	—	3 (1.5)	●	8	78 (3.8)	○	10	10 (3.3)
Bulgaria	●	8	94 (1.8)	●	5	50 (5.3)	●	8	80 (4.3)
Chinese Taipei	●	7–9	11 (2.9)	●	7–9	21 (3.5)	●	7–9	31 (3.9)
Colombia	●	6–7	72 (4.1)	●	6–7	62 (5.7)	●	6–7	91 (3.0)
Cyprus	●	8,11	r 97 (0.1)	●	8,11	r 58 (1.5)	○	9,11	r 85 (1.0)
Czech Republic	●	8–10	85 (3.1)	●	6–10	56 (4.3)	●	1–4,8–10	65 (4.2)
Egypt	●	6–8	97 (1.5)	⊙	7–9	90 (2.4)	⊙	6–8	96 (1.5)
El Salvador	○	9	43 (4.2)	○	9	37 (4.0)	○	9,11	73 (3.8)
England	●	7–8	r 70 (3.2)	●	6	r 90 (2.3)	●	6,8	r 94 (1.3)
Georgia	○	8,11	95 (2.5)	○	9	94 (1.7)	○	9	80 (3.6)
Ghana	○	10–12	43 (4.0)	○	10–12	27 (3.7)	●	6–12	67 (4.5)
Hong Kong SAR	○	—	5 (2.1)	●	7	41 (4.5)	●	8	84 (3.2)
Hungary	●	5	95 (1.7)	●	8–9	76 (3.7)	●	8	80 (3.2)
Indonesia	○	9	r 46 (13.5)	○	9	r 24 (11.7)	○	9	r 67 (12.6)
Iran, Islamic Rep. of	○	9	87 (2.7)	○	9	97 (1.4)	○	11	66 (3.4)
Israel	○	9	s 15 (3.3)	●	5–9	s 15 (3.0)	○	9	s 43 (5.0)
Italy	●	8	68 (3.1)	●	8	63 (3.4)	●	7–8	85 (2.0)
Japan	●	7,10–12	94 (2.1)	●	6–7,10–12	62 (4.3)	○	9–12	13 (2.4)
Jordan	●	7–12	85 (2.8)	●	6–12	94 (1.9)	●	6–12	93 (2.1)
Korea, Rep. of	●	8	95 (1.5)	●	8	92 (1.6)	○	10	31 (3.3)
Kuwait	○	—	r 30 (4.3)	○	—	r 46 (5.1)	○	—	r 45 (4.7)
Lebanon	●	8	—	●	8	—	●	4–6	—
Lithuania	●	8	97 (1.2)	●	8	64 (3.9)	●	8	77 (3.5)
Malaysia	●	7	6 (1.9)	○	9	38 (3.8)	●	7–8	81 (3.2)
Malta	⊙	9	71 (0.4)	○	8,10	37 (0.4)	●	8	67 (0.4)
Mongolia	●	6–7,10	—	●	8,10	—	●	8–9	—
Norway	●	8–10	57 (4.2)	●	8–10	55 (3.7)	●	5–10	56 (3.7)
Oman	○	9	39 (4.5)	●	5,8	60 (3.5)	●	6–8	62 (4.3)
Palestinian Nat'l Auth.	●	5	41 (4.1)	●	5,10	86 (3.0)	●	—	54 (4.3)
Qatar	○	5,9	22 (0.1)	●	7	47 (0.1)	○	5–6	26 (0.1)
Romania	○	9	94 (2.3)	○	—	75 (2.8)	●	1–5,9–11	88 (2.6)
Russian Federation	●	6–8	—	●	6–7	—	●	6–8	—
Saudi Arabia	○	11–12	20 (3.4)	○	11–12	53 (4.3)	●	8	63 (4.6)
Scotland	○	—	s 17 (3.3)	●	6	s 56 (3.5)	●	7	s 71 (3.0)
Serbia	●	5–7	99 (0.6)	●	5	93 (2.2)	●	7–8	95 (1.9)
Singapore	○	9–10	r 13 (1.7)	○	—	r 20 (2.1)	●	7–8	r 39 (3.0)
Slovenia	●	6,9	—	●	6	—	●	6–7	—
Sweden	●	6–9	r 21 (4.4)	●	6–9	r 50 (5.5)	●	6–9	r 60 (5.5)
Syrian Arab Republic	●	5,7,11	54 (5.1)	●	5,8,11	81 (4.0)	●	4,7,10	70 (4.7)
Thailand	○	10–12	80 (3.5)	●	7–9	70 (4.1)	●	7–9	72 (4.2)
Tunisia	○	10	38 (3.8)	○	11	57 (4.0)	○	10	12 (2.7)
Turkey	●	6	50 (4.2)	●	4,7	61 (4.5)	●	7	83 (3.2)
Ukraine	●	6–7	99 (0.8)	●	6–7	99 (0.6)	●	1–8	93 (2.2)
United States	●	5–8	88 (1.9)	●	5–8	80 (2.4)	—	5–8	78 (2.5)
‡ Morocco	●	7	r 97 (0.3)	●	7	r 55 (6.5)	●	4,7	r 54 (4.1)
International Avg.			57 (0.5)			60 (0.6)			63 (0.6)
<b>Benchmarking Participants</b>									
Basque Country, Spain	○	9–10	71 (4.7)	●	8	62 (4.8)	●	8	87 (3.2)
British Columbia, Canada	●	7,10	r 42 (4.8)	●	5	r 36 (4.6)	●	6–7,10	r 56 (4.3)
Dubai, UAE	●	8	x x	●	8	x x	●	7	x x
Massachusetts, US	●	6–8	89 (4.6)	○	9–10	79 (5.2)	○	9–10	78 (4.8)
Minnesota, US	●	8	83 (5.0)	●	8	70 (6.4)	○	8	63 (8.1)
Ontario, Canada	●	7	82 (3.9)	●	7	72 (4.3)	○	9–12	84 (4.0)
Quebec, Canada	●	7–8	72 (4.6)	○	10	52 (5.8)	●	7–8	83 (3.3)

● All or almost all students   ⊙ Only the more able students   ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit 5.13 Intended and Taught\* TIMSS Earth Science Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Earth Science (14 topics)	Earth's resources			Relationship of land management to human Use			Supply and demand of fresh water resources					
	Country	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic		
Algeria	○	9	r	14 (2.9)	○	9	r	20 (3.7)	○	9	r	6 (2.6)
Armenia	●	8		67 (4.2)	●	7		53 (4.1)	●	7		50 (4.2)
Australia	●	7-12		43 (3.4)	⊙	7-12		15 (3.0)	⊙	7-12		27 (2.7)
Bahrain	●	6	r	16 (1.6)	●	6	r	5 (1.6)	●	4	r	28 (2.3)
Bosnia and Herzegovina	●	-		69 (3.8)	●	-		59 (4.0)	●	5-6		70 (3.7)
Botswana	●	-		63 (4.4)	○	11-12		4 (1.8)	●	7		35 (4.5)
Bulgaria	○	9		70 (4.7)	○	9		55 (4.9)	●	8		50 (5.1)
Chinese Taipei	●	3-9		18 (3.5)	○	-		11 (2.9)	○	-		18 (3.6)
Colombia	●	6-7		92 (3.0)	●	8-9		64 (5.4)	●	8-9		61 (5.7)
Cyprus	●	8,11	r	91 (0.9)	●	8,11	r	55 (1.8)	●	8,11	r	70 (1.3)
Czech Republic	●	8-10		59 (4.2)	●	1-10		66 (4.0)	●	6-7,10		72 (3.0)
Egypt	⊙	7-9		95 (1.9)	⊙	7-8		40 (4.3)	⊙	6-7		73 (3.7)
El Salvador	●	3-10		78 (3.9)	●	4,6-8		48 (4.4)	○	-		62 (4.6)
England	●	6-8	r	85 (2.1)	○	-	r	52 (3.5)	○	-	r	31 (3.0)
Georgia	○	5-6		65 (4.8)	○	11		39 (5.9)	●	5-8		69 (4.4)
Ghana	●	7-12		56 (4.5)	●	7-12		53 (4.5)	●	7-12		53 (4.5)
Hong Kong SAR	●	8		59 (5.0)	○	10-11		6 (2.2)	●	7		35 (4.3)
Hungary	●	8-10		80 (3.3)	●	8-10		71 (3.7)	○	9-10		72 (3.8)
Indonesia	●	7	r	48 (13.6)	●	7	r	43 (13.5)	●	7	r	14 (9.0)
Iran, Islamic Rep. of	●	7		55 (3.8)	○	5		34 (3.9)	●	6		29 (3.7)
Israel	●	5-9	s	43 (5.2)	○	-	s	17 (3.3)	●	5-9	s	61 (4.8)
Italy	●	8		76 (2.9)	●	7-8		50 (3.4)	●	8		58 (3.4)
Japan	●	6,9-12		5 (1.8)	○	-		2 (1.0)	○	-		8 (2.0)
Jordan	●	6-12		93 (2.1)	●	9-12		56 (4.4)	●	5-12		53 (4.4)
Korea, Rep. of	○	-		25 (3.3)	○	-		14 (2.7)	○	-		20 (3.2)
Kuwait	○	-	r	58 (4.4)	○	-	r	45 (5.0)	○	-	r	51 (4.8)
Lebanon	●	6		--	●	6		--	●	4		--
Lithuania	●	8		60 (3.9)	●	8		41 (4.2)	●	8		63 (4.1)
Malaysia	●	7		84 (3.0)	●	8		58 (3.9)	●	8		71 (3.8)
Malta	○	8,10		29 (0.4)	○	-		36 (0.4)	○	-		89 (0.2)
Mongolia	●	7-9		--	●	8-9		--	●	8-10		--
Norway	●	8-10		34 (3.7)	○	-		15 (2.8)	○	-		18 (3.1)
Oman	○	9		64 (3.9)	○	-		36 (3.9)	⊙	6,8		56 (4.9)
Palestinian Nat'l Auth.	●	7		72 (4.1)	●	5-7		33 (4.2)	●	3,6		43 (4.4)
Qatar	○	6,9		23 (0.1)	○	5-6		14 (0.1)	○	6	r	18 (0.1)
Romania	○	10-11		89 (2.3)	○	9-11		67 (3.5)	○	9-11		65 (3.3)
Russian Federation	●	6-9		--	○	-		--	○	10		--
Saudi Arabia	●	8		42 (4.6)	○	9		43 (4.4)	○	9		38 (4.1)
Scotland	●	8	s	62 (3.2)	○	10	s	13 (2.8)	●	7	s	13 (1.8)
Serbia	●	7-8		97 (1.6)	●	7-8		99 (0.7)	●	7-8		97 (1.7)
Singapore	●	7-8	r	30 (2.6)	●	7-8	r	13 (1.9)	●	7-8	r	15 (1.9)
Slovenia	●	6		--	●	6		--	●	7		--
Sweden	●	6-9	r	38 (5.7)	●	6-9	r	15 (4.1)	●	6-9	r	32 (6.0)
Syrian Arab Republic	●	3-4,7,10		29 (4.6)	●	6,10	r	51 (5.9)	●	6,9,10	r	39 (5.5)
Thailand	○	7-9		69 (4.1)	○	10-12		60 (4.2)	●	7-9		68 (4.1)
Tunisia	○	11		9 (2.4)	○	-		25 (3.9)	○	10		7 (1.8)
Turkey	●	7-8		77 (3.7)	●	7		54 (4.8)	●	7		60 (4.6)
Ukraine	●	6-8		93 (2.4)	●	7		71 (4.3)	●	7		93 (2.0)
United States	●	5-8		78 (2.5)	●	5-8		63 (3.0)	●	5-8		66 (3.2)
‡ Morocco	●	7-8	r	29 (5.1)	●	6	r	28 (4.4)	●	7	r	42 (6.0)
International Avg.				57 (0.6)				39 (0.6)				47 (0.6)

Benchmarking Participants

Basque Country, Spain	●	8		80 (4.1)	○	9-10		16 (3.8)	●	8		55 (4.2)
British Columbia, Canada	●	5,10-11	r	43 (4.1)	●	5	r	26 (3.9)	●	8	r	50 (4.2)
Dubai, UAE	●	8		x x	●	8		x x	●	8		x x
Massachusetts, US	○	9-10		64 (6.6)	○	-		56 (7.6)	○	-		58 (6.3)
Minnesota, US	●	8		72 (5.9)	○	-		48 (7.4)	○	-		63 (6.1)
Ontario, Canada	●	4-8		80 (4.5)	○	9-12	r	64 (4.9)	●	8		66 (4.6)
Quebec, Canada	●	7-8		79 (3.6)	○	10		31 (4.6)	●	7-8		51 (4.9)

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 5.13 Intended and Taught\* TIMSS Earth Science Topics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Earth Science (14 topics)			Explanation of phenomena on Earth in relation to the solar system			Physical features of Earth compared with other planets		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Algeria	●	7	r 5 (2.0)	○	–	r 3 (1.7)			
Armenia	●	8	69 (4.1)	●	8	72 (4.0)			
Australia	⊙	7–10	62 (3.9)	⊙	7–10	62 (3.2)			
Bahrain	●	8	93 (1.8)	●	8	89 (1.7)			
Bosnia and Herzegovina	●	5–6	94 (2.2)	●	5–6	94 (1.8)			
Botswana	○	10	7 (2.9)	○	10–12	6 (2.2)			
Bulgaria	●	8	99 (0.8)	●	8	94 (2.2)			
Chinese Taipei	●	7–9	11 (2.9)	○	–	10 (2.8)			
Colombia	●	8–9	72 (5.5)	●	8–9	72 (5.6)			
Cyprus	●	7	r 89 (1.1)	●	7,11	r 80 (1.6)			
Czech Republic	●	8–10	98 (0.8)	●	8–10	97 (0.9)			
Egypt	⊙	7–8	98 (0.9)	●	7–8	92 (2.1)			
El Salvador	○	9	38 (4.3)	○	9	41 (4.5)			
England	●	6,8	r 92 (1.4)	●	6	r 84 (2.2)			
Georgia	●	5	87 (3.5)	●	6,8	83 (4.0)			
Ghana	●	7–9	42 (4.4)	○	9–12	40 (4.1)			
Hong Kong SAR	●	6	12 (2.9)	●	1–11	9 (2.5)			
Hungary	●	6	47 (4.6)	○	9	46 (4.5)			
Indonesia	○	9	r 87 (8.1)	○	11	r 76 (10.7)			
Iran, Islamic Rep. of	○	12	82 (3.1)	○	12	66 (3.9)			
Israel	⊙	5–6,10–12	s 28 (4.3)	○	–	s 27 (4.3)			
Italy	●	8	70 (3.0)	●	8	70 (3.1)			
Japan	●	4,9–12	4 (1.7)	○	9–12	4 (1.7)			
Jordan	●	6–12	64 (3.9)	●	5–12	50 (4.1)			
Korea, Rep. of	○	–	38 (4.4)	●	8	55 (3.7)			
Kuwait	○	–	r 80 (4.1)	○	–	r 61 (4.7)			
Lebanon	○	–	–	○	8	–			
Lithuania	●	8	85 (3.1)	○	10	73 (4.0)			
Malaysia	●	5–6	9 (2.2)	●	6	8 (2.1)			
Malta	○	–	33 (0.4)	○	–	18 (0.3)			
Mongolia	●	10	–	●	4–5,10	–			
Norway	●	5–10	88 (2.4)	●	5–10	85 (2.7)			
Oman	⊙	5,9	88 (2.6)	●	3–7	67 (4.0)			
Palestinian Nat'l Auth.	●	4,7	90 (2.9)	●	4,7	68 (4.1)			
Qatar	○	3	50 (0.2)	○	10	34 (0.1)			
Romania	●	3–5,9,11	96 (1.7)	●	5,9	94 (2.1)			
Russian Federation	●	5,11	–	●	6,11	–			
Saudi Arabia	●	8	85 (3.4)	○	11–12	83 (3.4)			
Scotland	●	6	s 38 (3.3)	●	6	s 30 (3.1)			
Serbia	●	5	99 (0.6)	●	5	98 (1.3)			
Singapore	○	–	r 12 (2.0)	○	–	r 7 (1.5)			
Slovenia	●	6,9	–	●	6,9	–			
Sweden	●	1–5	r 65 (5.3)	●	6–9	r 64 (5.7)			
Syrian Arab Republic	●	4–5	61 (5.1)	○	5,9	32 (4.4)			
Thailand	●	4–6	27 (4.3)	○	10–12	31 (4.2)			
Tunisia	○	10	7 (2.2)	○	–	5 (1.9)			
Turkey	●	7	89 (2.7)	●	7	81 (3.4)			
Ukraine	●	5–6,10	98 (1.3)	●	5–6	96 (1.8)			
United States	●	5–8	83 (2.3)	●	5–8	84 (2.3)			
‡ Morocco	○	–	r 20 (4.3)	○	–	r 7 (2.8)			
<b>International Avg.</b>			<b>61 (0.5)</b>			<b>55 (0.5)</b>			
<b>Benchmarking Participants</b>									
Basque Country, Spain	●	7	92 (2.2)	●	7	83 (3.8)			
British Columbia, Canada	●	3,9	r 32 (3.6)	●	3,9	r 25 (3.8)			
Dubai, UAE	●	7	x x	○	10	x x			
Massachusetts, US	●	6–8	96 (3.1)	●	6–8	87 (5.5)			
Minnesota, US	●	8	79 (5.3)	●	8	78 (5.8)			
Ontario, Canada	●	1,6	60 (5.3)	●	6	56 (5.3)			
Quebec, Canada	●	7–8	78 (4.1)	○	9	79 (4.1)			

● All or almost all students    ⊙ Only the more able students    ○ Not included in the curriculum through eighth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007





# Chapter 6



## *Teachers of Science*

To help place students' science achievement in the context of their school and classroom situations, the science teachers of the students tested were asked to complete questionnaires about their experience and education. This chapter presents teachers' reports about their background characteristics, education and training in teaching science, and about how well prepared they feel to teach science. It is important to note that the data shown are the percentages of students whose teachers reported on various characteristics. That is, the student is the unit of analysis so that TIMSS can describe the classroom contexts of the students.

The teachers who completed the questionnaires were the science teachers of the students who took the TIMSS 2007 test. At the eighth grade, the general sampling procedure was to sample a mathematics class from each participating school, administer the test to those students, and ask both their mathematics and science teachers to complete the questionnaire. In countries where science is taught as separate subjects, all science subject teachers of the students in the sampled mathematics classes were asked to complete a questionnaire. At the fourth grade, students often only have one teacher for all subjects, so this teacher is their science teacher and the one who completed the questionnaire. In either grade, the information about teachers' characteristics and instruction is tied directly to the students tested.

The exhibits have special notations when relatively large percentages of students did not have teacher questionnaire information. For a country where teacher responses were available for 70 to 84 percent of the students,

an “r” is included next to its data.<sup>1</sup> Where teacher responses were available for 50 to 69 percent of students, an “s” is included. Where teacher responses were available for less than 50 percent, an “x” replaces the data.

### **What Are the Background Characteristics of Science Teachers?**

This section presents information about the background characteristics of the teachers of science, including gender, age, and years teaching experience. As shown in Exhibit 6.1, in many countries, most fourth-grade students were taught science by females (international average of 79%). This was less so at the eighth grade (international average of 59%), although the majority of students had female teachers in more than two-thirds of the countries.

Exhibit 6.1 also presents teachers’ reports about their age and teaching experience. At both the fourth and eighth grades, the majority of students were taught science by teachers in their 30s and 40s. Relatively few students, 16 to 21 percent on average internationally, were taught by younger teachers. Several countries did have the majority of their students taught by younger teachers (for example, Kuwait at the fourth grade, and Ghana and Oman at the eighth grade). Although about one-fourth of the students internationally (21–24%) were taught by teachers age 50 or older, the teaching force was older in some countries. For example, half or more of the students had teachers 50 years or older in Georgia at the fourth grade and in Italy at the eighth grade. Older teachers can have more experience and as would be expected from their ages, on average internationally, science teachers at both the fourth and eighth grades were relatively experienced, with 15 to 17 years of teaching. Increases in years of teaching experience were noted at the fourth grade in Armenia, Hungary, Latvia, and Lithuania, and at the eighth grade in Bahrain, Cyprus, Egypt, Romania, the Russian Federation, and the Basque Country in Spain. The only decreases were at the eighth grade in Singapore and the benchmarking provinces of Ontario and Quebec.

<sup>1</sup> Although countries worked hard to maximize participation by teachers, sometimes this was affected by external factors. For example, a teacher strike led to somewhat reduced teacher participation in Israel.

**Exhibit 6.1 Science Teachers' Gender, Age, and Number of Years Teaching with Trends**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

Country	Percentage of Students by Teacher Characteristics						Trends in Average Number of Years Teaching	
	Gender		Age				2007	Difference from 2003
	Female	Male	29 Years or Under	30–39 Years	40–49 Years	50 Years or Older		
Algeria	58 (4.5)	42 (4.5)	6 (1.9)	45 (4.6)	44 (4.4)	5 (1.8)	17 (0.6)	0 0
Armenia	85 (3.3)	15 (3.3)	15 (3.0)	20 (3.2)	26 (3.2)	39 (4.4)	s 22 (0.8)	7 (1.4) 0
Australia	77 (3.7)	23 (3.7)	21 (3.8)	17 (3.0)	30 (3.9)	32 (3.3)	17 (0.9)	0 (1.2)
Austria	88 (2.2)	12 (2.2)	9 (2.1)	19 (2.5)	37 (3.0)	34 (2.9)	22 (0.7)	0 0
Chinese Taipei	65 (4.5)	35 (4.5)	15 (3.3)	41 (4.2)	38 (4.1)	6 (2.0)	12 (0.7)	-1 (1.2)
Colombia	77 (3.4)	23 (3.4)	18 (4.0)	28 (5.1)	33 (4.1)	22 (4.1)	18 (1.1)	0 0
Czech Republic	91 (2.1)	9 (2.1)	11 (2.5)	26 (2.8)	38 (3.1)	25 (3.0)	17 (0.8)	0 0
Denmark	45 (4.4)	55 (4.4)	9 (2.0)	30 (4.4)	27 (4.2)	33 (4.2)	15 (1.0)	0 0
El Salvador	72 (4.1)	28 (4.1)	14 (2.8)	38 (3.8)	39 (3.7)	9 (2.6)	14 (0.7)	0 0
England	70 (3.3)	30 (3.3)	31 (3.8)	28 (3.3)	25 (3.5)	16 (2.9)	r 11 (0.7)	-2 (1.2)
Georgia	99 (0.6)	1 (0.6)	7 (2.2)	16 (2.3)	27 (3.9)	50 (4.4)	25 (1.1)	0 0
Germany	86 (2.3)	14 (2.3)	9 (1.9)	25 (2.7)	22 (2.8)	44 (3.1)	19 (0.7)	0 0
Hong Kong SAR	71 (3.7)	29 (3.7)	38 (4.4)	33 (4.4)	18 (3.3)	11 (2.9)	11 (0.8)	-2 (1.3)
Hungary	95 (1.7)	5 (1.7)	5 (1.9)	20 (2.7)	45 (3.3)	30 (3.5)	23 (0.7)	3 (1.1) 0
Iran, Islamic Rep. of	53 (2.7)	47 (2.7)	14 (2.4)	40 (4.1)	40 (3.9)	7 (1.6)	16 (0.6)	0 (0.9)
Italy	97 (0.9)	3 (0.9)	4 (1.4)	20 (2.3)	37 (3.0)	39 (3.1)	21 (0.6)	0 (0.9)
Japan	62 (3.6)	38 (3.6)	14 (2.8)	18 (3.0)	41 (3.9)	27 (3.4)	19 (0.8)	-1 (1.1)
Kazakhstan	94 (1.7)	6 (1.7)	11 (3.0)	34 (3.7)	34 (5.2)	22 (4.6)	18 (0.9)	0 0
Kuwait	r 88 (2.6)	12 (2.6)	r 55 (4.8)	37 (4.7)	7 (2.4)	1 (0.8)	r 7 (0.5)	0 0
Latvia	100 (0.0)	0 (0.0)	6 (1.7)	31 (3.6)	34 (3.1)	29 (3.4)	21 (0.8)	3 (1.3) 0
Lithuania	98 (0.8)	2 (0.8)	1 (0.6)	34 (3.0)	39 (3.5)	26 (3.3)	21 (0.6)	2 (0.9) 0
Morocco	47 (3.8)	53 (3.8)	16 (3.0)	29 (3.5)	36 (3.9)	18 (3.0)	s 17 (0.6)	2 (1.1)
Netherlands	58 (4.1)	42 (4.1)	24 (3.5)	19 (3.1)	15 (3.0)	42 (3.9)	18 (1.0)	2 (1.5)
New Zealand	76 (2.4)	24 (2.4)	28 (2.6)	28 (2.3)	23 (2.1)	20 (2.4)	r 11 (0.6)	0 (0.9)
Norway	82 (2.4)	18 (2.4)	10 (2.0)	28 (2.8)	20 (2.6)	42 (2.9)	17 (0.8)	1 (1.3)
Qatar	92 (0.1)	8 (0.1)	30 (0.1)	50 (0.2)	17 (0.1)	3 (0.0)	10 (0.0)	0 0
Russian Federation	99 (0.9)	1 (0.9)	7 (2.3)	34 (3.3)	37 (3.6)	22 (2.4)	21 (0.5)	1 (0.9)
Scotland	92 (2.2)	8 (2.2)	23 (3.7)	21 (2.8)	23 (2.8)	33 (3.4)	r 15 (0.9)	0 (1.3)
Singapore	72 (2.3)	28 (2.3)	42 (3.0)	35 (3.1)	16 (2.3)	7 (1.5)	9 (0.6)	-1 (1.0)
Slovak Republic	94 (1.5)	6 (1.5)	10 (2.1)	31 (3.4)	29 (3.4)	29 (2.9)	19 (0.7)	0 0
Slovenia	98 (0.7)	2 (0.7)	14 (1.9)	21 (2.4)	48 (3.0)	17 (2.5)	19 (0.6)	1 (1.0)
Sweden	81 (2.8)	19 (2.8)	8 (1.8)	27 (3.1)	26 (2.7)	39 (3.1)	17 (0.8)	0 0
Tunisia	56 (3.9)	44 (3.9)	8 (2.0)	40 (4.2)	39 (3.6)	13 (2.7)	r 19 (0.7)	1 (1.0)
Ukraine	100 (0.0)	0 (0.0)	8 (1.8)	32 (3.7)	38 (3.9)	22 (2.8)	22 (0.6)	0 0
United States	88 (1.7)	12 (1.7)	19 (2.0)	31 (2.6)	21 (2.3)	29 (2.3)	13 (0.5)	0 (0.8)
Yemen	24 (3.7)	76 (3.7)	29 (4.5)	66 (4.9)	3 (1.9)	1 (0.9)	12 (0.5)	0 0
<b>International Avg.</b>	<b>79 (0.5)</b>	<b>21 (0.5)</b>	<b>16 (0.5)</b>	<b>30 (0.6)</b>	<b>30 (0.6)</b>	<b>24 (0.5)</b>	<b>17 (0.1)</b>	
<b>Benchmarking Participants</b>								
Alberta, Canada	81 (3.0)	19 (3.0)	16 (3.1)	27 (3.9)	29 (4.2)	28 (3.5)	14 (0.8)	0 0
British Columbia, Canada	r 82 (3.0)	18 (3.0)	r 10 (2.8)	33 (4.1)	21 (3.0)	35 (3.8)	r 15 (0.8)	0 0
Dubai, UAE	s 81 (3.4)	19 (3.4)	s 27 (4.2)	42 (3.9)	26 (4.7)	6 (2.9)	s 9 (0.8)	0 0
Massachusetts, US	91 (3.1)	9 (3.1)	21 (3.7)	27 (6.0)	24 (5.5)	28 (5.9)	13 (1.0)	0 0
Minnesota, US	75 (6.7)	25 (6.7)	13 (3.8)	24 (5.7)	23 (7.3)	40 (7.5)	18 (1.4)	0 0
Ontario, Canada	83 (3.3)	17 (3.3)	14 (3.2)	34 (5.0)	29 (5.0)	23 (4.3)	13 (0.8)	0 (1.3)
Quebec, Canada	88 (3.1)	12 (3.1)	14 (2.8)	30 (3.8)	33 (4.2)	23 (3.5)	r 15 (0.8)	-1 (1.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

2007 significantly higher 0  
2007 significantly lower 0

Background data provided by teachers.  
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.  
A diamond (0) indicates the country did not participate in the assessment.

Exhibit 6.1 **Science Teachers' Gender, Age, and Number of Years Teaching with Trends (Continued)**

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Teacher Characteristics						Trends in Average Number of Years Teaching	
	Gender		Age				2007	Difference from 2003
	Female	Male	29 Years or Under	30–39 Years	40–49 Years	50 Years or Older		
Algeria	54 (3.6)	46 (3.6)	7 (1.9)	35 (3.0)	52 (3.3)	6 (1.5)	r 17 (0.6)	◇ ◇
Armenia	88 (2.3)	12 (2.3)	10 (1.6)	27 (2.2)	32 (2.5)	31 (2.0)	r 19 (0.4)	0 (0.7)
Australia	50 (3.6)	50 (3.6)	23 (2.6)	24 (3.0)	26 (2.8)	27 (2.9)	r 14 (0.7)	-1 (1.1)
Bahrain	50 (0.9)	50 (0.9)	18 (2.3)	53 (2.5)	28 (2.6)	2 (0.9)	12 (0.4)	3 (0.7) ▲
Bosnia and Herzegovina	62 (2.0)	38 (2.0)	10 (1.5)	21 (1.8)	25 (1.9)	44 (2.3)	20 (0.6)	◇ ◇
Botswana	42 (4.2)	58 (4.2)	42 (4.7)	53 (4.4)	4 (1.8)	1 (0.3)	r 7 (0.4)	1 (0.7)
Bulgaria	84 (1.7)	16 (1.7)	4 (1.5)	25 (2.6)	30 (2.5)	41 (2.5)	20 (0.6)	--
Chinese Taipei	37 (3.7)	63 (3.7)	15 (3.1)	40 (4.2)	35 (4.1)	9 (2.5)	12 (0.7)	-1 (1.1)
Colombia	64 (4.9)	36 (4.9)	15 (3.0)	29 (4.4)	29 (4.0)	27 (5.4)	18 (1.4)	◇ ◇
Cyprus	r 62 (1.3)	38 (1.3)	r 13 (0.6)	15 (0.9)	47 (0.9)	25 (0.8)	r 10 (0.2)	1 (0.4) ▲
Czech Republic	70 (2.3)	30 (2.3)	15 (1.9)	20 (1.9)	25 (1.7)	40 (2.3)	19 (0.7)	◇ ◇
Egypt	41 (4.2)	59 (4.2)	20 (3.5)	39 (3.9)	38 (4.0)	2 (1.3)	14 (0.7)	2 (0.8) ▲
El Salvador	49 (4.4)	51 (4.4)	14 (2.9)	51 (4.1)	29 (3.5)	6 (1.6)	13 (0.5)	◇ ◇
England	55 (2.9)	45 (2.9)	26 (3.0)	28 (2.5)	21 (2.1)	26 (2.7)	s 12 (0.6)	0 (1.3)
Georgia	92 (1.2)	8 (1.2)	5 (1.2)	23 (2.3)	33 (2.3)	40 (3.1)	21 (0.7)	◇ ◇
Ghana	8 (2.1)	92 (2.1)	52 (3.9)	32 (4.1)	8 (2.1)	8 (2.3)	7 (0.6)	-1 (0.9)
Hong Kong SAR	37 (4.7)	63 (4.7)	23 (4.0)	39 (4.5)	27 (4.3)	12 (3.2)	14 (0.9)	2 (1.2)
Hungary	76 (2.0)	24 (2.0)	7 (1.3)	17 (1.7)	39 (2.2)	37 (2.3)	22 (0.5)	1 (0.7)
Indonesia	56 (3.8)	44 (3.8)	20 (2.3)	44 (3.2)	31 (3.0)	5 (1.2)	12 (0.6)	0 (0.8)
Iran, Islamic Rep. of	42 (2.1)	58 (2.1)	14 (2.5)	53 (3.4)	24 (3.0)	9 (1.9)	15 (0.5)	0 (0.8)
Israel	78 (3.1)	22 (3.1)	16 (3.1)	29 (3.2)	34 (3.5)	21 (2.9)	r 16 (0.8)	0 (1.1)
Italy	81 (2.8)	19 (2.8)	2 (1.1)	10 (1.9)	22 (2.3)	67 (2.9)	23 (0.7)	0 (0.9)
Japan	16 (3.0)	84 (3.0)	19 (3.1)	25 (3.6)	32 (4.0)	25 (3.7)	17 (0.9)	-1 (1.2)
Jordan	53 (2.1)	47 (2.1)	44 (4.4)	36 (4.0)	14 (2.9)	6 (1.9)	9 (0.6)	-2 (1.0)
Korea, Rep. of	63 (3.4)	37 (3.4)	21 (3.1)	26 (3.3)	41 (3.3)	12 (2.8)	r 13 (0.7)	1 (0.9)
Kuwait	r 50 (3.0)	50 (3.0)	r 23 (3.7)	42 (4.3)	27 (3.2)	9 (2.4)	s 13 (0.8)	◇ ◇
Lebanon	64 (3.6)	36 (3.6)	42 (4.1)	33 (3.6)	17 (2.3)	9 (2.2)	11 (0.6)	1 (0.8)
Lithuania	81 (1.7)	19 (1.7)	7 (1.3)	17 (1.6)	40 (2.1)	36 (2.1)	22 (0.6)	2 (0.9)
Malaysia	75 (3.3)	25 (3.3)	23 (3.5)	49 (4.4)	23 (3.5)	6 (2.0)	11 (0.6)	0 (0.9)
Malta	57 (0.3)	43 (0.3)	47 (0.3)	30 (0.2)	14 (0.2)	8 (0.2)	10 (0.1)	◇ ◇
Norway	39 (3.2)	61 (3.2)	10 (2.5)	40 (3.6)	14 (2.3)	35 (3.1)	15 (0.8)	0 (1.3)
Oman	51 (2.4)	49 (2.4)	76 (3.5)	18 (3.2)	5 (1.6)	1 (0.8)	6 (0.5)	◇ ◇
Palestinian Nat'l Auth.	53 (2.5)	47 (2.5)	36 (3.9)	26 (3.4)	27 (3.9)	11 (2.6)	11 (0.8)	1 (1.1)
Qatar	49 (0.2)	51 (0.2)	22 (0.1)	51 (0.2)	18 (0.1)	9 (0.1)	11 (0.0)	◇ ◇
Romania	72 (2.2)	28 (2.2)	13 (1.5)	22 (1.9)	23 (1.9)	42 (2.6)	21 (0.6)	2 (0.9) ▲
Russian Federation	92 (1.1)	8 (1.1)	10 (1.3)	21 (1.4)	32 (2.0)	36 (1.9)	22 (0.4)	2 (0.7) ▲
Saudi Arabia	49 (2.0)	51 (2.0)	24 (3.3)	63 (3.8)	13 (3.0)	1 (0.7)	10 (0.4)	--
Scotland	r 51 (2.3)	49 (2.3)	r 20 (2.0)	15 (1.7)	26 (2.5)	38 (2.1)	s 17 (0.6)	-1 (0.9)
Serbia	74 (1.9)	26 (1.9)	4 (0.7)	26 (1.9)	26 (1.6)	44 (2.2)	18 (0.6)	-1 (0.7)
Singapore	64 (2.4)	36 (2.4)	44 (2.5)	29 (2.3)	13 (1.5)	14 (1.6)	10 (0.5)	-2 (0.8) ▼
Slovenia	82 (1.7)	18 (1.7)	9 (1.6)	24 (2.0)	43 (2.4)	24 (2.4)	19 (0.5)	1 (0.8)
Sweden	52 (3.0)	48 (3.0)	12 (2.0)	33 (3.0)	21 (2.1)	34 (2.7)	14 (0.7)	1 (1.0)
Syrian Arab Republic	68 (3.0)	32 (3.0)	35 (3.2)	26 (2.7)	33 (3.2)	6 (1.5)	11 (0.7)	◇ ◇
Thailand	68 (3.9)	32 (3.9)	23 (3.6)	29 (3.6)	27 (3.8)	21 (3.5)	14 (0.7)	◇ ◇
Tunisia	65 (3.9)	35 (3.9)	17 (3.2)	48 (3.7)	25 (3.1)	10 (2.6)	r 11 (0.7)	0 (1.0)
Turkey	49 (4.4)	51 (4.4)	33 (3.6)	36 (4.0)	17 (3.4)	14 (3.2)	12 (0.8)	◇ ◇
Ukraine	86 (1.7)	14 (1.7)	12 (1.7)	26 (2.2)	29 (1.9)	33 (2.1)	21 (0.5)	◇ ◇
United States	58 (3.0)	42 (3.0)	15 (2.4)	30 (2.7)	25 (2.4)	30 (3.0)	13 (0.6)	-1 (0.9)
‡ Morocco	39 (4.3)	61 (4.3)	9 (2.3)	25 (3.2)	39 (3.3)	28 (3.1)	r 17 (1.1)	--
International Avg.	59 (0.4)	41 (0.4)	21 (0.4)	32 (0.4)	27 (0.4)	21 (0.3)	15 (0.1)	--
<b>Benchmarking Participants</b>								
Basque Country, Spain	56 (4.8)	44 (4.8)	5 (2.3)	20 (3.4)	47 (4.6)	28 (4.1)	20 (1.0)	3 (1.4) ▲
British Columbia, Canada	46 (4.2)	54 (4.2)	15 (2.6)	41 (3.5)	24 (3.7)	20 (3.1)	r 13 (0.7)	◇ ◇
Dubai, UAE	s 62 (4.1)	38 (4.1)	s 15 (2.9)	49 (4.6)	23 (5.5)	13 (4.3)	s 14 (0.6)	◇ ◇
Massachusetts, US	57 (5.1)	43 (5.1)	25 (5.9)	22 (6.1)	29 (6.1)	24 (6.5)	10 (1.1)	◇ ◇
Minnesota, US	42 (6.0)	58 (6.0)	30 (6.1)	16 (4.7)	26 (7.1)	28 (6.1)	13 (1.1)	◇ ◇
Ontario, Canada	55 (4.1)	45 (4.1)	24 (4.3)	45 (4.4)	20 (3.9)	12 (2.8)	9 (0.7)	-3 (1.1) ▼
Quebec, Canada	52 (4.2)	48 (4.2)	35 (4.8)	34 (5.0)	23 (4.4)	8 (2.7)	r 9 (0.8)	-3 (1.1) ▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

2007 significantly higher ▲  
2007 significantly lower ▼

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (◇) indicates the country did not participate in the assessment.



**TIMSS & PIRLS**  
International Study Center  
Lynch School of Education, Boston College

### What Education and Training Do Teachers Have for Teaching Science?

Exhibit 6.2 presents teachers' highest level of education. On average internationally, 70 percent of the fourth grade students and 81 percent of the eighth grade students had teachers who had completed a university degree. However, at the fourth grade, there was some variation across countries, with the majority of students in Algeria, Italy, Morocco, and Tunisia having teachers that had completed only secondary school.

Exhibit 6.3 contains information about teachers' educational emphasis in science and teaching. Most countries have a national or regional science curriculum, and most countries reported that teachers received specific preparation in how to teach the science curriculum as part of pre-service education. However, in a number of countries the teachers of the fourth grade students reported little specific training or specialized education in science. Countries where 80 percent or more of the fourth grade students had teachers who studied primary/elementary education without a major or specialization in mathematics or science included Australia, Austria, Hungary, Lithuania, and the Slovak Republic as well as the benchmarking province of Quebec. In contrast, 83 percent of the fourth grade students in Kazakhstan had teachers with primary/elementary education and a major or specialization in science. In Armenia, almost all teachers had a science major or specialization (90%), but few had studied primary/elementary education. At the eighth grade, on average internationally, 81 percent of students had teachers who had studied science (biology, physics, chemistry, or earth science), but only 39 percent had teachers whose major area of study was in science education.

To provide more information about the branches of science that science teachers studied during their postsecondary education, Exhibit 6.4 presents the percentage of eighth-grade students whose teachers reported majoring in biology, physics, chemistry, or earth science. Teachers could major in more than one of these subjects, and the percentages in the exhibit reflect this. On average, biology was the most frequently reported major (42%), followed by chemistry (40%), physics (32%), and earth science (19%).

Exhibit 6.2 Highest Educational Level of Science Teachers\*

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percentage of Students by Their Teachers' Educational Level				
	Completed Postgraduate University Degree**	Completed University but Not a Postgraduate Degree	Completed Post-secondary Education but Not University	Completed Upper-secondary School	Did Not Complete Upper-secondary School
Algeria	0 (0.5)	19 (3.3)	5 (2.1)	69 (3.8)	7 (1.9)
Armenia	0 (0.0)	98 (1.2)	2 (1.2)	0 (0.0)	0 (0.0)
Australia	41 (4.3)	52 (4.6)	8 (1.5)	0 (0.0)	0 (0.0)
Austria	3 (1.0)	1 (0.5)	93 (1.8)	3 (1.1)	0 (0.0)
Chinese Taipei	23 (3.4)	65 (4.3)	3 (1.2)	9 (2.7)	0 (0.0)
Colombia	9 (2.5)	70 (5.0)	11 (3.7)	9 (2.8)	1 (0.0)
Czech Republic	80 (3.1)	3 (1.4)	6 (2.1)	10 (2.4)	0 (0.0)
Denmark	3 (1.4)	84 (3.5)	9 (2.8)	4 (1.5)	0 (0.0)
El Salvador	0 (0.0)	21 (3.3)	64 (4.0)	13 (3.2)	2 (1.2)
England	34 (4.2)	56 (4.6)	10 (2.2)	0 (0.0)	0 (0.0)
Georgia	90 (1.9)	9 (1.7)	0 (0.0)	1 (0.7)	0 (0.0)
Germany	0 (0.0)	100 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
Hong Kong SAR	13 (2.5)	68 (3.8)	18 (3.5)	1 (0.8)	0 (0.0)
Hungary	--	--	--	--	--
Iran, Islamic Rep. of	1 (0.6)	27 (4.1)	44 (4.2)	28 (3.9)	0 (0.0)
Italy	2 (0.7)	19 (2.5)	6 (1.5)	73 (3.0)	0 (0.0)
Japan	3 (1.3)	90 (2.2)	7 (1.8)	0 (0.0)	0 (0.0)
Kazakhstan	24 (3.4)	40 (5.3)	35 (5.3)	0 (0.0)	0 (0.0)
Kuwait	2 (1.2)	94 (2.0)	4 (1.8)	0 (0.0)	0 (0.0)
Latvia	0 (0.0)	98 (1.0)	1 (0.0)	2 (0.8)	0 (0.0)
Lithuania	18 (2.5)	60 (3.1)	22 (2.9)	0 (0.0)	0 (0.0)
Morocco	0 (0.0)	27 (3.9)	3 (1.4)	55 (4.2)	14 (2.8)
Netherlands	2 (1.4)	96 (1.7)	0 (0.0)	1 (1.0)	0 (0.0)
New Zealand	10 (1.7)	65 (2.8)	25 (2.2)	0 (0.0)	0 (0.0)
Norway	1 (0.5)	71 (3.3)	27 (3.2)	1 (0.7)	1 (0.4)
Qatar	10 (0.1)	84 (0.2)	3 (0.1)	3 (0.1)	0 (0.0)
Russian Federation	36 (3.4)	35 (3.5)	29 (3.1)	0 (0.0)	0 (0.0)
Scotland	26 (3.5)	74 (3.5)	0 (0.0)	0 (0.0)	0 (0.0)
Singapore	4 (1.0)	54 (2.7)	40 (2.5)	2 (1.1)	0 (0.0)
Slovak Republic	96 (1.3)	0 (0.0)	0 (0.0)	3 (1.4)	0 (0.0)
Slovenia	0 (0.0)	50 (2.6)	49 (2.6)	0 (0.4)	0 (0.0)
Sweden	12 (2.2)	58 (3.8)	30 (3.4)	0 (0.0)	0 (0.0)
Tunisia	0 (0.0)	8 (2.3)	32 (3.8)	60 (3.5)	0 (0.0)
Ukraine	1 (0.6)	81 (3.1)	18 (3.1)	0 (0.0)	0 (0.0)
United States	54 (2.7)	45 (2.7)	0 (0.2)	0 (0.0)	0 (0.0)
Yemen	0 (0.0)	26 (4.1)	44 (4.9)	28 (4.7)	2 (1.7)
<b>International Avg.</b>	<b>17 (0.3)</b>	<b>53 (0.5)</b>	<b>18 (0.4)</b>	<b>11 (0.3)</b>	<b>1 (0.1)</b>
<b>Benchmarking Participants</b>					
Alberta, Canada	12 (2.4)	86 (2.7)	1 (1.0)	0 (0.0)	0 (0.0)
British Columbia, Canada	18 (2.3)	82 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)
Dubai, UAE	3 (0.2)	97 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
Massachusetts, US	80 (4.5)	20 (4.5)	0 (0.0)	0 (0.0)	0 (0.0)
Minnesota, US	75 (5.1)	25 (5.1)	0 (0.0)	0 (0.0)	0 (0.0)
Ontario, Canada	29 (4.5)	69 (4.6)	2 (0.9)	1 (0.6)	0 (0.0)
Quebec, Canada	10 (2.6)	89 (2.8)	2 (1.2)	0 (0.0)	0 (0.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

\* Based on countries' categorizations to UNESCO's International Standard Classification of Education (Operational Manual for ISCED-1997).

\*\* For example, doctorate, master's, other postgraduate degree or diploma.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 6.2 Highest Educational Level of Science Teachers\* (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Their Teachers' Educational Level				
	Completed Postgraduate University Degree**	Completed University but Not a Postgraduate Degree	Completed Post-secondary Education but Not University	Completed Upper-secondary School	Did Not Complete Upper-secondary School
Algeria	1 (0.0)	17 (2.6)	62 (3.2)	17 (2.5)	3 (1.0)
Armenia	94 (1.0)	5 (0.8)	0 (0.3)	1 (0.3)	0 (0.0)
Australia	63 (3.4)	35 (3.6)	2 (1.0)	0 (0.0)	0 (0.0)
Bahrain	8 (1.0)	91 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)
Bosnia and Herzegovina	0 (0.0)	19 (1.8)	79 (1.8)	1 (0.4)	1 (0.3)
Botswana	1 (0.9)	29 (3.6)	70 (3.7)	0 (0.0)	0 (0.0)
Bulgaria	70 (2.9)	15 (1.9)	14 (2.5)	0 (0.0)	0 (0.1)
Chinese Taipei	30 (3.8)	57 (4.1)	3 (1.5)	10 (2.3)	0 (0.0)
Colombia	20 (5.9)	79 (5.8)	0 (0.2)	0 (0.0)	0 (0.5)
Cyprus	r 31 (1.0)	69 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)
Czech Republic	95 (1.0)	1 (0.4)	1 (0.5)	3 (0.8)	0 (0.0)
Egypt	7 (2.1)	91 (2.6)	1 (1.0)	1 (1.0)	1 (0.6)
El Salvador	1 (0.0)	32 (4.1)	60 (4.0)	7 (2.2)	0 (0.0)
England	39 (2.8)	56 (2.9)	4 (1.3)	0 (0.0)	0 (0.2)
Georgia	94 (1.4)	6 (1.3)	0 (0.0)	1 (0.2)	0 (0.0)
Ghana	0 (0.0)	10 (2.1)	76 (3.2)	13 (2.7)	1 (0.6)
Hong Kong SAR	28 (3.6)	64 (4.0)	8 (2.3)	0 (0.0)	0 (0.0)
Hungary	--	--	--	--	--
Indonesia	1 (0.7)	76 (2.8)	19 (2.6)	4 (1.3)	0 (0.0)
Iran, Islamic Rep. of	1 (0.6)	53 (4.1)	47 (4.2)	0 (0.0)	0 (0.0)
Israel	33 (3.1)	65 (3.2)	2 (0.8)	0 (0.0)	0 (0.0)
Italy	14 (2.4)	86 (2.4)	0 (0.0)	0 (0.0)	0 (0.0)
Japan	15 (2.9)	83 (2.9)	2 (1.1)	0 (0.0)	0 (0.0)
Jordan	9 (2.2)	86 (2.9)	4 (1.8)	0 (0.0)	0 (0.0)
Korea, Rep. of	29 (3.7)	71 (3.7)	0 (0.0)	0 (0.0)	0 (0.0)
Kuwait	r 6 (2.1)	94 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)
Lebanon	7 (1.9)	79 (3.6)	0 (0.0)	14 (3.2)	0 (0.0)
Lithuania	40 (2.8)	47 (2.7)	12 (1.7)	1 (0.4)	0 (0.0)
Malaysia	2 (1.0)	79 (3.0)	16 (2.6)	2 (1.2)	1 (0.0)
Malta	15 (0.2)	76 (0.3)	4 (0.2)	5 (0.1)	0 (0.0)
Norway	12 (2.7)	76 (3.4)	10 (2.2)	0 (0.0)	2 (1.0)
Oman	2 (0.4)	97 (0.8)	1 (0.4)	1 (0.0)	0 (0.0)
Palestinian Nat'l Auth.	6 (2.0)	84 (3.0)	10 (2.3)	0 (0.0)	0 (0.0)
Qatar	12 (0.1)	86 (0.1)	1 (0.0)	0 (0.0)	0 (0.0)
Romania	12 (1.2)	71 (1.6)	16 (1.7)	1 (0.6)	0 (0.0)
Russian Federation	90 (1.1)	9 (1.1)	1 (0.4)	1 (0.5)	0 (0.0)
Saudi Arabia	0 (0.0)	96 (1.9)	2 (1.6)	1 (0.0)	0 (0.0)
Scotland	r 38 (2.4)	62 (2.4)	0 (0.0)	0 (0.0)	0 (0.0)
Serbia	2 (0.6)	57 (2.5)	40 (2.5)	0 (0.2)	0 (0.0)
Singapore	6 (1.0)	87 (1.6)	7 (1.4)	0 (0.0)	0 (0.0)
Slovenia	2 (0.8)	44 (2.9)	52 (2.8)	1 (0.5)	0 (0.0)
Sweden	56 (2.4)	39 (2.4)	5 (1.2)	1 (0.7)	0 (0.0)
Syrian Arab Republic	1 (0.5)	2 (0.9)	95 (1.5)	2 (0.8)	0 (0.5)
Thailand	11 (2.5)	86 (2.8)	4 (1.5)	0 (0.0)	0 (0.0)
Tunisia	13 (2.9)	70 (3.8)	17 (3.0)	0 (0.0)	1 (0.0)
Turkey	5 (2.2)	75 (3.9)	21 (3.5)	0 (0.0)	0 (0.0)
Ukraine	2 (0.6)	96 (0.8)	2 (0.5)	1 (0.3)	0 (0.0)
United States	60 (2.8)	40 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)
‡ Morocco	3 (0.8)	34 (3.9)	16 (2.6)	42 (3.7)	5 (2.1)
International Avg.	23 (0.3)	58 (0.4)	16 (0.3)	3 (0.2)	0 (0.1)
<b>Benchmarking Participants</b>					
Basque Country, Spain	55 (4.3)	45 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)
British Columbia, Canada	57 (3.9)	39 (4.3)	1 (1.0)	0 (0.3)	2 (0.1)
Dubai, UAE	s 4 (1.2)	90 (1.4)	5 (0.5)	0 (0.0)	1 (0.7)
Massachusetts, US	66 (7.9)	34 (7.9)	0 (0.0)	0 (0.0)	0 (0.0)
Minnesota, US	63 (6.9)	37 (6.9)	0 (0.0)	0 (0.0)	0 (0.0)
Ontario, Canada	80 (3.6)	19 (3.5)	1 (0.9)	0 (0.0)	0 (0.0)
Quebec, Canada	15 (2.9)	81 (3.4)	1 (1.0)	2 (1.9)	0 (0.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

\* Based on countries' categorizations to UNESCO's International Standard Classification of Education (Operational Manual for ISCED-1997).

\*\* For example, doctorate, master's, other postgraduate degree or diploma.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 6.3 Teachers' Educational Emphasis on Science and Teaching

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Teachers Receive Specific Preparation in How to Teach the Science Curriculum as Part of Pre-service Education	Percentage of Students by Their Teachers' Major Area of Study in Their Post-secondary Education				
		Primary/Elementary Education with a Major or Specialization in Science	Primary/Elementary Education with a Major or Specialization in Mathematics but Not in Science	Science or Mathematics Major or Specialization Without a Major in Primary/Elementary Education	Primary/Elementary Education Without a Major or Specialization in Science or Mathematics	Other
Algeria	●	r 15 (3.5)	3 (1.3)	14 (3.4)	46 (4.9)	22 (3.8)
Armenia	○	6 (2.1)	3 (1.1)	90 (2.4)	1 (0.5)	1 (0.6)
Australia	●	12 (2.5)	2 (0.6)	2 (0.8)	82 (2.9)	2 (1.0)
Austria	●	1 (0.5)	3 (1.1)	0 (0.0)	95 (1.2)	0 (0.2)
Chinese Taipei	●	39 (4.2)	6 (2.0)	17 (2.9)	25 (3.5)	14 (2.9)
Colombia	○	20 (4.6)	5 (2.8)	14 (3.2)	40 (3.9)	20 (4.2)
Czech Republic	●	1 (1.0)	2 (1.2)	5 (1.6)	73 (3.7)	19 (3.0)
Denmark	●	r 14 (2.9)	8 (2.3)	33 (4.8)	17 (3.0)	28 (3.9)
El Salvador	○	11 (2.7)	3 (1.5)	12 (2.9)	34 (4.3)	40 (4.3)
England	●	16 (2.5)	5 (1.5)	10 (2.4)	49 (3.7)	20 (3.2)
Georgia	○	45 (4.3)	10 (3.9)	12 (3.3)	23 (3.3)	11 (2.8)
Germany	●	69 (2.8)	16 (2.2)	2 (1.0)	10 (1.7)	3 (0.9)
Hong Kong SAR	○	27 (4.1)	13 (3.0)	10 (2.4)	39 (4.6)	12 (2.6)
Hungary	●	4 (1.5)	3 (2.2)	0 (0.0)	93 (2.6)	0 (0.0)
Iran, Islamic Rep. of	●	43 (4.0)	7 (2.3)	10 (2.0)	28 (3.0)	13 (2.9)
Italy	○	0 (0.0)	0 (0.0)	2 (0.7)	4 (1.2)	94 (1.4)
Japan	●	15 (2.4)	6 (2.0)	5 (1.8)	55 (3.8)	18 (2.9)
Kazakhstan	●	83 (3.6)	7 (2.2)	3 (1.3)	6 (2.5)	1 (0.4)
Kuwait	●	r 32 (4.3)	19 (3.8)	38 (4.1)	8 (2.4)	3 (1.2)
Latvia	●	71 (3.7)	5 (1.5)	1 (0.6)	24 (3.5)	0 (0.0)
Lithuania	●	7 (1.8)	1 (1.1)	2 (0.7)	85 (2.3)	5 (1.7)
Morocco	●	r 12 (2.6)	1 (0.8)	19 (2.6)	42 (4.0)	26 (3.4)
Netherlands	●	21 (3.8)	16 (3.2)	0 (0.0)	61 (4.5)	2 (1.2)
New Zealand	●	10 (1.5)	9 (1.6)	3 (1.1)	72 (2.5)	6 (1.4)
Norway	●	--	--	--	--	--
Qatar	●	14 (0.1)	0 (0.0)	55 (0.2)	14 (0.1)	16 (0.1)
Russian Federation	●	48 (3.2)	9 (2.0)	6 (1.4)	35 (2.8)	2 (1.0)
Scotland	●	9 (2.1)	6 (1.7)	3 (1.2)	73 (3.5)	10 (2.2)
Singapore	●	41 (2.9)	15 (2.0)	13 (1.8)	16 (2.0)	15 (2.0)
Slovak Republic	●	2 (1.0)	0 (0.2)	13 (2.8)	80 (3.1)	4 (1.4)
Slovenia	●	54 (3.3)	4 (1.2)	0 (0.0)	42 (3.1)	0 (0.4)
Sweden	●	39 (3.4)	8 (1.5)	5 (1.0)	42 (3.6)	7 (1.8)
Tunisia	●	r 7 (2.1)	0 (0.0)	12 (2.8)	19 (3.9)	62 (4.9)
Ukraine	●	20 (3.2)	4 (1.4)	2 (1.3)	68 (3.6)	6 (1.7)
United States	●	9 (1.4)	4 (0.8)	3 (1.0)	70 (2.3)	13 (1.7)
Yemen	●	12 (3.6)	2 (1.2)	38 (4.8)	16 (3.5)	32 (4.4)
International Avg.		24 (0.5)	6 (0.3)	13 (0.4)	42 (0.5)	15 (0.4)
<b>Benchmarking Participants</b>						
Alberta, Canada	●	9 (2.2)	3 (1.2)	3 (1.0)	71 (3.5)	14 (3.1)
British Columbia, Canada	○	r 10 (2.6)	2 (1.6)	2 (0.8)	72 (4.2)	15 (3.4)
Dubai, UAE	●	s 18 (2.4)	1 (0.7)	69 (3.5)	7 (1.7)	5 (1.9)
Massachusetts, US	–	8 (2.6)	8 (3.5)	7 (3.0)	63 (4.9)	15 (3.7)
Minnesota, US	●	19 (7.6)	5 (2.3)	0 (0.0)	76 (7.6)	0 (0.0)
Ontario, Canada	●	6 (1.8)	5 (2.8)	3 (1.5)	65 (4.2)	21 (3.2)
Quebec, Canada	●	4 (1.6)	4 (1.7)	1 (0.7)	82 (3.3)	9 (2.7)

● Yes ○ No

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by National Research Coordinators and by teachers.

(l) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 6.3 Teachers' Educational Emphasis on Science and Teaching (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Teachers Receive Specific Preparation in How to Teach the Science Curriculum as Part of Pre-service Education	Percentage of Students by Their Teachers' Major Area of Study in Their Post-secondary Education <sup>1</sup>						
		Education – Science	Biology, Physics, Chemistry, or Earth Science	Education – Mathematics	Mathematics	Education – General	Other	
Algeria	○	r 26 (2.8)	83 (2.2)	r 10 (2.2)	r 15 (2.3)	r 13 (2.2)	r 16 (2.4)	
Armenia	○	37 (2.5)	99 (0.4)	22 (2.3)	47 (2.3)	49 (2.4)	42 (2.8)	
Australia	●	63 (3.3)	85 (2.4)	16 (2.3)	22 (2.6)	39 (4.1)	r 30 (3.3)	
Bahrain	●	48 (2.7)	91 (1.5)	2 (0.6)	9 (1.8)	20 (2.1)	12 (1.5)	
Bosnia and Herzegovina	●	28 (2.6)	96 (0.9)	7 (0.9)	15 (1.1)	26 (2.4)	19 (2.0)	
Botswana	●	71 (4.1)	69 (4.8)	19 (3.4)	28 (4.1)	27 (4.0)	r 16 (3.3)	
Bulgaria	○	57 (2.8)	97 (0.9)	15 (1.4)	26 (1.9)	54 (2.8)	35 (3.8)	
Chinese Taipei	●	38 (3.9)	96 (1.7)	6 (1.7)	16 (2.6)	42 (4.3)	r 9 (2.8)	
Colombia	○	42 (5.8)	93 (2.2)	2 (1.0)	14 (5.5)	34 (5.4)	r 16 (3.6)	
Cyprus	○	r 13 (0.6)	96 (0.6)	r 2 (0.3)	r 13 (0.7)	r 9 (0.5)	r 10 (0.7)	
Czech Republic	●	45 (2.4)	84 (1.8)	20 (1.6)	20 (1.8)	22 (2.0)	39 (2.0)	
Egypt	○	46 (3.9)	87 (2.4)	2 (1.1)	4 (1.5)	16 (3.1)	7 (2.3)	
El Salvador	●	41 (4.6)	58 (3.9)	19 (3.6)	34 (4.3)	48 (5.0)	47 (5.0)	
England	●	r 43 (2.8)	93 (1.4)	r 2 (0.8)	r 15 (1.7)	r 24 (2.4)	r 17 (2.2)	
Georgia	○	10 (1.4)	91 (1.6)	3 (0.8)	5 (1.0)	5 (1.3)	8 (1.5)	
Ghana	●	59 (4.4)	60 (4.2)	43 (3.9)	55 (4.0)	58 (4.0)	r 40 (4.3)	
Hong Kong SAR	○	45 (5.1)	70 (4.3)	23 (3.8)	22 (3.9)	31 (4.1)	30 (4.6)	
Hungary	●	94 (1.3)	95 (1.3)	29 (1.6)	30 (1.6)	5 (1.3)	34 (2.3)	
Indonesia	●	29 (3.2)	74 (2.9)	4 (1.0)	4 (1.2)	10 (2.2)	12 (2.3)	
Iran, Islamic Rep. of	●	84 (2.9)	35 (3.4)	3 (1.0)	7 (1.9)	7 (1.4)	12 (2.4)	
Israel	●	r 59 (3.5)	r 90 (2.1)	r 1 (0.7)	r 7 (2.0)	r 19 (2.7)	r 12 (2.3)	
Italy	○	--	67 (3.1)	--	16 (2.4)	--	17 (2.6)	
Japan	●	35 (3.9)	90 (2.6)	1 (0.7)	2 (1.3)	14 (2.9)	11 (2.6)	
Jordan	○	37 (3.9)	86 (2.8)	6 (1.9)	53 (4.1)	20 (3.7)	16 (3.2)	
Korea, Rep. of	●	13 (2.5)	92 (2.1)	0 (0.0)	0 (0.0)	1 (0.6)	6 (1.9)	
Kuwait	●	r 37 (4.6)	r 71 (4.4)	r 8 (2.8)	r 6 (1.7)	r 18 (4.0)	r 9 (2.9)	
Lebanon	●	25 (3.5)	93 (1.6)	6 (1.2)	29 (3.2)	12 (2.2)	r 11 (2.2)	
Lithuania	●	16 (1.6)	93 (1.4)	1 (0.5)	7 (1.1)	23 (2.0)	r 19 (2.2)	
Malaysia	●	49 (4.2)	64 (4.3)	18 (2.9)	36 (4.0)	28 (3.8)	29 (3.3)	
Malta	●	25 (0.2)	83 (0.2)	14 (0.2)	24 (0.2)	39 (0.3)	26 (0.3)	
Norway	●	11 (2.8)	s 49 (3.8)	7 (2.2)	39 (3.8)	44 (4.1)	r 53 (4.2)	
Oman	●	42 (4.4)	95 (1.8)	5 (2.3)	8 (2.6)	15 (3.3)	3 (1.4)	
Palestinian Nat'l Auth.	●	29 (3.9)	83 (3.1)	2 (1.1)	6 (2.0)	20 (2.8)	9 (2.5)	
Qatar	○	22 (0.1)	91 (0.1)	1 (0.0)	6 (0.1)	10 (0.1)	10 (0.1)	
Romania	●	42 (2.6)	96 (1.0)	4 (1.0)	21 (2.2)	54 (2.3)	25 (2.6)	
Russian Federation	●	50 (2.5)	97 (0.6)	8 (0.8)	14 (0.9)	47 (2.8)	20 (1.9)	
Saudi Arabia	●	31 (4.1)	89 (2.8)	1 (0.7)	0 (0.0)	16 (3.0)	3 (1.2)	
Scotland	●	r 44 (2.0)	r 98 (0.6)	r 9 (1.3)	r 27 (2.2)	r 23 (1.9)	r 14 (2.1)	
Serbia	○	24 (2.0)	99 (0.3)	1 (0.4)	6 (0.9)	18 (1.8)	12 (1.4)	
Singapore	●	49 (2.8)	94 (0.9)	31 (2.5)	58 (2.4)	40 (2.2)	r 31 (2.4)	
Slovenia	●	90 (1.2)	8 (1.3)	17 (1.4)	2 (0.5)	--	16 (2.0)	
Sweden	●	63 (2.7)	77 (2.9)	55 (2.7)	51 (3.1)	29 (2.8)	22 (2.5)	
Syrian Arab Republic	●	23 (3.3)	83 (3.1)	3 (1.2)	13 (2.3)	14 (2.4)	15 (2.7)	
Thailand	●	22 (3.3)	42 (4.5)	0 (0.0)	1 (0.0)	6 (1.9)	29 (4.3)	
Tunisia	○	9 (2.3)	99 (0.7)	1 (0.9)	6 (2.0)	6 (2.1)	5 (1.8)	
Turkey	●	53 (4.3)	59 (4.3)	3 (1.4)	16 (2.7)	25 (3.5)	9 (2.3)	
Ukraine	●	11 (2.0)	92 (1.2)	7 (0.9)	6 (0.9)	8 (1.7)	12 (1.7)	
United States	●	39 (2.5)	57 (3.1)	3 (0.9)	6 (1.3)	38 (3.2)	34 (2.7)	
‡ Morocco	●	r 12 (2.8)	r 96 (1.8)	r 2 (1.3)	r 5 (1.8)	r 5 (1.7)	r 8 (2.3)	
International Avg.		39 (0.5)	81 (0.4)	10 (0.3)	18 (0.3)	24 (0.4)	19 (0.4)	
<b>Benchmarking Participants</b>								
Basque Country, Spain	○	45 (4.4)	57 (4.6)	23 (3.9)	19 (4.3)	17 (3.8)	12 (3.3)	
British Columbia, Canada	○	47 (4.2)	r 74 (3.9)	14 (3.4)	11 (2.6)	40 (4.0)	45 (4.3)	
Dubai, UAE	●	s 48 (3.8)	s 86 (2.8)	s 5 (1.4)	s 20 (3.4)	s 12 (1.9)	s 13 (3.4)	
Massachusetts, US	●	45 (6.9)	68 (5.8)	3 (2.6)	7 (2.8)	25 (4.4)	28 (5.3)	
Minnesota, US	●	66 (8.0)	90 (4.2)	4 (2.3)	5 (2.6)	19 (5.1)	26 (5.6)	
Ontario, Canada	●	29 (4.4)	44 (4.2)	8 (2.2)	7 (2.0)	56 (4.5)	61 (4.3)	
Quebec, Canada	●	51 (4.7)	69 (4.1)	14 (3.8)	10 (3.1)	17 (3.7)	21 (3.4)	

● Yes ○ No

Background data provided by National Research Coordinators and by teachers.

<sup>1</sup> Teachers who responded that they majored in more than one area are reflected in all categories that apply.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

## Exhibit 6.4 Teachers' Major Area of Study in Science

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students Taught by Teachers Having Major Area of Study in Sciences in Their Post-secondary Education <sup>1</sup>			
	Biology	Physics	Chemistry	Earth Science
Algeria	r 43 (2.1)	r 45 (2.6)	r 31 (3.0)	r 23 (3.1)
Armenia	43 (1.6)	52 (2.4)	51 (2.0)	24 (1.2)
Australia	61 (3.2)	23 (2.9)	51 (3.5)	21 (2.5)
Bahrain	34 (2.9)	30 (1.9)	61 (2.7)	7 (1.3)
Bosnia and Herzegovina	32 (1.1)	26 (1.1)	40 (1.4)	26 (0.6)
Botswana	63 (4.7)	40 (4.4)	51 (4.8)	7 (2.2)
Bulgaria	40 (2.0)	41 (2.2)	52 (1.5)	29 (2.0)
Chinese Taipei	20 (3.5)	64 (4.0)	72 (3.9)	22 (3.3)
Colombia	79 (3.6)	12 (2.5)	64 (3.9)	16 (3.1)
Cyprus	r 26 (0.8)	r 39 (1.0)	r 46 (0.8)	r 15 (0.7)
Czech Republic	38 (1.9)	21 (1.5)	33 (1.8)	22 (1.4)
Egypt	48 (4.7)	43 (3.6)	53 (4.5)	16 (3.0)
El Salvador	48 (3.8)	31 (4.1)	40 (4.1)	25 (3.8)
England	64 (2.6)	31 (2.7)	53 (2.8)	r 10 (2.2)
Georgia	38 (1.9)	25 (1.2)	30 (1.9)	23 (1.5)
Ghana	53 (4.2)	56 (4.1)	57 (4.1)	14 (3.1)
Hong Kong SAR	34 (4.4)	28 (3.8)	36 (4.2)	3 (1.6)
Hungary	40 (1.7)	26 (1.1)	31 (1.3)	34 (1.3)
Indonesia	43 (2.9)	32 (3.1)	10 (2.2)	2 (0.9)
Iran, Islamic Rep. of	24 (3.0)	20 (2.8)	26 (3.0)	21 (3.0)
Israel	r 76 (3.0)	r 32 (3.5)	r 54 (4.1)	r 4 (1.3)
Italy	52 (3.0)	4 (1.4)	3 (1.0)	9 (1.8)
Japan	31 (4.3)	27 (3.6)	42 (3.7)	16 (3.0)
Jordan	52 (4.0)	65 (3.8)	62 (4.1)	36 (4.2)
Korea, Rep. of	28 (3.2)	26 (3.6)	23 (3.4)	16 (2.9)
Kuwait	r 35 (4.6)	r 31 (3.8)	r 44 (4.4)	r 20 (4.5)
Lebanon	67 (3.1)	45 (3.5)	58 (3.8)	24 (3.1)
Lithuania	35 (1.3)	25 (1.1)	28 (1.4)	22 (0.7)
Malaysia	50 (4.1)	34 (4.2)	43 (4.0)	13 (2.6)
Malta	24 (0.3)	34 (0.2)	21 (0.3)	27 (0.2)
Norway	s 33 (3.6)	s 9 (2.3)	s 15 (2.9)	s 12 (3.0)
Oman	21 (3.4)	66 (4.0)	57 (4.3)	9 (2.5)
Palestinian Nat'l Auth.	34 (4.3)	27 (3.8)	35 (4.4)	8 (2.2)
Qatar	41 (0.2)	35 (0.2)	46 (0.2)	13 (0.1)
Romania	28 (1.0)	46 (1.5)	50 (1.5)	24 (0.7)
Russian Federation	49 (1.5)	27 (0.5)	40 (1.0)	29 (1.0)
Saudi Arabia	46 (4.7)	16 (3.3)	31 (4.4)	15 (2.8)
Scotland	r 48 (2.5)	r 38 (2.1)	r 50 (2.2)	r 9 (1.6)
Serbia	28 (0.7)	29 (1.0)	38 (1.2)	25 (0.4)
Singapore	50 (2.6)	47 (2.1)	62 (2.5)	12 (1.6)
Slovenia	3 (0.8)	3 (0.9)	3 (0.9)	--
Sweden	54 (3.1)	41 (2.7)	56 (3.2)	13 (2.0)
Syrian Arab Republic	50 (2.9)	52 (3.2)	52 (3.2)	17 (2.6)
Thailand	21 (3.2)	6 (2.0)	13 (3.0)	2 (1.3)
Tunisia	96 (1.3)	7 (2.1)	9 (2.4)	73 (3.4)
Turkey	24 (3.7)	33 (4.2)	36 (3.7)	5 (1.8)
Ukraine	39 (1.6)	22 (0.8)	32 (1.5)	24 (1.2)
United States	42 (2.7)	7 (1.5)	17 (2.1)	17 (2.2)
‡ Morocco	r 46 (3.1)	r 47 (3.2)	r 40 (3.7)	r 33 (3.6)
International Avg.	42 (0.4)	32 (0.4)	40 (0.4)	19 (0.3)
<b>Benchmarking Participants</b>				
Basque Country, Spain	37 (4.7)	17 (4.2)	30 (4.1)	11 (3.3)
British Columbia, Canada	r 53 (3.7)	r 10 (2.5)	r 26 (3.6)	r 14 (2.8)
Dubai, UAE	s 43 (5.6)	s 41 (6.1)	s 53 (5.1)	s 8 (1.9)
Massachusetts, US	47 (6.6)	12 (4.6)	20 (6.0)	27 (6.2)
Minnesota, US	68 (7.4)	7 (2.2)	25 (6.5)	37 (8.2)
Ontario, Canada	30 (4.1)	10 (2.8)	19 (3.7)	21 (4.1)
Quebec, Canada	46 (5.1)	25 (4.5)	24 (4.5)	14 (3.4)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

<sup>1</sup> Teachers who responded that they majored in more than one area are reflected in all categories that apply.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 6.5 contains teachers' reports about their participation in professional development in science. At the fourth grade, one-third of the students, on average internationally, had teachers that had participated in some type of professional development during the past two years in the various science areas asked about by TIMSS, including science content (34%), science pedagogy (35%), science curriculum (31%), and/or improving students' critical thinking or inquiry skills (33%). Somewhat fewer students had teachers with such professional development in science assessment (28%) and/or integrating information technology into science (24%). At the eighth grade, the participation in professional development was somewhat higher, but the pattern was similar. Approximately one-half of the eighth grade students, on average internationally, had teachers that had participated in some type of professional development during the past two years in science content (58%), science pedagogy (57%), science curriculum (51%), science assessment (47%), improving students critical thinking or inquiry skills (46%), and integrating information technology into science (45%).

Teachers also were asked about opportunities for collaboration with other science teachers. Exhibit 6.6 contains the results in relation to students' average science achievement, with trend data from 2003. Internationally on average, the largest percentages of students at both grades (59% for both) had teachers that collaborated with other teachers about 2–3 times a month. Other than that, collaboration tended to be more frequent (27–31% at least weekly) rather than less frequent (10–14% never or almost never). Although teachers may well appreciate opportunities to benefit from the experience of their colleagues, on average internationally, the frequency of collaboration was not related to achievement at either grade. At the fourth grade, between 2003 and 2007 the frequency of collaboration (percent at least weekly) increased to some extent in Armenia, Italy, Morocco, Scotland, and Tunisia while it decreased in Lithuania. At the eighth grade, the frequency of collaboration increased between 2003 and 2007 in Armenia, Jordan, and Scotland, while it decreased in Bahrain, Cyprus, Serbia, and Sweden.

## Exhibit 6.5 Teachers' Participation in Professional Development in Science

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percentage of Students by Their Teachers' Participation in Professional Development in Science in the Past 2 Years					
	Science Content	Science Pedagogy / Instruction	Science Curriculum	Integrating Information Technology into Science	Improving Students' Critical Thinking or Inquiry Skills	Science Assessment
Algeria	32 (4.3)	48 (5.1)	40 (5.3)	9 (2.6)	35 (4.4)	36 (4.2)
Armenia	15 (2.6)	17 (2.6)	23 (3.2)	16 (2.7)	18 (3.3)	17 (3.1)
Australia	22 (3.0)	16 (2.5)	24 (3.4)	20 (3.1)	36 (3.5)	15 (2.3)
Austria	35 (3.6)	24 (2.9)	8 (1.8)	13 (1.9)	20 (2.3)	4 (1.2)
Chinese Taipei	65 (3.9)	69 (3.3)	65 (3.8)	64 (4.2)	41 (4.4)	37 (3.9)
Colombia	42 (5.0)	36 (4.3)	52 (5.0)	26 (4.2)	32 (4.5)	35 (4.7)
Czech Republic	20 (3.2)	19 (2.9)	15 (2.9)	17 (3.1)	24 (3.6)	13 (3.1)
Denmark	r 21 (3.9)	r 17 (3.6)	r 13 (3.3)	r 6 (2.0)	r 6 (2.1)	r 4 (2.0)
El Salvador	23 (3.4)	14 (2.6)	10 (2.1)	9 (2.5)	27 (3.9)	15 (3.1)
England	32 (4.1)	41 (4.2)	34 (3.7)	28 (3.5)	42 (4.3)	36 (4.0)
Georgia	20 (4.7)	25 (3.5)	30 (4.2)	16 (3.2)	49 (5.0)	44 (4.7)
Germany	36 (2.8)	21 (2.6)	33 (3.2)	7 (1.6)	25 (2.5)	15 (2.2)
Hong Kong SAR	53 (4.3)	47 (4.4)	38 (4.2)	45 (4.2)	56 (4.5)	31 (3.9)
Hungary	24 (3.2)	29 (3.5)	13 (2.7)	14 (2.5)	26 (2.9)	7 (1.9)
Iran, Islamic Rep. of	28 (3.3)	36 (3.3)	25 (3.2)	12 (2.8)	28 (3.7)	25 (3.4)
Italy	16 (2.1)	10 (1.9)	8 (1.4)	17 (2.3)	12 (1.9)	6 (1.4)
Japan	37 (3.8)	45 (4.0)	14 (2.6)	23 (3.3)	11 (2.4)	15 (2.9)
Kazakhstan	65 (5.5)	68 (5.6)	70 (5.1)	53 (4.3)	69 (5.5)	67 (5.6)
Kuwait	r 39 (4.1)	r 36 (4.1)	r 19 (3.3)	r 39 (3.8)	r 43 (4.0)	r 39 (4.1)
Latvia	68 (3.6)	61 (3.8)	68 (3.9)	29 (3.7)	51 (4.3)	60 (3.9)
Lithuania	21 (3.0)	25 (3.1)	9 (1.8)	35 (3.2)	44 (4.2)	24 (2.7)
Morocco	8 (2.5)	16 (3.2)	5 (1.9)	2 (1.4)	15 (2.8)	10 (2.7)
Netherlands	5 (1.7)	4 (1.3)	r 3 (1.4)	7 (2.3)	17 (2.6)	5 (1.5)
New Zealand	14 (1.9)	12 (1.6)	17 (1.9)	19 (2.3)	47 (2.7)	11 (1.7)
Norway	8 (1.9)	4 (1.4)	12 (2.5)	4 (1.5)	4 (1.3)	0 (0.3)
Qatar	37 (0.2)	39 (0.2)	27 (0.2)	29 (0.2)	44 (0.2)	39 (0.2)
Russian Federation	58 (3.3)	62 (3.5)	62 (2.9)	48 (3.1)	41 (3.6)	52 (3.4)
Scotland	r 39 (4.1)	r 44 (4.3)	r 42 (4.2)	r 27 (3.6)	r 47 (3.9)	r 23 (3.2)
Singapore	61 (2.9)	68 (3.0)	48 (2.6)	52 (2.9)	57 (3.2)	53 (2.8)
Slovak Republic	21 (3.1)	47 (3.8)	51 (3.8)	45 (3.6)	29 (3.5)	26 (3.4)
Slovenia	63 (3.1)	57 (3.4)	43 (2.9)	29 (2.9)	23 (2.5)	57 (3.1)
Sweden	22 (2.4)	17 (2.8)	21 (2.9)	4 (1.3)	14 (2.5)	11 (2.5)
Tunisia	27 (3.1)	41 (3.5)	27 (3.6)	19 (3.2)	28 (3.9)	42 (3.9)
Ukraine	67 (3.2)	75 (2.9)	75 (3.6)	62 (3.2)	63 (3.7)	78 (3.0)
United States	42 (2.8)	29 (2.4)	44 (2.7)	28 (2.8)	36 (2.2)	24 (2.4)
Yemen	22 (4.2)	35 (5.0)	27 (4.5)	7 (2.9)	41 (5.0)	36 (5.0)
<b>International Avg.</b>	<b>34 (0.6)</b>	<b>35 (0.6)</b>	<b>31 (0.5)</b>	<b>24 (0.5)</b>	<b>33 (0.6)</b>	<b>28 (0.5)</b>
<b>Benchmarking Participants</b>						
Alberta, Canada	38 (4.0)	32 (3.8)	31 (3.9)	35 (4.2)	55 (4.0)	31 (3.9)
British Columbia, Canada	r 51 (4.2)	r 30 (4.2)	r 44 (4.7)	r 14 (2.9)	r 45 (4.3)	r 17 (3.4)
Dubai, UAE	s 60 (5.0)	x x	s 51 (5.4)	s 38 (5.4)	s 58 (5.1)	s 53 (4.9)
Massachusetts, US	45 (6.5)	41 (5.5)	51 (5.9)	35 (6.4)	38 (5.5)	21 (4.7)
Minnesota, US	35 (8.7)	33 (7.4)	45 (7.7)	27 (7.6)	41 (5.7)	20 (6.5)
Ontario, Canada	17 (3.6)	12 (2.7)	26 (4.6)	19 (4.6)	29 (4.0)	10 (2.7)
Quebec, Canada	19 (3.1)	20 (3.4)	r 15 (3.1)	11 (2.8)	11 (2.6)	10 (2.8)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



Exhibit 6.5 Teachers' Participation in Professional Development in Science (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Their Teachers' Participation in Professional Development in Science in the Past 2 Years					
	Science Content	Science Pedagogy / Instruction	Science Curriculum	Integrating Information Technology into Science	Improving Students' Critical Thinking or Inquiry Skills	Science Assessment
Algeria	r 48 (3.2)	r 60 (3.2)	r 47 (3.5)	r 36 (3.4)	r 50 (3.6)	r 47 (3.4)
Armenia	38 (2.1)	50 (2.5)	51 (2.0)	31 (2.1)	44 (2.4)	34 (2.2)
Australia	56 (3.7)	52 (3.5)	57 (3.9)	57 (4.3)	51 (3.9)	54 (3.5)
Bahrain	45 (2.9)	50 (2.4)	35 (2.5)	68 (2.5)	58 (2.4)	50 (2.8)
Bosnia and Herzegovina	44 (2.1)	39 (2.6)	46 (2.5)	45 (2.3)	49 (2.4)	53 (2.1)
Botswana	22 (3.9)	15 (2.7)	13 (2.8)	18 (3.1)	26 (3.5)	33 (3.6)
Bulgaria	69 (2.8)	55 (3.0)	75 (2.4)	76 (2.7)	29 (2.9)	44 (3.0)
Chinese Taipei	78 (3.7)	70 (3.9)	80 (3.4)	73 (3.8)	40 (4.2)	48 (4.3)
Colombia	72 (4.2)	68 (4.4)	71 (4.8)	39 (4.6)	46 (4.9)	62 (4.5)
Cyprus	r 58 (1.0)	r 67 (0.8)	r 53 (1.0)	r 68 (1.0)	r 48 (0.9)	r 40 (1.0)
Czech Republic	61 (2.4)	43 (2.3)	30 (2.7)	55 (2.7)	31 (2.3)	22 (2.5)
Egypt	55 (4.1)	70 (3.6)	39 (4.1)	49 (4.4)	71 (3.9)	61 (4.1)
El Salvador	53 (4.2)	36 (3.9)	22 (3.5)	24 (3.7)	43 (4.5)	30 (3.7)
England	66 (2.6)	75 (2.4)	71 (2.6)	44 (3.0)	49 (3.1)	65 (2.6)
Georgia	44 (3.1)	48 (3.2)	58 (2.7)	36 (3.5)	68 (3.2)	71 (3.3)
Ghana	60 (4.5)	48 (4.3)	54 (4.5)	20 (3.4)	45 (4.1)	51 (4.5)
Hong Kong SAR	79 (3.4)	78 (3.5)	75 (4.0)	56 (4.3)	69 (4.0)	56 (4.5)
Hungary	48 (2.6)	50 (2.3)	29 (2.3)	35 (2.7)	33 (2.3)	25 (2.2)
Indonesia	64 (4.1)	68 (3.6)	75 (3.2)	25 (3.1)	51 (4.3)	71 (3.1)
Iran, Islamic Rep. of	81 (2.9)	83 (2.8)	58 (3.8)	44 (3.8)	51 (3.8)	58 (3.9)
Israel	70 (3.9)	67 (4.2)	72 (3.7)	56 (3.3)	62 (3.8)	50 (4.0)
Italy	24 (3.0)	28 (3.2)	13 (1.9)	25 (2.9)	10 (1.8)	15 (2.3)
Japan	74 (3.3)	64 (3.8)	31 (3.7)	31 (3.5)	14 (2.9)	40 (4.3)
Jordan	58 (4.2)	78 (3.4)	66 (4.0)	59 (3.8)	74 (3.7)	54 (4.2)
Korea, Rep. of	69 (3.2)	49 (3.9)	34 (3.4)	29 (3.4)	38 (4.0)	36 (3.9)
Kuwait	r 53 (4.8)	r 57 (4.7)	r 33 (4.6)	r 46 (4.5)	r 47 (4.4)	r 34 (4.9)
Lebanon	57 (3.4)	59 (3.4)	52 (3.7)	42 (4.1)	58 (3.6)	64 (3.7)
Lithuania	75 (1.9)	68 (1.9)	66 (2.2)	69 (2.2)	51 (2.4)	62 (2.0)
Malaysia	66 (3.7)	46 (4.0)	66 (3.9)	60 (4.6)	38 (3.9)	49 (3.9)
Malta	37 (0.3)	28 (0.3)	34 (0.3)	38 (0.3)	26 (0.3)	28 (0.3)
Norway	31 (3.3)	29 (3.0)	28 (3.3)	15 (2.7)	9 (2.0)	7 (1.8)
Oman	53 (4.3)	45 (4.5)	46 (4.4)	20 (3.5)	27 (3.9)	61 (3.9)
Palestinian Nat'l Auth.	49 (4.2)	50 (3.8)	36 (4.3)	38 (3.4)	50 (3.4)	40 (4.2)
Qatar	52 (0.2)	68 (0.1)	45 (0.2)	55 (0.1)	47 (0.2)	48 (0.1)
Romania	58 (2.5)	54 (2.4)	47 (2.6)	67 (2.6)	50 (2.7)	54 (2.7)
Russian Federation	63 (2.1)	72 (1.6)	70 (2.2)	67 (2.8)	49 (2.2)	54 (2.2)
Saudi Arabia	41 (4.0)	55 (3.9)	21 (3.8)	30 (3.7)	44 (4.2)	31 (4.4)
Scotland	r 73 (2.2)	r 84 (2.0)	r 68 (2.4)	r 64 (2.1)	r 63 (2.5)	r 57 (2.3)
Serbia	63 (2.4)	33 (2.2)	20 (2.2)	50 (2.5)	45 (2.3)	6 (1.1)
Singapore	78 (2.3)	85 (1.9)	78 (2.2)	70 (2.2)	72 (2.4)	65 (2.3)
Slovenia	82 (2.1)	49 (2.2)	43 (2.1)	43 (2.2)	24 (1.7)	67 (2.3)
Sweden	43 (3.3)	29 (2.5)	36 (2.6)	10 (1.9)	20 (2.4)	37 (3.1)
Syrian Arab Republic	27 (3.5)	26 (3.3)	18 (2.4)	16 (2.6)	51 (3.6)	34 (3.7)
Thailand	91 (2.5)	85 (3.1)	82 (3.2)	70 (3.4)	80 (3.1)	81 (3.3)
Tunisia	64 (4.1)	78 (3.5)	76 (3.8)	54 (4.3)	41 (4.2)	55 (4.6)
Turkey	65 (4.3)	64 (4.5)	78 (3.9)	28 (3.6)	25 (3.9)	44 (4.0)
Ukraine	80 (2.3)	84 (1.9)	85 (2.0)	81 (2.0)	80 (2.1)	84 (2.0)
United States	82 (2.3)	64 (2.8)	82 (2.3)	70 (3.1)	73 (2.9)	61 (3.0)
‡ Morocco	33 (3.2)	58 (3.1)	r 34 (3.2)	16 (2.7)	r 18 (3.1)	26 (3.5)
International Avg.	58 (0.5)	57 (0.5)	51 (0.5)	45 (0.5)	46 (0.5)	47 (0.5)
<b>Benchmarking Participants</b>						
Basque Country, Spain	30 (4.2)	28 (4.8)	25 (4.5)	41 (5.0)	18 (3.8)	13 (3.6)
British Columbia, Canada	r 84 (3.2)	r 56 (3.9)	r 70 (3.3)	r 55 (4.0)	r 64 (3.8)	r 42 (4.5)
Dubai, UAE	s 58 (3.8)	s 68 (3.3)	s 64 (3.1)	s 67 (3.9)	s 75 (3.6)	s 69 (4.2)
Massachusetts, US	85 (5.3)	76 (6.8)	90 (4.3)	72 (6.3)	69 (7.4)	61 (7.1)
Minnesota, US	89 (3.9)	77 (5.2)	87 (3.7)	66 (6.6)	68 (7.8)	61 (6.6)
Ontario, Canada	44 (4.0)	32 (4.7)	40 (4.3)	36 (4.4)	45 (5.3)	22 (3.9)
Quebec, Canada	66 (4.8)	64 (4.4)	68 (5.2)	42 (5.4)	17 (3.6)	73 (4.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



**Exhibit 6.6 Frequency of Collaboration Among Science Teachers with Trends**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Percentage of Students by Their Teachers' Frequency of Collaboration with Other Teachers									
	Never or Almost Never			2 or 3 Times per Month			At Least Weekly			
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	
Algeria	5 (2.0)	351 (25.8)	∅ ∅	55 (4.6)	351 (9.4)	∅ ∅	40 (4.4)	347 (10.2)	∅ ∅	
Armenia	2 (1.0)	~ ~	0 (1.6)	35 (3.2)	483 (9.4)	-35 (5.9) ▾	63 (3.2)	485 (8.2)	35 (5.9) ▲	
Australia	10 (2.4)	527 (15.4)	-3 (3.2)	61 (3.3)	528 (5.0)	-1 (5.2)	29 (3.0)	526 (7.0)	4 (4.7)	
Austria	23 (2.6)	533 (4.7)	∅ ∅	66 (3.1)	522 (3.4)	∅ ∅	11 (2.0)	533 (5.5)	∅ ∅	
Chinese Taipei	18 (3.6)	549 (6.0)	6 (4.6)	64 (4.3)	558 (3.0)	-7 (5.8)	17 (2.9)	560 (4.9)	1 (4.2)	
Colombia	11 (2.8)	388 (12.0)	∅ ∅	45 (5.0)	414 (8.8)	∅ ∅	45 (5.0)	396 (11.3)	∅ ∅	
Czech Republic	15 (2.8)	513 (7.6)	∅ ∅	78 (3.4)	515 (3.7)	∅ ∅	7 (2.1)	508 (5.0)	∅ ∅	
Denmark	22 (3.6)	520 (6.2)	∅ ∅	68 (4.2)	519 (3.7)	∅ ∅	10 (2.7)	520 (6.1)	∅ ∅	
El Salvador	17 (3.6)	404 (9.4)	∅ ∅	56 (4.7)	391 (5.6)	∅ ∅	27 (3.8)	375 (8.8)	∅ ∅	
England	10 (2.6)	541 (9.1)	-3 (3.9)	58 (3.9)	545 (4.0)	-2 (6.2)	32 (3.4)	535 (5.6)	5 (5.7)	
Georgia	2 (1.2)	~ ~	∅ ∅	39 (4.5)	415 (8.1)	∅ ∅	59 (4.6)	420 (5.0)	∅ ∅	
Germany	21 (2.8)	532 (6.0)	∅ ∅	73 (3.1)	528 (3.0)	∅ ∅	6 (1.6)	505 (11.3)	∅ ∅	
Hong Kong SAR	12 (3.1)	573 (10.6)	-8 (4.9)	76 (4.3)	553 (4.1)	2 (6.1)	13 (3.1)	555 (7.5)	6 (4.1)	
Hungary	3 (1.5)	554 (28.8)	-3 (2.3)	62 (3.8)	538 (4.7)	-1 (4.9)	34 (3.7)	531 (5.3)	3 (5.1)	
Iran, Islamic Rep. of	5 (1.7)	418 (19.6)	-1 (2.7)	65 (3.7)	437 (5.6)	11 (6.1)	30 (3.9)	431 (9.1)	-10 (6.3)	
Italy	6 (1.5)	532 (8.4)	-6 (2.8) ▾	69 (2.9)	535 (4.1)	-1 (4.2)	26 (2.5)	537 (5.8)	7 (3.5) ▲	
Japan	12 (2.2)	548 (4.8)	-2 (3.4)	74 (3.4)	547 (2.2)	6 (5.0)	14 (2.8)	552 (5.9)	-3 (4.1)	
Kazakhstan	1 (0.7)	~ ~	∅ ∅	26 (4.2)	527 (11.8)	∅ ∅	73 (4.3)	534 (5.6)	∅ ∅	
Kuwait	0 (0.5)	~ ~	∅ ∅	40 (4.4)	342 (10.0)	∅ ∅	59 (4.4)	350 (7.9)	∅ ∅	
Latvia	8 (1.9)	552 (5.7)	8 (1.9) ▲	78 (2.9)	543 (2.7)	-4 (5.3)	13 (2.3)	538 (5.5)	-4 (5.0)	
Lithuania	8 (1.5)	510 (6.6)	5 (2.1) ▲	71 (3.2)	515 (2.7)	13 (4.9) ▲	20 (3.0)	514 (5.5)	-18 (4.8) ▾	
Morocco	19 (3.7)	292 (21.7)	-36 (6.4) ▾	54 (4.0)	294 (8.9)	14 (6.6) ▲	27 (3.8)	296 (16.8)	22 (4.2) ▲	
Netherlands	32 (3.6)	523 (4.2)	0 (5.5)	62 (4.1)	523 (3.4)	-3 (5.8)	7 (2.3)	520 (7.7)	3 (3.1)	
New Zealand	5 (1.0)	504 (7.3)	-4 (2.2)	65 (2.5)	508 (3.6)	3 (3.9)	31 (2.6)	499 (4.6)	1 (4.0)	
Norway	8 (1.7)	466 (9.7)	-2 (3.4)	58 (3.8)	473 (4.3)	-6 (5.7)	34 (3.8)	483 (4.4)	7 (5.0)	
Qatar	5 (0.1)	314 (7.1)	∅ ∅	45 (0.2)	312 (3.3)	∅ ∅	50 (0.2)	271 (2.7)	∅ ∅	
Russian Federation	0 (0.2)	~ ~	-1 (0.7)	50 (3.6)	543 (4.9)	-3 (4.8)	50 (3.5)	550 (6.9)	4 (4.7)	
Scotland	17 (3.1)	497 (7.3)	-2 (4.6)	53 (4.1)	499 (3.6)	-13 (6.1) ▾	30 (3.5)	505 (4.7)	15 (5.0) ▲	
Singapore	8 (1.6)	589 (11.2)	-4 (3.3)	79 (2.5)	589 (4.3)	-1 (4.4)	13 (2.2)	570 (10.3)	5 (3.1)	
Slovak Republic	5 (1.8)	492 (20.2)	∅ ∅	60 (3.9)	534 (3.9)	∅ ∅	35 (3.9)	519 (11.3)	∅ ∅	
Slovenia	11 (1.9)	521 (6.7)	-2 (3.7)	73 (2.9)	518 (2.3)	-3 (4.8)	16 (2.5)	517 (5.4)	5 (3.6)	
Sweden	19 (3.0)	527 (4.9)	∅ ∅	61 (3.5)	524 (3.8)	∅ ∅	20 (3.0)	529 (5.1)	∅ ∅	
Tunisia	11 (2.8)	300 (28.3)	-21 (5.0) ▾	51 (4.1)	321 (9.1)	2 (5.8)	38 (4.0)	304 (9.6)	19 (5.1) ▲	
Ukraine	1 (0.7)	~ ~	∅ ∅	20 (3.2)	482 (6.0)	∅ ∅	79 (3.3)	472 (3.5)	∅ ∅	
United States	9 (1.6)	542 (9.4)	-3 (2.6)	65 (2.8)	541 (3.2)	4 (3.9)	25 (2.7)	529 (4.9)	-1 (3.8)	
Yemen	15 (3.6)	217 (21.8)	∅ ∅	56 (4.6)	211 (9.3)	∅ ∅	30 (4.5)	178 (14.7)	∅ ∅	
International Avg.	10 (0.4)	478 (2.5)		59 (0.6)	477 (1.0)		31 (0.6)	472 (1.3)		
<b>Benchmarking Participants</b>										
Alberta, Canada	10 (3.0)	530 (15.5)	∅ ∅	69 (3.8)	544 (4.2)	∅ ∅	21 (2.9)	543 (5.4)	∅ ∅	
British Columbia, Canada	23 (3.8)	543 (4.9)	∅ ∅	63 (4.3)	536 (4.3)	∅ ∅	14 (2.8)	522 (5.9)	∅ ∅	
Dubai, UAE	0 (0.0)	~ ~	∅ ∅	62 (3.3)	458 (9.3)	∅ ∅	38 (3.3)	441 (3.8)	∅ ∅	
Massachusetts, US	12 (3.9)	565 (13.0)	∅ ∅	59 (5.2)	570 (5.2)	∅ ∅	30 (5.3)	576 (7.5)	∅ ∅	
Minnesota, US	8 (2.9)	554 (12.8)	∅ ∅	66 (8.6)	554 (5.7)	∅ ∅	26 (8.1)	546 (22.4)	∅ ∅	
Ontario, Canada	14 (3.5)	537 (8.2)	-4 (5.0)	63 (5.1)	534 (5.1)	-2 (6.5)	23 (4.4)	536 (9.8)	6 (5.7)	
Quebec, Canada	18 (2.9)	522 (6.1)	0 (4.3)	67 (3.9)	518 (3.5)	-5 (5.6)	16 (3.1)	517 (7.2)	6 (4.0)	

▲ 2007 percent significantly higher

▾ 2007 percent significantly lower

Based on teachers' reports on the frequency of four types of interactions with other teachers: 1) Discussions about how to teach a particular concept; 2) Working on preparing instructional materials; 3) Visits to another teacher's classroom to observe his/her teaching; 4) Informal observation of my classroom by another teacher. Frequency is computed by averaging across four items based on a 4-point scale: 1. Never or Almost Never; 2. 2 or 3 times per month; 3. 1-3 times per week; 4. Daily or almost daily.

(l) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (∅) indicates the country did not participate in the assessment.



**Exhibit 6.6 Frequency of Collaboration Among Science Teachers with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Percentage of Students by Their Teachers' Frequency of Collaboration with Other Teachers									
	Never or Almost Never			2 or 3 Times per Month			At Least Weekly			
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	
Algeria	5 (1.4)	410 (6.2)	0 0	56 (3.3)	409 (2.2)	0 0	40 (3.3)	408 (2.6)	0 0	
Armenia	3 (0.9)	476 (20.1)	-6 (2.1) ▾	31 (2.3)	490 (5.1)	-25 (3.7) ▾	66 (2.1)	487 (6.9)	30 (3.5) ▾	
Australia	16 (2.6)	512 (9.0)	1 (4.0)	62 (2.5)	520 (4.6)	-6 (4.2)	22 (2.4)	511 (6.0)	5 (3.5)	
Bahrain	5 (1.5)	438 (16.8)	3 (1.9)	70 (2.7)	466 (2.8)	14 (4.3) ▾	25 (2.2)	475 (4.8)	-17 (3.9) ▾	
Bosnia and Herzegovina	8 (1.1)	469 (5.5)	0 0	56 (2.5)	464 (3.3)	0 0	36 (2.6)	468 (4.0)	0 0	
Botswana	8 (2.3)	359 (7.7)	2 (3.1)	52 (4.2)	357 (4.8)	-1 (6.1)	40 (4.2)	351 (5.4)	-1 (6.0)	
Bulgaria	17 (2.5)	480 (10.0)	--	66 (2.8)	464 (7.0)	--	17 (2.6)	469 (13.8)	--	
Chinese Taipei	36 (4.2)	549 (6.3)	10 (5.6)	53 (4.4)	563 (4.3)	-13 (6.0) ▾	11 (2.7)	585 (9.8)	3 (3.4)	
Colombia	22 (4.1)	417 (6.1)	0 0	53 (4.4)	422 (4.8)	0 0	25 (3.8)	405 (8.7)	0 0	
Cyprus	9 (0.6)	456 (5.0)	1 (1.3)	67 (1.0)	451 (2.1)	12 (1.8) ▾	24 (0.8)	447 (2.9)	-13 (1.3) ▾	
Czech Republic	39 (3.0)	541 (3.3)	0 0	56 (2.8)	538 (2.7)	0 0	5 (1.1)	525 (5.3)	0 0	
Egypt	1 (0.5)	~ ~	0 (0.5)	37 (4.1)	409 (6.1)	6 (5.3)	62 (4.1)	406 (5.0)	-6 (5.4)	
El Salvador	31 (4.1)	388 (6.5)	0 0	48 (4.7)	387 (5.1)	0 0	21 (3.2)	385 (7.0)	0 0	
England	15 (2.3)	558 (11.4)	-2 (4.4)	60 (3.0)	541 (6.0)	-6 (5.5)	25 (2.7)	537 (8.3)	8 (4.5)	
Georgia	2 (0.8)	~ ~	0 0	49 (4.0)	420 (6.9)	0 0	48 (4.1)	422 (5.3)	0 0	
Ghana	10 (2.5)	313 (23.4)	-6 (4.0)	39 (4.1)	302 (7.6)	5 (6.1)	51 (4.1)	303 (8.2)	1 (6.3)	
Hong Kong SAR	19 (3.7)	525 (15.9)	-7 (5.7)	68 (4.5)	531 (5.3)	-1 (6.4)	13 (3.3)	537 (13.8)	7 (4.0)	
Hungary	14 (1.6)	530 (6.8)	4 (2.0) ▾	67 (2.5)	540 (3.0)	-7 (3.3) ▾	19 (2.4)	540 (6.0)	3 (3.1)	
Indonesia	5 (1.8)	411 (6.5)	2 (2.2)	66 (4.1)	437 (5.1)	3 (5.2)	29 (3.7)	436 (8.0)	-4 (4.9)	
Iran, Islamic Rep. of	12 (2.6)	454 (10.5)	2 (3.7)	77 (3.3)	460 (4.3)	1 (4.9)	10 (2.5)	461 (11.1)	-3 (3.7)	
Israel	10 (2.0)	489 (13.0)	-6 (2.9)	84 (2.4)	466 (5.6)	10 (3.8) ▾	6 (1.9)	476 (19.2)	-4 (3.0)	
Italy	35 (3.1)	497 (4.1)	7 (4.5)	58 (3.3)	493 (4.1)	-6 (4.8)	8 (1.7)	498 (6.9)	-1 (2.7)	
Japan	42 (4.1)	550 (3.5)	3 (5.3)	49 (4.0)	559 (4.4)	-4 (5.4)	9 (2.4)	546 (6.6)	1 (3.4)	
Jordan	6 (1.9)	458 (11.4)	4 (2.4)	50 (4.3)	482 (6.8)	-16 (6.2) ▾	44 (4.4)	485 (5.9)	12 (6.1) ▾	
Korea, Rep. of	7 (2.0)	560 (7.5)	-10 (3.7) ▾	80 (3.4)	552 (2.3)	8 (4.9)	13 (2.7)	555 (5.5)	3 (3.4)	
Kuwait	2 (1.1)	~ ~	0 0	26 (3.5)	418 (6.7)	0 0	72 (3.7)	415 (4.6)	0 0	
Lebanon	14 (2.7)	400 (11.7)	1 (3.6)	60 (3.5)	417 (7.0)	-2 (5.0)	26 (3.5)	416 (14.7)	1 (4.6)	
Lithuania	25 (2.1)	520 (3.1)	9 (2.7) ▾	65 (2.2)	517 (3.0)	-7 (3.0) ▾	11 (1.3)	525 (6.6)	-2 (2.1)	
Malaysia	3 (1.4)	518 (32.3)	-4 (2.6)	66 (3.7)	470 (7.3)	1 (5.3)	31 (3.5)	469 (10.2)	2 (5.0)	
Malta	41 (0.2)	461 (1.7)	0 0	56 (0.3)	447 (1.8)	0 0	3 (0.2)	404 (7.2)	0 0	
Norway	23 (3.0)	486 (6.0)	9 (4.4)	62 (3.6)	487 (2.5)	-4 (5.3)	15 (2.9)	487 (4.4)	-5 (4.5)	
Oman	5 (1.8)	407 (18.1)	0 0	51 (4.4)	417 (5.1)	0 0	44 (4.4)	431 (5.0)	0 0	
Palestinian Nat'l Auth.	4 (1.8)	433 (16.4)	2 (2.2)	55 (4.3)	403 (5.8)	-4 (5.9)	40 (4.2)	402 (6.5)	2 (5.8)	
Qatar	3 (0.1)	375 (5.7)	0 0	40 (0.2)	334 (2.1)	0 0	57 (0.2)	302 (2.2)	0 0	
Romania	2 (0.7)	~ ~	-1 (1.3)	45 (3.1)	460 (5.0)	5 (4.0)	53 (3.1)	462 (4.6)	-4 (4.0)	
Russian Federation	3 (0.6)	519 (10.9)	-1 (1.0)	66 (2.2)	529 (4.1)	6 (3.2)	31 (2.3)	533 (5.3)	-5 (3.3)	
Saudi Arabia	13 (3.3)	388 (9.1)	--	66 (4.4)	403 (3.4)	--	21 (3.8)	410 (6.4)	--	
Scotland	15 (1.8)	490 (7.4)	-5 (3.5)	59 (2.5)	501 (4.0)	-3 (4.2)	26 (2.4)	487 (7.1)	8 (3.6) ▾	
Serbia	13 (1.4)	474 (5.2)	2 (1.9)	69 (2.3)	468 (3.5)	7 (3.4) ▾	18 (1.9)	476 (4.4)	-10 (3.0) ▾	
Singapore	11 (1.4)	558 (8.9)	-8 (2.4) ▾	75 (2.3)	565 (5.4)	6 (3.2)	14 (1.7)	585 (9.0)	2 (2.5)	
Slovenia	32 (3.0)	536 (3.5)	-2 (3.8)	63 (3.0)	537 (2.4)	3 (4.0)	5 (1.4)	553 (7.3)	-2 (1.9)	
Sweden	22 (2.7)	509 (4.4)	4 (3.6)	68 (2.8)	509 (3.2)	4 (4.1)	10 (1.5)	517 (5.1)	-9 (3.1) ▾	
Syrian Arab Republic	11 (2.1)	434 (7.8)	0 0	65 (3.3)	453 (3.5)	0 0	24 (3.0)	453 (6.2)	0 0	
Thailand	4 (1.6)	439 (20.1)	0 0	50 (4.6)	475 (6.1)	0 0	45 (4.5)	469 (8.2)	0 0	
Tunisia	8 (2.4)	445 (7.0)	-11 (4.3) ▾	69 (4.1)	447 (2.8)	7 (6.3)	23 (3.9)	439 (4.1)	4 (5.2)	
Turkey	16 (3.5)	452 (11.8)	0 0	72 (4.3)	451 (4.7)	0 0	13 (2.8)	474 (13.4)	0 0	
Ukraine	0 (0.3)	~ ~	0 0	49 (2.7)	488 (4.4)	0 0	50 (2.8)	484 (4.1)	0 0	
United States	22 (2.8)	522 (6.0)	-3 (4.0)	58 (3.3)	520 (4.1)	1 (4.6)	20 (2.2)	507 (7.8)	2 (3.0)	
‡ Morocco	23 (3.4)	394 (4.7)	--	59 (4.5)	404 (5.0)	--	18 (3.7)	422 (9.1)	--	
International Avg.	14 (0.3)	468 (1.7)		59 (0.5)	466 (0.7)		27 (0.4)	466 (1.1)		
<b>Benchmarking Participants</b>										
Basque Country, Spain	16 (3.8)	487 (8.1)	-2 (5.8)	77 (4.3)	501 (3.3)	16 (6.8) ▾	7 (2.1)	494 (10.6)	-14 (4.8) ▾	
British Columbia, Canada	28 (3.8)	524 (4.4)	0 0	58 (4.3)	527 (4.5)	0 0	14 (2.8)	521 (10.1)	0 0	
Dubai, UAE	1 (0.7)	~ ~	0 0	74 (3.1)	492 (3.8)	0 0	25 (3.2)	474 (6.9)	0 0	
Massachusetts, US	27 (7.2)	566 (11.6)	0 0	54 (8.4)	551 (7.0)	0 0	19 (5.3)	546 (24.2)	0 0	
Minnesota, US	29 (5.1)	535 (4.4)	0 0	59 (4.9)	534 (6.4)	0 0	11 (3.5)	561 (10.6)	0 0	
Ontario, Canada	23 (3.8)	520 (7.8)	0 (5.2)	64 (4.9)	527 (5.0)	-1 (6.6)	13 (3.7)	536 (6.2)	1 (4.9)	
Quebec, Canada	13 (3.6)	516 (8.5)	-16 (5.9) ▾	77 (4.0)	511 (4.6)	10 (6.2)	10 (3.1)	513 (15.4)	6 (3.5)	

▾ 2007 percent significantly higher  
▾ 2007 percent significantly lower

Based on teachers' reports on the frequency of four types of interactions with other teachers: 1) Discussions about how to teach a particular concept; 2) Working on preparing instructional materials; 3) Visits to another teacher's classroom to observe his/her teaching; 4) Informal observation of my classroom by another teacher. Frequency is computed by averaging across four items based on a 4-point scale: 1. Never or Almost Never; 2. 2 or 3 times per month; 3. 1-3 times per week; 4. Daily or almost daily.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

### How Well Prepared Do Teachers Feel They Are to Teach Science?

TIMSS 2007 asked the students' teachers of science how prepared they felt to teach a subset of the science topics included in the TIMSS 2007 science framework. At the fourth grade, teachers were asked about 22 topics in total, including 6 topics in life science, 9 topics in physical science, and 7 topics in earth science. At the eighth grade, teachers were asked about 23 topics in total, including 7 topics in biology, 5 topics in chemistry, 6 topics in physics, and 5 topics in earth science. The percentages of students with teachers that reported feeling "Very Well" prepared to teach the various topics are presented in Exhibits 6.7 and 6.8. In Exhibit 6.7, the results are summarized across all the science topics and by content domain, and Exhibit 6.8 presents the results for each topic.

At the fourth grade, the average across all science topics was 54 percent. The life science content domain had the highest average percent across topics internationally (59 percent), with the highest percents for the individual topics of changes in environment (66%), relationships in a living community (64%), and human health (63%). The average across the topics in the earth science content domain was 56 percent, with most of the individual topics ranging from 56 to 64 percent, however, only 31 percent of fourth-grade students were taught by teachers who reported feeling very well prepared to teach about fossils of animals and plants. The physical science content area had the lowest average percent across topics internationally (46%), with considerable variation from topic to topic.

At the eighth grade, the average across all topics was 70 percent. Chemistry had the highest percent on average across topics, with 77 percent of the students having teachers that reported being very well prepared to teach those topics. The highest percents for the individual topics were for particulate structure of matter (83%) and classification and composition of matter (81%). The average for the physics topic was 70 percent, followed by the biology topic at 67 percent, and then the earth science topic at 62 percent.

The individual topics in physics were similar, with all between 65 and 76 percent. Within the biology topics, the highest percents were for cells and their functions (76%) and major organs and organ systems in humans and other organisms (75%). In earth science, 70 percent of eighth-grade students were taught by teachers who reported feeling very well prepared to teach about environmental concerns and 68 percent on the use and conservation of earth's natural resources.

**Exhibit 6.7 Summary of Students Whose Teachers Feel “Very Well” Prepared to Teach the TIMSS Science Topics\***
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Percentage of Students Whose Teachers Report Feeling Very Well Prepared to Teach the TIMSS Science Topics**			
	All Science (22 topics)	Life Science (6 topics)	Physical Science (9 topics)	Earth Science (7 topics)
Algeria	53 (2.8)	58 (3.6)	48 (2.8)	53 (3.1)
Armenia	x x	x x	x x	x x
Australia	46 (3.0)	48 (3.8)	37 (2.8)	52 (3.5)
Austria	49 (1.7)	55 (2.0)	34 (2.0)	55 (1.9)
Chinese Taipei	59 (2.7)	62 (3.1)	60 (3.0)	54 (2.8)
Colombia	68 (3.3)	78 (3.3)	55 (4.1)	69 (4.0)
Czech Republic	66 (2.5)	76 (2.6)	49 (3.1)	72 (2.7)
Denmark	r 56 (2.9)	r 57 (3.7)	r 50 (3.9)	r 60 (3.6)
El Salvador	50 (2.6)	63 (3.2)	29 (2.5)	55 (3.4)
England	68 (2.5)	71 (2.6)	70 (2.9)	63 (3.1)
Georgia	55 (3.0)	62 (3.2)	r 31 (4.0)	62 (3.8)
Germany	47 (1.7)	r 53 (2.4)	r 32 (1.9)	r 52 (2.1)
Hong Kong SAR	r 29 (3.1)	r 33 (3.8)	s 28 (3.8)	r 30 (3.6)
Hungary	59 (2.3)	62 (2.6)	s 43 (3.4)	r 66 (2.8)
Iran, Islamic Rep. of	67 (2.5)	67 (3.1)	73 (2.6)	62 (2.9)
Italy	38 (2.3)	42 (2.7)	23 (2.3)	48 (2.8)
Japan	23 (2.2)	18 (2.2)	r 29 (3.0)	r 21 (2.4)
Kazakhstan	--	--	--	--
Kuwait	r 69 (2.6)	r 73 (2.7)	r 67 (3.2)	r 67 (3.0)
Latvia	67 (1.6)	75 (1.8)	49 (2.2)	77 (1.7)
Lithuania	36 (2.3)	44 (2.8)	18 (2.0)	45 (2.9)
Morocco	52 (2.2)	57 (2.6)	r 48 (3.0)	r 53 (3.2)
Netherlands	27 (2.6)	33 (3.6)	12 (2.1)	35 (3.5)
New Zealand	42 (2.0)	44 (2.5)	35 (2.0)	48 (2.2)
Norway	52 (2.5)	62 (3.1)	31 (2.6)	61 (2.9)
Qatar	73 (0.1)	78 (0.1)	r 74 (0.1)	r 67 (0.1)
Russian Federation	--	--	--	--
Scotland	r 51 (3.0)	r 52 (3.2)	r 46 (3.2)	r 52 (3.3)
Singapore	53 (1.9)	53 (2.3)	64 (1.8)	r 40 (2.3)
Slovak Republic	78 (1.7)	88 (1.5)	65 (2.8)	79 (1.8)
Slovenia	56 (1.6)	63 (1.8)	55 (2.2)	50 (1.9)
Sweden	44 (2.7)	51 (3.1)	32 (2.9)	49 (3.2)
Tunisia	53 (2.4)	57 (2.6)	52 (2.7)	r 48 (3.3)
Ukraine	78 (1.7)	88 (1.6)	r 53 (3.2)	84 (2.0)
United States	63 (1.5)	63 (1.7)	56 (1.9)	68 (1.9)
Yemen	64 (2.6)	64 (2.9)	r 66 (2.8)	r 65 (3.2)
<b>International Avg.</b>	<b>54 (0.4)</b>	<b>59 (0.5)</b>	<b>46 (0.5)</b>	<b>56 (0.5)</b>
<b>Benchmarking Participants</b>				
Alberta, Canada	59 (2.2)	61 (2.6)	r 57 (2.6)	r 60 (2.9)
British Columbia, Canada	r 56 (2.1)	r 62 (2.7)	s 43 (2.6)	r 61 (2.7)
Dubai, UAE	x x	x x	x x	x x
Massachusetts, US	63 (4.9)	r 59 (5.1)	r 60 (6.8)	r 71 (4.6)
Minnesota, US	51 (6.8)	48 (6.5)	r 48 (7.8)	r 56 (7.3)
Ontario, Canada	59 (3.3)	r 66 (3.7)	r 43 (3.9)	r 62 (4.0)
Quebec, Canada	r 34 (2.5)	r 37 (3.3)	r 19 (2.1)	r 42 (2.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

\* See Exhibit 6.8 for data on individual topics.

\*\* The TIMSS topics were summarized to reduce teachers' response burden.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students. An “x” indicates data are available for less than 50% of the students.



**Exhibit 6.7 Summary of Students Whose Teachers Feel “Very Well” Prepared to Teach the TIMSS Science Topics\* (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Percentage of Students Whose Teachers Report Feeling Very Well Prepared to Teach the TIMSS Science Topics**				
	All Science (23 topics)	Biology (7 topics)	Chemistry (5 topics)	Physics (6 topics)	Earth Science (5 topics)
Algeria	60 (2.1)	62 (3.0)	r 60 (3.4)	73 (3.0)	r 47 (4.2)
Armenia	50 (1.9)	53 (3.3)	75 (3.8)	36 (3.0)	39 (3.6)
Australia	73 (1.9)	76 (2.4)	79 (2.4)	69 (2.7)	70 (2.4)
Bahrain	77 (1.3)	70 (1.5)	90 (1.6)	77 (2.0)	69 (1.9)
Bosnia and Herzegovina	87 (1.2)	81 (2.1)	91 (1.6)	91 (1.8)	87 (2.4)
Botswana	76 (1.6)	82 (1.9)	86 (1.7)	71 (2.7)	62 (2.7)
Bulgaria	89 (1.0)	86 (1.8)	94 (1.5)	95 (1.5)	83 (2.6)
Chinese Taipei	63 (2.2)	26 (3.6)	86 (2.8)	83 (3.0)	45 (3.9)
Colombia	71 (1.8)	82 (2.3)	84 (2.7)	45 (3.1)	70 (2.6)
Cyprus	r 84 (0.7)	--	r 92 (0.9)	r 88 (1.4)	r 72 (1.1)
Czech Republic	85 (1.0)	78 (2.0)	95 (1.3)	93 (1.3)	76 (2.3)
Egypt	73 (1.6)	62 (2.7)	85 (2.2)	78 (2.5)	68 (2.8)
El Salvador	50 (2.9)	59 (3.0)	42 (3.5)	42 (3.5)	56 (3.4)
England	79 (1.0)	81 (1.7)	84 (1.6)	76 (2.0)	71 (1.4)
Georgia	86 (1.6)	82 (2.5)	87 (3.1)	89 (2.3)	86 (2.5)
Ghana	80 (1.8)	80 (2.1)	87 (1.7)	82 (2.3)	70 (2.5)
Hong Kong SAR	52 (2.8)	49 (4.0)	60 (4.0)	55 (3.9)	r 33 (2.7)
Hungary	r 85 (1.4)	r 72 (3.1)	93 (2.5)	92 (1.9)	r 80 (2.4)
Indonesia	80 (2.0)	78 (3.0)	--	80 (3.1)	--
Iran, Islamic Rep. of	76 (1.9)	72 (2.4)	83 (2.3)	76 (2.3)	71 (2.2)
Israel	68 (1.6)	r 80 (1.9)	r 87 (1.9)	r 61 (2.6)	r 39 (2.6)
Italy	52 (2.0)	56 (2.5)	54 (2.6)	45 (2.6)	54 (2.6)
Japan	41 (2.1)	29 (2.5)	60 (2.8)	47 (2.8)	30 (2.7)
Jordan	70 (2.3)	67 (3.0)	76 (2.6)	74 (2.9)	64 (3.0)
Korea, Rep. of	53 (2.2)	42 (2.5)	62 (3.1)	57 (2.8)	52 (2.9)
Kuwait	r 66 (2.1)	r 65 (3.2)	r 75 (2.8)	r 67 (3.2)	r 61 (3.5)
Lebanon	85 (1.4)	77 (1.9)	95 (1.9)	83 (2.1)	--
Lithuania	r 59 (1.6)	49 (3.7)	70 (3.0)	s 64 (4.0)	r 52 (3.2)
Malaysia	65 (2.3)	71 (2.7)	70 (3.0)	63 (3.3)	r 45 (3.2)
Malta	88 (0.1)	88 (0.3)	91 (0.2)	90 (0.2)	86 (0.2)
Norway	64 (1.9)	72 (2.2)	55 (2.9)	58 (2.7)	69 (2.2)
Oman	70 (1.7)	61 (2.8)	85 (1.9)	80 (2.8)	57 (2.7)
Palestinian Nat'l Auth.	74 (1.9)	72 (2.6)	86 (2.0)	76 (2.7)	62 (3.1)
Qatar	65 (0.1)	64 (0.1)	74 (0.1)	r 65 (0.1)	r 63 (0.1)
Romania	85 (1.3)	76 (2.5)	92 (1.5)	91 (1.6)	79 (2.5)
Russian Federation	--	--	--	--	--
Saudi Arabia	58 (2.1)	68 (3.1)	56 (3.8)	r 51 (3.6)	r 57 (3.6)
Scotland	r 68 (1.2)	r 63 (2.1)	r 77 (1.8)	r 71 (1.8)	r 54 (2.1)
Serbia	91 (1.3)	85 (2.1)	96 (1.0)	94 (1.5)	88 (2.2)
Singapore	59 (1.5)	46 (2.1)	74 (1.8)	64 (2.1)	r 18 (1.9)
Slovenia	80 (1.4)	64 (2.5)	90 (2.1)	85 (1.7)	--
Sweden	67 (1.6)	59 (2.5)	67 (2.7)	68 (2.8)	45 (3.9)
Syrian Arab Republic	77 (1.7)	72 (2.7)	86 (2.5)	79 (2.4)	62 (3.6)
Thailand	46 (2.2)	51 (2.7)	45 (3.1)	32 (2.7)	59 (3.0)
Tunisia	49 (2.0)	66 (2.2)	s 19 (3.7)	s 14 (3.7)	59 (2.7)
Turkey	71 (2.4)	70 (3.2)	79 (2.9)	r 72 (2.6)	62 (3.2)
Ukraine	94 (0.7)	91 (1.7)	96 (1.4)	95 (1.1)	92 (1.3)
United States	72 (1.5)	r 74 (1.8)	r 73 (2.0)	r 60 (2.3)	78 (2.0)
‡ Morocco	r 69 (2.5)	r 62 (4.0)	r 82 (3.4)	r 77 (3.2)	r 57 (4.0)
<b>International Avg.</b>	<b>70 (0.3)</b>	<b>67 (0.4)</b>	<b>77 (0.4)</b>	<b>70 (0.4)</b>	<b>62 (0.4)</b>
<b>Benchmarking Participants</b>					
Basque Country, Spain	68 (2.5)	65 (3.4)	68 (3.1)	65 (3.5)	74 (3.1)
British Columbia, Canada	r 69 (2.3)	r 68 (3.0)	r 78 (2.8)	r 65 (2.8)	r 64 (3.3)
Dubai, UAE	s 79 (1.5)	x x	s 85 (2.0)	s 80 (2.0)	x x
Massachusetts, US	66 (3.3)	67 (4.6)	67 (4.4)	52 (4.5)	76 (5.0)
Minnesota, US	68 (4.2)	78 (5.6)	57 (6.3)	45 (4.4)	84 (5.2)
Ontario, Canada	54 (2.6)	65 (3.7)	44 (3.2)	47 (2.8)	60 (3.5)
Quebec, Canada	61 (2.3)	65 (3.6)	64 (4.0)	51 (4.2)	61 (3.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

Does not include students whose teachers report that they do not teach the content domain.

\* See Exhibit 6.8 for data on individual topics.

\*\* The TIMSS topics were summarized to reduce teachers' response burden.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

**Exhibit 6.8 Students Whose Teachers Feel “Very Well” Prepared to Teach the TIMSS Science Topics**

**TIMSS2007**  
Science **4<sup>th</sup>** Grade

Country	Percentage of Students Whose Teachers Report Feeling Very Well Prepared to Teach the TIMSS Science Topics*									
	Life Science (6 topics)						Physical Science (9 topics)			
	Major Body Structures and Their Functions in Humans and Other Organisms	Reproduction and Development in Plants and Animals	Physical Features, Behavior, and Survival of Organisms Living in Different Environments	Relationships in a Living Community	Changes in Environments	Human Health	Classification of Objects / Materials Based on Physical Properties	Forming and Separating Mixtures	States of Matter and Differences in Their Physical Properties, Including Changes in State of Matter by Heating and Cooling	Familiar Changes in Materials
Algeria	62 (4.7)	57 (4.4)	42 (4.7)	70 (5.1)	66 (4.3)	53 (5.0)	45 (4.5)	33 (4.1)	73 (4.4)	47 (5.0)
Armenia	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
Australia	41 (4.5)	42 (4.6)	40 (4.9)	55 (4.7)	61 (4.4)	49 (4.6)	38 (4.0)	19 (3.2)	44 (3.6)	40 (3.7)
Austria	66 (3.0)	35 (2.7)	39 (3.1)	51 (3.2)	65 (2.9)	74 (2.9)	28 (3.2)	14 (2.5)	41 (3.2)	25 (3.0)
Chinese Taipei	63 (3.9)	54 (4.1)	54 (4.1)	67 (3.7)	70 (3.7)	65 (3.9)	51 (4.2)	40 (4.1)	71 (3.8)	70 (3.5)
Colombia	78 (4.9)	78 (4.6)	74 (5.0)	88 (3.6)	86 (3.8)	66 (4.2)	72 (4.6)	63 (5.4)	72 (4.9)	56 (5.0)
Czech Republic	80 (3.4)	52 (4.4)	74 (3.3)	79 (3.2)	82 (2.9)	85 (3.2)	55 (4.5)	22 (4.0)	73 (3.7)	60 (4.1)
Denmark	r 55 (4.8)	r 48 (5.4)	r 47 (4.6)	r 66 (5.2)	r 59 (5.1)	r 66 (4.4)	r 48 (5.0)	r 33 (4.7)	r 50 (5.0)	r 51 (4.6)
El Salvador	57 (3.7)	58 (4.0)	55 (4.1)	67 (4.1)	72 (3.8)	71 (4.2)	35 (4.0)	19 (3.8)	50 (4.5)	32 (3.6)
England	68 (3.2)	71 (3.5)	63 (3.4)	76 (3.3)	69 (3.8)	79 (3.3)	74 (3.8)	68 (3.9)	85 (3.2)	72 (3.7)
Georgia	57 (5.1)	52 (5.2)	51 (5.3)	54 (4.9)	79 (4.1)	73 (4.3)	33 (5.4)	22 (5.4)	44 (5.1)	37 (5.2)
Germany	45 (3.3)	44 (3.5)	44 (3.7)	54 (3.6)	60 (3.2)	67 (3.4)	23 (2.7)	17 (2.8)	50 (2.9)	24 (3.4)
Hong Kong SAR	33 (4.7)	24 (4.8)	23 (4.3)	35 (5.3)	42 (4.9)	43 (4.3)	26 (4.4)	15 (3.8)	40 (5.0)	32 (4.0)
Hungary	57 (3.3)	58 (3.6)	34 (3.1)	66 (3.7)	77 (3.1)	72 (3.5)	44 (3.5)	29 (4.1)	69 (3.4)	48 (3.8)
Iran, Islamic Rep. of	71 (3.9)	62 (4.5)	57 (4.2)	68 (3.9)	77 (3.2)	68 (4.1)	61 (4.3)	80 (3.0)	87 (3.0)	68 (4.1)
Italy	42 (3.2)	45 (3.2)	37 (3.3)	48 (2.9)	47 (3.3)	37 (3.4)	25 (3.5)	19 (2.8)	48 (3.0)	29 (3.5)
Japan	17 (2.9)	23 (3.3)	14 (2.8)	19 (3.2)	21 (3.4)	17 (3.0)	29 (4.2)	10 (2.7)	47 (4.4)	15 (3.2)
Kazakhstan	--	--	--	--	--	--	--	--	--	--
Kuwait	r 78 (3.8)	r 74 (4.1)	r 60 (4.3)	r 87 (2.9)	r 71 (4.4)	r 70 (4.0)	r 60 (5.2)	r 47 (5.5)	r 76 (4.1)	r 61 (4.9)
Latvia	81 (2.7)	60 (3.6)	66 (3.4)	85 (2.3)	82 (2.9)	74 (2.9)	51 (3.6)	28 (3.2)	75 (3.4)	48 (4.1)
Lithuania	36 (3.5)	36 (3.3)	37 (3.2)	47 (3.2)	52 (3.3)	54 (4.0)	14 (2.5)	2 (1.0)	23 (3.0)	17 (2.6)
Morocco	55 (4.4)	54 (4.0)	34 (4.2)	67 (4.0)	68 (4.3)	61 (4.5)	58 (4.2)	29 (4.3)	74 (3.6)	50 (4.6)
Netherlands	28 (4.3)	28 (4.0)	25 (3.7)	36 (4.3)	39 (4.2)	42 (4.6)	9 (2.5)	5 (1.8)	18 (3.5)	8 (2.3)
New Zealand	36 (2.9)	37 (2.9)	38 (2.9)	51 (3.1)	52 (3.2)	47 (2.3)	36 (2.5)	21 (2.3)	40 (2.6)	38 (2.6)
Norway	60 (4.1)	56 (4.2)	48 (3.9)	69 (3.6)	66 (3.6)	76 (3.3)	21 (2.9)	11 (2.2)	41 (3.5)	38 (3.8)
Qatar	85 (0.2)	82 (0.1)	69 (0.2)	86 (0.1)	73 (0.2)	75 (0.2)	67 (0.2)	53 (0.2)	85 (0.1)	70 (0.1)
Russian Federation	--	--	--	--	--	--	--	--	--	--
Scotland	r 51 (3.7)	r 46 (4.1)	r 41 (4.0)	r 55 (4.1)	r 59 (4.4)	r 58 (4.2)	r 47 (3.9)	r 38 (3.8)	r 54 (4.0)	r 46 (4.4)
Singapore	50 (2.7)	54 (2.7)	49 (2.7)	59 (2.8)	62 (2.7)	43 (2.7)	74 (2.4)	44 (2.9)	83 (2.1)	59 (3.0)
Slovak Republic	95 (1.4)	79 (2.8)	86 (2.7)	94 (1.7)	92 (2.0)	83 (2.4)	73 (3.6)	32 (4.8)	83 (2.9)	73 (3.8)
Slovenia	76 (2.8)	36 (2.9)	36 (2.9)	62 (3.2)	83 (2.0)	84 (2.2)	53 (3.2)	50 (3.1)	68 (3.1)	50 (2.8)
Sweden	51 (3.6)	41 (3.8)	40 (3.6)	65 (3.7)	48 (4.2)	59 (4.1)	25 (3.6)	22 (3.6)	43 (4.0)	37 (3.7)
Tunisia	58 (3.4)	56 (3.7)	44 (3.4)	60 (3.1)	62 (3.6)	60 (3.6)	54 (3.5)	35 (4.3)	67 (3.1)	53 (3.8)
Ukraine	89 (2.5)	86 (3.0)	82 (3.2)	93 (1.9)	93 (1.7)	88 (2.5)	45 (4.7)	35 (4.5)	71 (3.9)	79 (3.7)
United States	55 (2.6)	54 (2.9)	69 (2.2)	77 (2.3)	73 (2.4)	52 (2.6)	62 (2.8)	37 (3.0)	71 (2.5)	53 (3.1)
Yemen	67 (4.4)	61 (4.9)	49 (5.4)	66 (4.6)	64 (4.8)	72 (4.3)	65 (4.4)	r 38 (5.3)	77 (4.5)	69 (4.5)
<b>International Avg.</b>	<b>59 (0.6)</b>	<b>53 (0.7)</b>	<b>49 (0.7)</b>	<b>64 (0.6)</b>	<b>66 (0.6)</b>	<b>63 (0.6)</b>	<b>45 (0.7)</b>	<b>31 (0.6)</b>	<b>60 (0.6)</b>	<b>47 (0.7)</b>
<b>Benchmarking Participants</b>										
Alberta, Canada	42 (3.9)	57 (4.2)	52 (4.6)	75 (2.9)	81 (3.0)	59 (4.1)	54 (4.3)	40 (4.2)	58 (4.0)	66 (3.7)
British Columbia, Canada	r 56 (4.4)	r 41 (3.8)	r 72 (3.8)	r 79 (3.3)	r 71 (4.0)	r 50 (4.3)	r 40 (4.9)	r 20 (3.0)	r 57 (4.1)	r 36 (3.8)
Dubai, UAE	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
Massachusetts, US	48 (6.5)	53 (7.3)	68 (6.3)	70 (5.3)	69 (5.7)	47 (8.2)	59 (8.2)	40 (7.1)	65 (7.7)	54 (8.3)
Minnesota, US	41 (7.2)	36 (9.1)	42 (9.1)	59 (8.7)	58 (7.9)	50 (6.9)	53 (8.6)	32 (9.2)	60 (8.5)	44 (9.2)
Ontario, Canada	53 (5.2)	51 (4.8)	71 (4.7)	84 (3.5)	75 (4.0)	59 (5.4)	44 (4.6)	22 (4.1)	57 (5.1)	44 (4.8)
Quebec, Canada	35 (4.4)	r 30 (4.3)	r 22 (3.2)	r 41 (4.7)	r 53 (4.8)	r 45 (4.7)	r 24 (3.5)	r 16 (3.4)	r 35 (4.3)	r 16 (3.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

\* The TIMSS topics were summarized to reduce teachers' response burden.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An “r” indicates data are available for at least 70 but less than 85% of the students. An “x” indicates data are available for less than 50% of the students.

**Exhibit 6.8 Students Whose Teachers Feel “Very Well” Prepared to Teach the TIMSS Science Topics (Continued)**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

Country	Percentage of Students Whose Teachers Report Feeling Very Well Prepared to Teach the TIMSS Science Topics*											
	Physical Science (9 topics) (Continued)					Earth Science (7 topics)						
	Common Energy Sources / Forms and Their Practical Uses	Light	Electrical Circuits	Properties of Magnets	Forces that Cause Objects to Move	Features of the Earth's Landscape	Water on Earth	Air	Common Features of the Earth's Landscape and Relationship to Human Use	Weather Conditions from Day to Day or Over the Seasons	Fossils of Animals and Plants	Earth's Solar System
Algeria	48 (4.9)	44 (5.0)	55 (5.3)	39 (5.1)	45 (5.1)	68 (4.5)	67 (4.5)	58 (4.1)	64 (4.8)	58 (4.8)	20 (3.5)	31 (4.5)
Armenia	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
Australia	48 (3.6)	33 (4.1)	30 (4.4)	33 (4.0)	44 (4.4)	64 (4.0)	57 (4.6)	40 (4.5)	58 (4.5)	60 (4.0)	22 (3.1)	63 (4.5)
Austria	46 (3.1)	37 (3.2)	30 (2.9)	53 (3.5)	27 (3.2)	67 (3.0)	79 (2.6)	51 (3.3)	45 (3.3)	69 (2.8)	23 (2.8)	51 (3.0)
Chinese Taipei	75 (3.6)	56 (3.9)	51 (4.5)	64 (3.7)	63 (4.0)	61 (3.6)	59 (3.5)	60 (3.6)	60 (4.0)	58 (4.0)	29 (3.7)	49 (4.2)
Colombia	55 (5.3)	55 (5.4)	30 (4.5)	40 (5.4)	52 (5.2)	80 (4.7)	75 (5.0)	76 (4.9)	70 (4.8)	71 (4.7)	36 (4.2)	80 (4.5)
Czech Republic	64 (4.0)	43 (4.5)	29 (4.3)	53 (4.5)	36 (4.2)	79 (3.6)	86 (2.9)	81 (3.2)	76 (3.4)	74 (3.9)	32 (4.2)	70 (4.1)
Denmark	r 65 (4.6)	r 41 (5.1)	r 50 (5.1)	r 61 (4.7)	r 53 (5.0)	r 67 (4.7)	r 61 (4.6)	r 60 (5.0)	r 61 (5.3)	r 67 (5.0)	r 37 (4.8)	r 66 (4.0)
El Salvador	29 (3.3)	35 (3.8)	16 (3.4)	18 (3.6)	27 (3.7)	64 (4.1)	49 (4.6)	48 (4.4)	60 (4.2)	62 (4.0)	35 (4.2)	66 (4.4)
England	67 (3.7)	69 (3.9)	60 (4.1)	65 (3.8)	68 (4.3)	67 (4.4)	70 (4.1)	60 (4.2)	63 (4.1)	72 (3.8)	34 (4.2)	79 (3.7)
Georgia	38 (4.7)	38 (4.8)	13 (3.6)	27 (5.3)	24 (4.5)	73 (4.5)	73 (4.2)	68 (4.6)	66 (4.8)	59 (5.1)	29 (4.0)	60 (4.8)
Germany	38 (3.3)	25 (3.2)	45 (3.2)	44 (3.2)	15 (2.9)	62 (3.2)	68 (2.7)	57 (3.5)	44 (3.2)	67 (3.1)	18 (3.3)	39 (3.9)
Hong Kong SAR	31 (4.7)	32 (4.7)	21 (4.4)	24 (4.3)	26 (4.8)	38 (4.1)	28 (4.3)	44 (4.8)	31 (4.2)	34 (4.4)	11 (3.5)	26 (4.8)
Hungary	45 (3.8)	38 (5.4)	r 12 (4.3)	48 (4.3)	15 (4.3)	79 (3.0)	71 (4.1)	60 (4.5)	77 (3.6)	76 (3.4)	24 (4.4)	38 (4.5)
Iran, Islamic Rep. of	70 (3.8)	73 (3.8)	68 (4.1)	83 (3.2)	69 (4.2)	76 (3.4)	61 (4.2)	56 (4.5)	69 (4.1)	60 (3.8)	40 (4.1)	71 (3.6)
Italy	26 (2.9)	19 (2.8)	10 (2.0)	12 (2.3)	16 (2.5)	57 (3.2)	53 (2.7)	53 (3.0)	55 (3.0)	46 (3.3)	31 (3.8)	39 (3.3)
Japan	21 (3.5)	29 (4.1)	46 (4.3)	49 (4.3)	19 (3.7)	16 (3.3)	21 (3.4)	23 (3.6)	13 (3.1)	31 (3.9)	19 (3.3)	22 (3.5)
Kazakhstan	--	--	--	--	--	--	--	--	--	--	--	--
Kuwait	r 69 (4.4)	r 74 (4.5)	r 64 (4.6)	r 77 (3.6)	r 73 (3.9)	r 67 (4.0)	r 75 (3.9)	r 74 (3.8)	r 67 (4.4)	r 66 (4.4)	r 49 (4.9)	r 69 (4.7)
Latvia	73 (3.5)	70 (3.5)	16 (3.1)	49 (4.1)	28 (3.9)	90 (1.9)	86 (2.3)	79 (2.8)	83 (2.9)	80 (2.9)	36 (3.8)	79 (2.9)
Lithuania	37 (3.6)	28 (3.2)	16 (2.7)	9 (2.1)	7 (1.7)	50 (3.9)	48 (3.6)	38 (3.4)	46 (3.3)	59 (3.5)	20 (2.9)	49 (3.6)
Morocco	46 (4.5)	41 (4.0)	62 (4.1)	36 (4.1)	36 (5.1)	65 (4.7)	59 (4.2)	60 (4.3)	63 (4.5)	52 (4.4)	22 (3.6)	45 (5.2)
Netherlands	24 (3.7)	12 (2.7)	8 (2.1)	15 (2.9)	r 12 (3.1)	47 (4.6)	39 (4.9)	31 (4.4)	46 (4.6)	46 (4.6)	17 (3.3)	18 (3.2)
New Zealand	44 (2.6)	37 (2.6)	34 (2.7)	31 (2.6)	33 (2.6)	54 (2.7)	53 (2.6)	37 (2.8)	49 (2.6)	54 (2.6)	32 (2.6)	57 (2.8)
Norway	50 (3.7)	36 (3.7)	19 (2.9)	29 (3.4)	30 (3.1)	69 (3.7)	56 (3.8)	55 (3.7)	66 (3.8)	72 (2.7)	37 (3.4)	71 (3.1)
Qatar	70 (0.2)	77 (0.1)	79 (0.2)	82 (0.1)	73 (0.2)	66 (0.2)	75 (0.2)	78 (0.1)	62 (0.2)	69 (0.1)	46 (0.2)	76 (0.1)
Russian Federation	--	--	--	--	--	--	--	--	--	--	--	--
Scotland	r 54 (4.3)	r 46 (4.5)	r 47 (4.1)	r 42 (4.2)	r 41 (4.3)	r 63 (4.0)	r 55 (4.2)	r 37 (4.2)	r 57 (4.5)	r 66 (4.0)	r 22 (3.8)	r 64 (3.7)
Singapore	69 (2.6)	73 (2.2)	43 (2.7)	76 (2.2)	57 (2.7)	35 (3.1)	44 (2.5)	62 (2.5)	35 (3.1)	38 (2.8)	25 (2.8)	41 (2.8)
Slovak Republic	79 (3.6)	62 (4.4)	52 (3.8)	64 (4.1)	65 (4.1)	84 (3.1)	83 (2.9)	87 (2.8)	86 (2.2)	77 (3.5)	38 (4.2)	89 (2.3)
Slovenia	59 (3.3)	50 (3.2)	68 (3.0)	56 (3.2)	35 (3.1)	51 (2.9)	66 (2.5)	64 (2.9)	44 (3.0)	62 (3.0)	21 (2.7)	36 (2.8)
Sweden	44 (3.9)	30 (3.6)	27 (3.8)	40 (3.5)	26 (3.7)	61 (3.8)	53 (4.0)	50 (3.8)	46 (4.0)	55 (4.1)	27 (3.5)	53 (4.5)
Tunisia	62 (3.4)	49 (4.0)	51 (4.3)	41 (4.2)	62 (3.2)	54 (4.3)	49 (4.5)	65 (3.7)	56 (4.2)	52 (4.3)	28 (3.8)	36 (4.2)
Ukraine	79 (3.6)	62 (4.3)	18 (4.3)	36 (4.8)	42 (4.8)	90 (2.4)	92 (2.2)	81 (3.2)	86 (2.5)	91 (2.4)	58 (4.4)	81 (3.2)
United States	64 (2.8)	49 (2.6)	53 (2.9)	58 (2.7)	60 (2.9)	78 (2.2)	70 (2.2)	59 (3.2)	74 (2.3)	73 (2.5)	54 (2.9)	70 (2.4)
Yemen	75 (3.9)	78 (4.2)	50 (5.2)	59 (5.0)	69 (4.8)	73 (4.3)	74 (4.5)	75 (4.5)	63 (5.3)	62 (4.7)	40 (5.6)	67 (4.5)
<b>International Avg.</b>	<b>53 (0.7)</b>	<b>47 (0.7)</b>	<b>39 (0.7)</b>	<b>46 (0.7)</b>	<b>41 (0.7)</b>	<b>64 (0.6)</b>	<b>62 (0.6)</b>	<b>58 (0.7)</b>	<b>59 (0.7)</b>	<b>62 (0.7)</b>	<b>31 (0.6)</b>	<b>56 (0.7)</b>
<b>Benchmarking Participants</b>												
Alberta, Canada	72 (3.5)	80 (3.3)	36 (4.7)	45 (4.4)	56 (4.0)	73 (4.0)	56 (4.4)	53 (4.1)	72 (3.6)	69 (3.8)	47 (3.9)	51 (4.4)
British Columbia, Canada	r 52 (3.9)	r 60 (4.3)	r 33 (4.6)	r 40 (4.3)	r 48 (4.9)	r 74 (3.6)	r 68 (3.5)	r 58 (4.4)	r 69 (3.8)	r 75 (3.3)	r 25 (3.5)	r 58 (4.7)
Dubai, UAE	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
Massachusetts, US	66 (7.7)	56 (8.1)	66 (7.3)	64 (7.8)	64 (7.9)	84 (3.8)	74 (5.6)	60 (7.2)	76 (4.9)	71 (7.6)	48 (8.1)	71 (6.2)
Minnesota, US	49 (9.0)	35 (9.0)	50 (7.1)	56 (8.6)	48 (8.7)	66 (7.8)	66 (7.3)	45 (9.1)	67 (7.5)	58 (8.4)	39 (9.8)	52 (8.3)
Ontario, Canada	51 (4.8)	65 (4.9)	18 (4.1)	39 (5.6)	50 (5.0)	76 (4.1)	62 (4.7)	53 (4.8)	63 (5.3)	68 (4.9)	51 (4.7)	58 (5.4)
Quebec, Canada	r 27 (4.0)	r 16 (3.4)	r 8 (2.3)	r 13 (2.9)	r 14 (3.0)	r 58 (4.2)	r 33 (3.8)	r 42 (4.1)	r 52 (4.3)	r 50 (4.4)	r 18 (3.6)	r 44 (4.1)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 6.8 **Students Whose Teachers Feel “Very Well” Prepared to Teach the TIMSS Science Topics (Continued)**

TIMSS2007  
Science **8**<sup>th</sup>  
Grade

Country	Percentage of Students Whose Teachers Report Feeling Very Well Prepared to Teach the TIMSS Science Topics*						
	Biology (7 topics)						
	Major Organs and Organ Systems in Humans and Other Organisms	Cells and Their Functions, Including Respiration and Photosynthesis as Cellular Processes	Reproduction and Heredity	Role of Variation and Adaptation in Survival/Extinction of Species in a Changing Environment	Interaction with Living Organisms and the Physical Environment in the Ecosystem	Trends in Human Population and its Effects on the Environment	Impact of Natural Hazards on Humans, Wildlife, and the Environment
Algeria	70 (4.3)	71 (4.5)	52 (4.1)	52 (5.0)	68 (4.1)	53 (4.6)	65 (3.9)
Armenia	53 (4.5)	50 (4.7)	56 (4.3)	55 (4.3)	50 (4.3)	49 (4.2)	57 (3.9)
Australia	83 (2.5)	79 (3.2)	80 (2.5)	78 (2.9)	80 (3.0)	63 (3.7)	72 (3.7)
Bahrain	75 (2.0)	82 (1.8)	72 (2.1)	67 (2.6)	72 (1.9)	56 (2.4)	67 (2.0)
Bosnia and Herzegovina	93 (2.1)	94 (1.9)	87 (2.9)	68 (3.6)	90 (2.2)	67 (3.6)	68 (3.7)
Botswana	90 (2.5)	97 (1.6)	74 (3.9)	66 (4.3)	91 (2.0)	69 (4.3)	80 (3.7)
Bulgaria	96 (2.1)	97 (1.3)	90 (3.3)	85 (3.7)	97 (1.4)	56 (5.0)	77 (3.9)
Chinese Taipei	20 (3.6)	24 (3.8)	22 (3.6)	24 (4.0)	25 (4.1)	28 (4.3)	31 (4.3)
Colombia	92 (2.2)	94 (2.6)	85 (3.8)	74 (4.8)	90 (3.1)	60 (4.7)	81 (5.0)
Cyprus	--	--	--	--	--	--	--
Czech Republic	94 (1.9)	86 (2.6)	77 (3.7)	71 (3.6)	75 (3.4)	68 (3.9)	71 (3.9)
Egypt	70 (4.0)	64 (4.0)	70 (3.7)	59 (4.2)	61 (4.2)	47 (4.1)	61 (4.1)
El Salvador	55 (3.9)	59 (4.2)	62 (4.0)	52 (4.2)	53 (4.1)	61 (4.0)	70 (3.9)
England	82 (2.1)	85 (1.6)	84 (2.1)	85 (2.0)	84 (2.0)	74 (2.3)	76 (2.3)
Georgia	91 (2.6)	91 (2.8)	86 (3.3)	73 (4.4)	83 (3.0)	62 (5.7)	84 (4.1)
Ghana	83 (2.9)	92 (2.2)	88 (2.7)	59 (4.5)	81 (3.5)	78 (3.9)	78 (3.9)
Hong Kong SAR	46 (4.9)	54 (4.6)	49 (4.7)	47 (4.8)	54 (4.1)	45 (4.6)	44 (4.2)
Hungary	91 (2.9)	78 (4.2)	76 (4.6)	73 (4.1)	79 (3.4)	52 (4.7)	66 (3.9)
Indonesia	86 (3.1)	80 (3.6)	81 (3.3)	78 (3.8)	85 (3.4)	79 (3.9)	63 (5.4)
Iran, Islamic Rep. of	83 (2.9)	71 (3.5)	88 (2.5)	66 (3.8)	67 (3.8)	66 (3.8)	67 (3.8)
Israel	r 84 (2.6)	r 90 (1.9)	90 (1.9)	r 75 (3.1)	r 82 (2.9)	r 69 (3.4)	r 74 (2.9)
Italy	63 (2.9)	69 (2.9)	70 (2.9)	54 (3.4)	53 (3.7)	31 (3.3)	51 (3.4)
Japan	40 (3.6)	46 (3.8)	37 (4.1)	18 (3.2)	33 (3.6)	13 (2.9)	16 (3.1)
Jordan	66 (4.3)	68 (4.2)	70 (4.0)	63 (4.3)	75 (3.4)	62 (4.1)	68 (4.1)
Korea, Rep. of	41 (3.9)	63 (3.6)	50 (4.1)	32 (3.3)	40 (3.8)	29 (3.5)	35 (3.6)
Kuwait	r 75 (4.1)	r 68 (4.8)	r 54 (4.9)	r 62 (5.2)	r 67 (5.0)	r 63 (4.8)	r 64 (4.5)
Lebanon	91 (2.0)	96 (1.2)	93 (1.7)	57 (5.1)	67 (4.0)	61 (4.1)	66 (4.2)
Lithuania	59 (4.7)	59 (5.0)	54 (4.6)	36 (4.5)	53 (4.3)	42 (4.3)	38 (3.9)
Malaysia	70 (4.0)	84 (3.1)	66 (3.9)	61 (3.8)	87 (2.9)	66 (3.8)	70 (3.9)
Malta	96 (0.4)	100 (0.0)	96 (0.4)	75 (0.9)	91 (0.5)	80 (0.6)	77 (0.9)
Norway	73 (3.4)	81 (3.2)	79 (3.0)	73 (3.4)	70 (3.4)	66 (3.3)	65 (3.1)
Oman	68 (4.2)	71 (3.9)	62 (3.8)	51 (4.4)	62 (4.2)	53 (4.0)	56 (4.4)
Palestinian Nat'l Auth.	78 (3.4)	87 (2.9)	76 (3.6)	59 (4.5)	67 (4.1)	63 (4.1)	72 (4.2)
Qatar	79 (0.1)	76 (0.1)	65 (0.1)	50 (0.2)	64 (0.2)	54 (0.2)	60 (0.2)
Romania	90 (2.5)	88 (2.9)	76 (3.5)	67 (3.9)	84 (3.1)	68 (4.0)	59 (4.5)
Russian Federation	--	--	--	--	--	--	--
Saudi Arabia	76 (3.8)	78 (4.0)	62 (4.5)	61 (4.3)	72 (4.0)	59 (4.2)	67 (4.1)
Scotland	r 66 (2.4)	r 70 (2.2)	r 66 (2.2)	r 62 (2.5)	r 68 (2.5)	r 55 (2.8)	r 58 (2.5)
Serbia	98 (1.7)	94 (2.7)	88 (3.2)	78 (4.0)	92 (2.4)	73 (3.9)	74 (3.9)
Singapore	50 (2.7)	58 (2.7)	52 (2.5)	39 (2.6)	50 (2.8)	30 (2.4)	40 (2.4)
Slovenia	81 (3.4)	76 (3.4)	58 (4.2)	54 (3.9)	77 (3.2)	53 (4.1)	45 (4.0)
Sweden	67 (2.4)	68 (2.5)	71 (2.6)	56 (3.1)	63 (2.8)	36 (3.1)	35 (3.1)
Syrian Arab Republic	84 (3.8)	88 (2.9)	75 (4.3)	59 (5.5)	67 (4.2)	55 (5.0)	70 (5.1)
Thailand	56 (4.1)	52 (4.2)	47 (4.0)	43 (4.2)	48 (4.2)	51 (3.9)	61 (3.9)
Tunisia	85 (2.9)	91 (2.0)	85 (2.9)	51 (4.5)	57 (3.8)	40 (4.1)	53 (4.0)
Turkey	74 (4.3)	78 (3.8)	79 (3.8)	64 (4.1)	63 (4.3)	65 (4.6)	61 (4.7)
Ukraine	97 (1.5)	92 (2.4)	91 (2.6)	87 (3.1)	91 (2.5)	94 (2.0)	86 (3.0)
United States	r 73 (2.7)	r 78 (2.6)	r 75 (2.6)	r 75 (2.9)	r 80 (2.4)	r 68 (2.9)	r 72 (2.8)
‡ Morocco	r 74 (3.9)	r 65 (5.9)	r 69 (6.0)	r 49 (5.1)	r 69 (4.3)	r 53 (6.6)	r 60 (5.0)
International Avg.	75 (0.5)	76 (0.5)	71 (0.5)	60 (0.6)	70 (0.5)	57 (0.6)	62 (0.6)
<b>Benchmarking Participants</b>							
Basque Country, Spain	69 (4.4)	76 (4.4)	66 (4.3)	63 (4.2)	66 (3.8)	57 (4.6)	57 (4.3)
British Columbia, Canada	r 83 (3.4)	r 79 (3.8)	r 73 (4.3)	r 68 (4.3)	r 71 (4.2)	r 48 (4.4)	r 57 (4.4)
Dubai, UAE	s 62 (3.0)	s 76 (2.2)	s 62 (4.3)	s 56 (3.9)	s 74 (4.1)	s 63 (2.8)	s 60 (3.4)
Massachusetts, US	57 (4.1)	72 (5.2)	66 (6.8)	69 (7.0)	77 (7.3)	61 (7.5)	69 (6.6)
Minnesota, US	77 (6.8)	76 (5.8)	76 (8.0)	80 (7.5)	82 (6.4)	77 (6.6)	76 (6.3)
Ontario, Canada	69 (4.3)	72 (4.6)	59 (5.3)	60 (5.0)	73 (4.3)	57 (4.9)	63 (5.1)
Quebec, Canada	63 (5.1)	70 (4.9)	72 (4.5)	61 (5.0)	64 (5.0)	60 (5.0)	65 (5.2)

Background data provided by teachers.

Does not include students whose teachers report that they do not teach the content domain.

\* The TIMSS topics were summarized to reduce teachers' response burden.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students.



**TIMSS & PIRLS**  
International Study Center  
Lynch School of Education, Boston College

**Exhibit 6.8 Students Whose Teachers Feel “Very Well” Prepared to Teach the TIMSS Science Topics (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Percentage of Students Whose Teachers Report Feeling Very Well Prepared to Teach the TIMSS Science Topics*											
	Chemistry (5 topics)						Physics (6 topics)					
	Classification and Composition of Matter	Particulate Structure of Matter	Solutions	Properties and Uses of Common Acids and Bases	Chemical Change	Physical States and Changes in Matter	Energy Forms, Transformations, Heat, and Temperature	Basic Properties / Behaviors of Light	Electric Circuits	Properties of Permanent Magnets and Electro-magnets	Forces and Motion	
Algeria	r 62 (5.1)	77 (4.1)	r 72 (4.5)	r 39 (4.5)	r 46 (4.9)	68 (4.1)	77 (4.0)	58 (4.7)	79 (3.9)	82 (3.5)	72 (4.2)	
Armenia	77 (4.2)	76 (4.2)	75 (4.0)	72 (4.2)	74 (4.5)	33 (4.4)	32 (3.9)	33 (4.1)	37 (4.5)	49 (5.7)	37 (5.9)	
Australia	82 (2.8)	85 (2.4)	82 (2.9)	79 (2.8)	70 (3.2)	71 (3.2)	75 (3.2)	68 (3.0)	69 (3.2)	63 (3.4)	71 (3.2)	
Bahrain	94 (1.5)	95 (1.5)	90 (1.6)	87 (2.4)	83 (2.5)	68 (2.7)	79 (2.2)	78 (2.4)	67 (2.8)	89 (2.0)	78 (2.6)	
Bosnia and Herzegovina	95 (1.6)	96 (1.5)	82 (2.7)	90 (2.5)	93 (1.9)	89 (2.6)	91 (2.3)	91 (2.3)	92 (2.1)	90 (2.5)	93 (2.0)	
Botswana	93 (2.4)	85 (2.7)	90 (2.9)	93 (2.3)	72 (3.7)	67 (4.4)	79 (3.3)	82 (3.1)	80 (3.8)	59 (5.2)	52 (4.5)	
Bulgaria	98 (1.2)	99 (0.8)	87 (3.4)	96 (1.7)	91 (2.7)	94 (2.2)	97 (1.5)	96 (1.9)	92 (2.5)	95 (2.0)	95 (1.9)	
Chinese Taipei	85 (3.0)	88 (2.8)	86 (2.9)	86 (2.9)	83 (3.5)	84 (3.4)	84 (3.4)	82 (3.5)	81 (3.3)	85 (3.1)	83 (3.6)	
Colombia	93 (2.0)	95 (1.9)	77 (4.5)	74 (4.4)	79 (3.9)	66 (4.5)	71 (3.9)	33 (4.8)	19 (4.0)	32 (4.9)	42 (5.1)	
Cyprus	r 90 (0.8)	r 93 (0.8)	r 90 (0.9)	r 93 (0.9)	r 90 (0.9)	r 92 (1.6)	r 91 (1.7)	r 86 (1.7)	r 87 (2.0)	r 79 (2.2)	r 94 (1.6)	
Czech Republic	95 (1.7)	97 (1.3)	95 (1.8)	93 (1.9)	91 (2.4)	97 (1.6)	94 (2.1)	90 (1.9)	92 (2.0)	92 (1.8)	94 (1.3)	
Egypt	86 (2.6)	93 (2.2)	86 (3.3)	80 (3.2)	82 (3.2)	76 (3.6)	83 (3.0)	86 (2.8)	83 (3.3)	71 (4.3)	68 (4.3)	
El Salvador	48 (4.6)	50 (4.5)	46 (4.2)	33 (4.1)	34 (4.2)	37 (4.3)	56 (4.5)	42 (4.5)	33 (4.3)	39 (4.3)	47 (4.7)	
England	87 (1.8)	86 (1.8)	86 (1.8)	83 (2.1)	78 (2.2)	83 (2.1)	81 (2.4)	75 (2.9)	74 (2.7)	73 (2.6)	73 (2.8)	
Georgia	91 (3.2)	93 (2.9)	82 (4.3)	91 (3.0)	80 (4.6)	94 (2.5)	89 (3.7)	90 (2.9)	90 (2.3)	83 (3.8)	92 (2.8)	
Ghana	92 (2.2)	88 (2.9)	95 (1.9)	81 (3.1)	77 (3.4)	80 (3.6)	94 (2.0)	82 (3.6)	80 (3.3)	79 (3.6)	78 (3.5)	
Hong Kong SAR	55 (4.8)	61 (4.7)	62 (4.4)	72 (4.3)	53 (4.7)	56 (4.4)	59 (4.4)	51 (4.5)	61 (4.7)	50 (4.6)	55 (4.4)	
Hungary	93 (2.7)	94 (2.5)	93 (2.7)	92 (2.7)	93 (2.6)	92 (2.6)	92 (2.4)	84 (3.0)	94 (2.1)	94 (2.1)	96 (1.6)	
Indonesia	--	--	--	--	--	84 (3.0)	87 (2.8)	82 (3.0)	76 (3.9)	84 (3.5)	83 (3.0)	
Iran, Islamic Rep. of	87 (2.8)	92 (2.2)	87 (2.9)	76 (3.5)	73 (3.7)	87 (2.9)	79 (3.5)	72 (4.1)	74 (3.2)	83 (3.2)	62 (3.7)	
Israel	r 94 (1.8)	r 95 (1.5)	r 90 (2.3)	r 77 (3.0)	r 81 (3.1)	r 91 (2.0)	r 74 (4.0)	r 38 (3.5)	r 72 (3.7)	r 46 (4.3)	r 47 (3.7)	
Italy	61 (3.0)	68 (2.6)	59 (3.0)	42 (3.1)	41 (3.0)	59 (3.5)	53 (3.4)	33 (3.2)	36 (3.2)	35 (3.1)	55 (3.5)	
Japan	63 (3.6)	50 (3.7)	53 (3.7)	62 (3.2)	71 (3.3)	40 (3.7)	29 (3.8)	50 (3.8)	67 (3.5)	46 (4.0)	49 (3.9)	
Jordan	79 (3.4)	90 (2.6)	71 (4.0)	60 (4.2)	78 (3.5)	78 (3.5)	82 (3.1)	71 (3.6)	71 (3.8)	73 (3.8)	69 (3.9)	
Korea, Rep. of	68 (3.6)	58 (3.5)	69 (3.3)	55 (3.9)	57 (4.0)	61 (3.7)	58 (3.9)	39 (3.4)	74 (3.5)	46 (4.2)	65 (3.7)	
Kuwait	r 83 (3.4)	r 87 (3.5)	r 72 (3.6)	r 62 (4.4)	r 65 (5.0)	r 64 (4.3)	r 78 (3.7)	r 75 (4.1)	r 55 (4.9)	r 69 (4.4)	r 60 (4.7)	
Lebanon	97 (1.7)	97 (1.5)	96 (1.7)	92 (3.5)	93 (3.3)	88 (2.8)	87 (3.8)	87 (3.3)	92 (2.3)	55 (4.8)	90 (2.9)	
Lithuania	73 (3.5)	80 (3.2)	65 (3.9)	63 (4.9)	63 (4.0)	70 (4.5)	65 (4.3)	55 (4.5)	68 (5.3)	52 (5.2)	72 (3.6)	
Malaysia	79 (3.8)	59 (4.4)	82 (3.6)	78 (3.7)	51 (4.6)	65 (4.4)	72 (4.2)	68 (4.2)	44 (4.4)	49 (4.6)	70 (4.2)	
Malta	95 (0.1)	100 (0.0)	90 (0.4)	91 (0.3)	80 (0.5)	88 (0.3)	94 (0.2)	94 (0.2)	83 (0.3)	81 (0.3)	95 (0.1)	
Norway	61 (3.2)	75 (3.4)	42 (3.8)	64 (3.5)	35 (3.4)	62 (3.6)	67 (3.6)	60 (3.6)	58 (3.8)	43 (3.6)	61 (3.5)	
Oman	93 (2.0)	93 (1.7)	76 (3.4)	83 (2.9)	78 (3.2)	88 (3.0)	90 (2.7)	75 (4.3)	78 (4.0)	73 (3.9)	74 (4.2)	
Palestinian Nat'l Auth.	96 (1.8)	96 (1.5)	84 (3.2)	80 (3.4)	76 (3.5)	78 (3.8)	89 (2.8)	88 (3.0)	74 (3.9)	67 (4.0)	60 (4.6)	
Qatar	84 (0.1)	86 (0.1)	69 (0.1)	67 (0.1)	67 (0.1)	72 (0.1)	73 (0.1)	61 (0.2)	59 (0.2)	64 (0.1)	63 (0.2)	
Romania	95 (1.9)	97 (1.6)	92 (2.4)	93 (2.0)	85 (3.1)	88 (3.0)	94 (1.5)	89 (2.3)	94 (1.9)	91 (2.2)	92 (2.1)	
Russian Federation	--	--	--	--	--	--	--	--	--	--	--	
Saudi Arabia	64 (4.6)	64 (4.4)	53 (4.7)	31 (4.4)	60 (4.7)	56 (4.8)	65 (4.6)	58 (4.9)	32 (4.6)	42 (4.8)	42 (4.9)	
Scotland	r 81 (1.9)	r 83 (1.8)	r 80 (1.9)	r 72 (2.4)	r 68 (2.6)	r 77 (2.0)	r 81 (2.0)	r 69 (2.3)	r 78 (2.2)	r 60 (2.5)	r 64 (2.5)	
Serbia	99 (0.6)	98 (1.1)	93 (2.3)	95 (1.7)	94 (2.3)	90 (2.9)	95 (1.7)	92 (2.4)	96 (1.5)	92 (2.5)	98 (1.1)	
Singapore	78 (2.2)	80 (2.1)	76 (2.2)	75 (2.1)	63 (2.4)	69 (2.7)	65 (2.5)	64 (2.4)	66 (2.3)	56 (2.5)	62 (2.2)	
Slovenia	91 (2.5)	93 (2.3)	92 (2.3)	87 (3.0)	86 (3.1)	83 (2.8)	93 (2.0)	76 (3.6)	89 (2.4)	71 (3.3)	97 (1.3)	
Sweden	67 (2.6)	81 (2.1)	63 (2.8)	66 (2.4)	50 (2.9)	58 (2.9)	68 (2.8)	60 (2.9)	62 (3.0)	55 (2.9)	64 (2.9)	
Syrian Arab Republic	88 (3.4)	91 (2.6)	84 (3.5)	83 (3.8)	84 (3.0)	80 (3.7)	87 (2.9)	75 (3.6)	81 (3.2)	78 (3.5)	74 (3.7)	
Thailand	50 (4.3)	48 (4.0)	44 (4.3)	55 (3.9)	26 (4.0)	24 (2.9)	43 (4.0)	29 (3.7)	31 (4.2)	34 (4.2)	34 (4.3)	
Tunisia	r 26 (5.1)	r 14 (4.3)	r 19 (4.5)	r 14 (4.3)	r 18 (4.6)	r 11 (3.9)	r 15 (4.0)	r 14 (4.1)	s 12 (4.6)	s 10 (4.6)	r 13 (3.9)	
Turkey	85 (3.4)	87 (3.1)	65 (4.1)	81 (3.7)	75 (3.8)	81 (3.5)	67 (4.4)	49 (5.1)	77 (3.7)	70 (4.3)	82 (3.3)	
Ukraine	97 (1.4)	98 (1.2)	96 (1.6)	96 (1.6)	94 (2.1)	97 (0.9)	95 (1.0)	91 (2.2)	97 (1.5)	92 (2.4)	96 (1.7)	
United States	85 (2.0)	89 (1.8)	67 (3.0)	61 (2.8)	67 (2.9)	72 (3.2)	r 69 (2.8)	57 (3.3)	43 (3.1)	46 (3.2)	73 (2.8)	
‡ Morocco	r 77 (4.8)	r 86 (3.7)	r 87 (3.4)	r 82 (3.5)	r 76 (5.5)	r 71 (5.4)	r 86 (2.5)	r 66 (5.4)	r 82 (3.2)	r 75 (4.5)	r 79 (4.8)	
International Avg.	81 (0.4)	83 (0.4)	76 (0.5)	74 (0.5)	71 (0.5)	72 (0.5)	76 (0.5)	68 (0.5)	69 (0.5)	65 (0.5)	70 (0.5)	
<b>Benchmarking Participants</b>												
Basque Country, Spain	76 (4.1)	82 (3.4)	78 (3.7)	45 (4.6)	60 (4.5)	65 (4.5)	81 (3.4)	69 (4.9)	56 (4.9)	39 (5.2)	76 (4.1)	
British Columbia, Canada	r 85 (2.9)	r 83 (3.2)	r 79 (3.4)	r 68 (4.0)	r 71 (3.7)	r 86 (2.9)	r 81 (3.7)	r 68 (4.5)	r 44 (3.8)	r 43 (4.4)	r 64 (4.2)	
Dubai, UAE	s 94 (2.1)	s 94 (1.8)	s 82 (3.1)	s 80 (2.5)	s 78 (3.1)	s 85 (2.1)	s 74 (2.2)	s 76 (2.9)	s 84 (3.0)	s 67 (2.9)	s 84 (2.1)	
Massachusetts, US	83 (5.2)	81 (5.2)	68 (5.9)	51 (7.1)	53 (6.2)	75 (6.3)	79 (5.6)	25 (6.1)	28 (6.0)	28 (7.1)	79 (5.8)	
Minnesota, US	70 (6.2)	72 (7.3)	46 (7.6)	47 (7.2)	48 (7.8)	60 (7.3)	63 (8.4)	39 (7.5)	33 (6.2)	26 (6.8)	51 (6.3)	
Ontario, Canada	47 (3.7)	48 (4.3)	57 (4.1)	34 (3.8)	35 (4.2)	58 (4.1)	65 (4.3)	55 (4.6)	22 (4.0)	23 (3.8)	55 (3.4)	
Quebec, Canada	66 (5.0)	69 (4.5)	79 (4.1)	55 (5.3)	50 (5.6)	70 (5.0)	68 (5.3)	35 (5.1)	49 (5.2)	42 (5.3)	48 (5.6)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 6.8 **Students Whose Teachers Feel “Very Well” Prepared to Teach the TIMSS Science Topics (Continued)**

TIMSS2007  
Science **8<sup>th</sup>**  
Grade

Country	Percentage of Students Whose Teachers Report Feeling Very Well Prepared to Teach the TIMSS Science Topics*					
	Earth Science (5 topics)					
	Earth's Structure and Physical Features	Earth's Processes, Cycles, and History	Environmental Concerns	Use and Conservation of Earth's Natural Resources	Earth in the Solar System and the Universe	
Algeria	48 (4.9)	r 45 (5.2)	r 46 (4.8)	r 53 (5.5)	r 34 (4.9)	
Armenia	41 (4.6)	36 (4.3)	40 (4.6)	34 (4.3)	44 (4.6)	
Australia	64 (2.9)	67 (3.3)	78 (3.1)	70 (2.9)	68 (2.9)	
Bahrain	60 (2.5)	58 (2.9)	72 (2.1)	73 (2.5)	79 (2.3)	
Bosnia and Herzegovina	89 (2.8)	91 (2.7)	84 (2.8)	81 (3.5)	91 (2.7)	
Botswana	29 (5.0)	52 (4.7)	83 (3.3)	86 (3.1)	50 (5.0)	
Bulgaria	86 (3.5)	76 (4.2)	83 (3.2)	80 (3.5)	87 (2.7)	
Chinese Taipei	39 (4.2)	39 (4.2)	57 (4.7)	52 (4.5)	36 (4.4)	
Colombia	57 (5.0)	59 (4.5)	90 (2.5)	88 (3.0)	57 (4.8)	
Cyprus	r 72 (1.4)	r 58 (2.0)	r 85 (1.0)	r 78 (1.3)	r 62 (1.8)	
Czech Republic	81 (3.1)	56 (4.0)	81 (3.3)	77 (3.6)	83 (2.9)	
Egypt	57 (3.7)	56 (4.3)	70 (4.1)	82 (3.1)	77 (3.3)	
El Salvador	48 (4.2)	44 (4.0)	70 (4.2)	69 (4.2)	50 (4.3)	
England	57 (2.7)	63 (2.5)	88 (1.5)	80 (1.8)	70 (2.5)	
Georgia	87 (3.4)	81 (4.4)	89 (3.0)	91 (3.3)	75 (4.6)	
Ghana	57 (4.8)	46 (4.5)	80 (3.2)	79 (4.0)	84 (2.8)	
Hong Kong SAR	15 (3.8)	19 (3.5)	58 (4.1)	49 (4.6)	25 (4.7)	
Hungary	91 (2.7)	88 (2.8)	75 (3.5)	77 (3.7)	67 (5.1)	
Indonesia	--	--	--	--	--	
Iran, Islamic Rep. of	74 (3.3)	62 (3.7)	79 (3.4)	81 (3.3)	60 (3.8)	
Israel	r 27 (3.6)	r 22 (3.0)	r 60 (4.1)	r 55 (4.2)	r 29 (3.4)	
Italy	56 (3.2)	42 (3.1)	61 (3.2)	57 (3.4)	56 (3.1)	
Japan	22 (3.6)	28 (3.6)	34 (4.2)	20 (3.5)	44 (4.3)	
Jordan	51 (4.0)	60 (4.3)	77 (3.3)	75 (3.6)	58 (4.2)	
Korea, Rep. of	66 (3.5)	52 (4.4)	56 (3.8)	33 (3.4)	50 (4.3)	
Kuwait	r 54 (4.8)	r 53 (4.8)	r 49 (4.6)	r 68 (4.2)	r 68 (4.5)	
Lebanon	--	--	--	--	--	
Lithuania	60 (4.0)	32 (3.8)	60 (3.8)	67 (3.5)	43 (4.9)	
Malaysia	28 (4.5)	28 (4.5)	70 (4.0)	71 (3.6)	38 (4.4)	
Malta	98 (0.3)	84 (0.3)	100 (0.0)	99 (0.1)	52 (0.4)	
Norway	57 (3.9)	57 (3.3)	82 (2.4)	78 (3.0)	69 (3.3)	
Oman	33 (4.0)	41 (4.1)	69 (3.8)	67 (4.0)	72 (3.6)	
Palestinian Nat'l Auth.	49 (4.6)	54 (4.5)	65 (4.2)	72 (4.1)	68 (4.3)	
Qatar	46 (0.2)	53 (0.2)	68 (0.2)	71 (0.1)	67 (0.2)	
Romania	82 (2.7)	72 (3.4)	79 (3.9)	76 (3.4)	88 (2.6)	
Russian Federation	--	--	--	--	--	
Saudi Arabia	55 (4.4)	41 (4.5)	54 (4.8)	54 (4.7)	67 (4.2)	
Scotland	r 32 (3.0)	r 42 (2.9)	r 75 (2.1)	r 71 (2.6)	r 49 (2.5)	
Serbia	94 (2.7)	90 (2.9)	77 (4.0)	84 (3.4)	93 (2.5)	
Singapore	7 (2.2)	5 (1.7)	43 (3.1)	29 (3.0)	15 (2.5)	
Slovenia	--	--	--	--	--	
Sweden	r 20 (2.9)	r 30 (3.2)	r 65 (2.8)	r 45 (3.1)	r 53 (3.0)	
Syrian Arab Republic	62 (4.5)	61 (5.2)	69 (4.7)	67 (5.0)	52 (5.6)	
Thailand	62 (3.8)	63 (4.1)	62 (3.7)	61 (4.0)	41 (4.5)	
Tunisia	74 (3.8)	73 (3.5)	51 (3.9)	59 (3.9)	34 (3.9)	
Turkey	38 (5.0)	48 (5.0)	76 (4.5)	73 (4.2)	64 (4.7)	
Ukraine	94 (1.6)	91 (2.4)	94 (1.9)	95 (1.7)	87 (3.0)	
United States	83 (2.4)	80 (2.4)	75 (2.6)	78 (2.6)	75 (3.1)	
‡ Morocco	r 82 (3.3)	r 54 (6.0)	r 56 (5.7)	r 54 (4.4)	r 42 (6.7)	
<b>International Avg.</b>	<b>57 (0.5)</b>	<b>55 (0.6)</b>	<b>70 (0.5)</b>	<b>68 (0.5)</b>	<b>59 (0.6)</b>	
<b>Benchmarking Participants</b>						
Basque Country, Spain	75 (4.1)	60 (4.2)	81 (3.4)	76 (3.5)	78 (3.8)	
British Columbia, Canada	r 67 (3.6)	r 66 (4.5)	r 66 (4.3)	r 61 (4.4)	r 59 (4.1)	
Dubai, UAE	s 44 (3.5)	s 59 (4.3)	s 75 (4.5)	s 83 (2.3)	s 58 (4.2)	
Massachusetts, US	80 (4.9)	76 (6.4)	75 (6.2)	71 (6.4)	81 (5.4)	
Minnesota, US	86 (5.4)	84 (5.8)	82 (6.2)	84 (5.5)	84 (5.9)	
Ontario, Canada	59 (4.7)	58 (4.8)	67 (4.2)	65 (3.9)	49 (4.5)	
Quebec, Canada	52 (5.1)	47 (4.8)	80 (4.2)	66 (5.5)	61 (5.0)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007







# Chapter 7



## *Classroom Characteristics and Instruction*

To place students' science achievement results in instructional contexts, this chapter begins by providing information about class size and the characteristics of students in science classes. The focus of the rest of the chapter is on the instructional activities used in teaching and learning science and how these activities are supported with technology use, homework, and assessment.

### **How Do the Characteristics of Science Classrooms Impact Instruction?**

Because having larger or smaller classes can impact instructional choices, TIMSS asked teachers about the size of their science classes. The class size data are shown in Exhibits 7.1 and 7.2. Exhibit 7.1 presents trends in average class sizes back to 1995, and across the distribution of different class sizes. Exhibit 7.2 presents the TIMSS 2007 distribution of students in different sizes of classes in relation to their science achievement.

As presented in Exhibit 7.1, in TIMSS 2007 across participating countries at the fourth grade, the average size of science classes was 26. This represented a decrease in class size in eight of the participating countries and an increase in two—Norway and the United States. Two of the benchmarking provinces, Ontario and Quebec, also had decreases. At the eighth grade, the average class size of 30 represented a decrease in class size in 18 countries. Also among the benchmarking participants, the Basque country in Spain and the Canadian province of Ontario had smaller average class sizes in TIMSS 2007 than in previous assessments. However, some countries averaged larger

science classes (usually a modest increase, but not always), including Ghana, Israel, Italy, Lithuania, Norway, Singapore, Sweden, the United States, and the province of Quebec.

The results in Exhibit 7.2 show that the majority of students are in medium-sized science classes. At the fourth grade, on average internationally, 23 percent of the students were in classes with fewer than 20 students, 58 percent were in classes of 20 to 32 students, and 19 percent were in classes with 33 or more students. Notable exceptions included Singapore with almost all students (95%) in large classes, Hong Kong SAR and Yemen with about three-fourths in large classes, and Chinese Taipei, Colombia, El Salvador, Japan, and Morocco with approximately half in large classes. In general, class sizes were larger at the eighth grade, 31 percent were in classes of 1 to 24 students, 58 percent in classes of 25 to 40 students, and 11 percent were in classes of 41 or more students. The largest percentages of students in large classes, from 41 to 47 percent, were in Egypt, Ghana, Hong Kong SAR, the Palestinian National Authority, and Thailand. The countries with more than half of their eighth-grade students in small classes were Bulgaria (71%), Cyprus (54%), Georgia (51%), Hungary (64%), Italy (73%), Malta (81%), Romania (75%), the Russian Federation (62%), Scotland (91%), Serbia (52%), Slovenia (82%), and Sweden (60%) as well as the Basque country in Spain (66%).

Because countries have a variety of policies, practices, and realities determining class sizes, the relationship between class size and achievement is extremely difficult to disentangle. For example, countries and schools cannot always control class size. Because of this, the ability to cap class sizes can indicate the availability of more resources in general. As another complicating factor, smaller classes can be used for advanced or practical classes such as computer laboratories on one hand, and for remedial learning or students with special needs on the other. Finally, TIMSS data repeatedly

show, contrary to what might be anticipated, that the high-achieving Asian countries have some of the largest class sizes. The complexity of this issue is evidenced in the TIMSS 2007 results showing a curvilinear relationship, on average, between class size and science achievement at both the eighth and fourth grades.

Science teachers were asked about the instructional impact of five characteristics of their students—differing academic abilities, a wide range in backgrounds, students with special needs, uninterested students, and disruptive students. Responses were given on a four-point scale; *not at all*, *a little*, *some*, and *a lot*. TIMSS used the teachers' responses to construct an Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors (SCFL). The results are presented in Exhibit 7.3. Students were placed in the high category, if, on average, teachers reported their classrooms were impacted only a little (if at all), and in the low category, if, on average, these factors impacted instruction at least somewhat. The remaining students fell in the medium category. The results show that at both grades average science achievement was related to the diversity of the students in the class and the instructional challenges involved. At the fourth and eighth grades, 53 and 37 percent of the students, respectively, were in classes where teachers reported the composition had little, if any impact on instruction, and these students had the highest achievement internationally. In general, at the eighth grade between 2003 and 2007, teachers in six countries and one benchmarking entity reported increases in the more challenging types of classes, whereas teachers in five countries reported decreases.

Exhibit 7.1 Class Size for Science Instruction with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Overall Average Class Size			1–19 Students			20–32 Students			
	2007	Difference from 2003	Difference from 1995	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1995	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1995	
Algeria	r	30 (0.7)	0 0	0 0	6 (1.8)	0 0	0 0	60 (4.4)	0 0	0 0
Armenia		27 (0.7)	--	0 0	19 (3.0)	--	0 0	60 (4.2)	--	0 0
Australia		24 (0.4)	-2 (0.6) ▼	-1 (0.6)	17 (2.8)	3 (4.1)	5 (3.8)	81 (2.9)	-2 (4.4)	-3 (4.1)
Austria		20 (0.3)	0 0	0 (0.6)	37 (2.9)	0 0	-4 (6.2)	63 (2.9)	0 0	4 (6.2)
Chinese Taipei		31 (0.3)	-1 (0.4)	0 0	4 (1.5)	3 (1.6)	0 0	43 (4.0)	-1 (5.5)	0 0
Colombia		32 (1.1)	0 0	0 0	19 (3.1)	0 0	0 0	24 (4.6)	0 0	0 0
Czech Republic		22 (0.4)	0 0	0 (0.7)	29 (3.9)	0 0	5 (5.5)	71 (3.9)	0 0	-4 (5.5)
Denmark	r	21 (0.3)	0 0	0 0	34 (4.1)	0 0	0 0	66 (4.1)	0 0	0 0
El Salvador		30 (0.7)	0 0	0 0	19 (2.8)	0 0	0 0	38 (4.0)	0 0	0 0
England	r	27 (0.5)	-1 (0.9)	-1 (0.7)	8 (2.2)	0 (3.6)	1 (3.2)	81 (2.9)	7 (5.6)	4 (5.1)
Georgia		23 (0.6)	0 0	0 0	38 (3.8)	0 0	0 0	49 (4.6)	0 0	0 0
Germany		22 (0.2)	0 0	0 0	21 (2.4)	0 0	0 0	78 (2.4)	0 0	0 0
Hong Kong SAR	r	35 (0.3)	1 (0.5)	-1 (0.6)	1 (0.5)	0 (0.8)	0 (0.5)	25 (3.3)	-9 (5.8)	4 (6.6)
Hungary		22 (0.4)	-2 (0.6) ▼	0 (0.7)	35 (3.7)	16 (4.9) ▲	3 (6.2)	65 (3.7)	-15 (4.9) ▼	-1 (6.1)
Iran, Islamic Rep. of	s	24 (0.5)	-3 (0.8) ▼	-7 (1.4) ▼	25 (2.8)	9 (3.8) ▲	11 (4.7) ▲	58 (3.8)	3 (5.8)	19 (6.9) ▲
Italy		20 (0.2)	0 (0.4)	--	44 (2.6)	-1 (4.3)	--	56 (2.6)	1 (4.3)	--
Japan		31 (0.3)	-1 (0.4)	-1 (0.6) ▼	5 (0.8)	1 (1.3)	4 (1.1) ▲	47 (2.9)	7 (4.2)	-3 (5.4)
Kazakhstan		22 (0.5)	0 0	0 0	30 (4.5)	0 0	0 0	68 (4.6)	0 0	0 0
Kuwait	s	27 (1.5)	0 0	--	11 (3.0)	0 0	--	79 (4.3)	0 0	--
Latvia		23 (0.9)	--	2 (1.3)	46 (2.7)	--	4 (6.3)	46 (2.9)	--	-10 (6.5)
Lithuania		20 (0.3)	-1 (0.5) ▼	0 0	37 (3.0)	8 (4.2)	0 0	63 (3.0)	-7 (4.2)	0 0
Morocco	r	29 (0.8)	--	0 0	17 (3.2)	--	0 0	40 (5.1)	--	0 0
Netherlands		22 (0.4)	-1 (0.6)	-1 (0.9)	27 (3.3)	3 (4.8)	0 (5.4)	71 (3.5)	-3 (5.1)	10 (5.6)
New Zealand	s	26 (0.4)	-1 (0.5) ▼	-2 (0.7) ▼	10 (2.1)	1 (2.5)	-1 (3.6)	85 (2.4)	4 (3.7)	32 (5.2) ▲
Norway		21 (0.5)	0 (0.6)	2 (0.8) ▲	42 (3.3)	4 (4.6)	-7 (6.5)	53 (3.6)	-7 (5.0)	2 (6.6)
Qatar	s	27 (0.0)	0 0	0 0	8 (0.1)	0 0	0 0	76 (0.2)	0 0	0 0
Russian Federation		21 (0.4)	0 (0.5)	0 0	33 (2.7)	0 (4.2)	0 0	67 (2.7)	2 (4.2)	0 0
Scotland	s	26 (0.6)	0 (0.8)	0 (0.8)	12 (2.8)	-5 (4.6)	-2 (3.6)	81 (3.4)	6 (5.5)	0 (4.6)
Singapore		38 (0.2)	0 (0.3)	-1 (0.3)	0 (0.0)	0 (0.1)	0 (0.0)	5 (1.2)	1 (1.8)	1 (1.6)
Slovak Republic		21 (0.3)	0 0	0 0	33 (2.7)	0 0	0 0	66 (2.8)	0 0	0 0
Slovenia		19 (0.3)	0 (0.5)	-3 (0.5) ▼	46 (2.9)	1 (5.0)	20 (5.3) ▲	53 (3.0)	-2 (5.0)	-21 (5.3) ▼
Sweden		22 (0.6)	0 0	0 0	33 (3.3)	0 0	0 0	61 (3.5)	0 0	0 0
Tunisia	r	25 (0.5)	-5 (0.7) ▼	0 0	17 (2.8)	12 (3.2) ▲	0 0	72 (3.9)	14 (5.9) ▲	0 0
Ukraine		23 (0.4)	0 0	0 0	30 (3.3)	0 0	0 0	65 (3.5)	0 0	0 0
United States	r	26 (0.7)	2 (0.8) ▲	1 (0.9)	22 (2.2)	-2 (3.5)	4 (3.9)	65 (2.7)	-7 (4.0)	-13 (4.3) ▼
Yemen	r	45 (1.4)	0 0	0 0	9 (2.0)	0 0	0 0	16 (3.4)	0 0	0 0
International Avg.		26 (0.1)			23 (0.5)			58 (0.6)		
<b>Benchmarking Participants</b>										
Alberta, Canada		22 (0.5)	0 0	0 (1.2)	23 (3.1)	0 0	1 (8.4)	73 (3.2)	0 0	-5 (8.4)
British Columbia, Canada	r	23 (0.5)	0 0	0 0	25 (3.4)	0 0	0 0	74 (3.5)	0 0	0 0
Dubai, UAE		--	0 0	0 0	--	0 0	0 0	--	0 0	0 0
Massachusetts, US	r	24 (1.0)	0 0	0 0	16 (5.3)	0 0	0 0	75 (6.2)	0 0	0 0
Minnesota, US	s	28 (2.2)	0 0	--	14 (4.5)	0 0	--	66 (7.8)	0 0	--
Ontario, Canada		24 (0.4)	-1 (0.6) ▼	-2 (0.7) ▼	16 (3.3)	2 (4.6)	-2 (5.2)	80 (3.7)	-3 (5.3)	1 (5.6)
Quebec, Canada	r	24 (0.4)	-1 (0.4) ▼	-1 (0.7) ▼	16 (2.8)	11 (3.2) ▲	7 (6.0)	84 (2.8)	-11 (3.2) ▼	-8 (6.0)

▲ 2007 significantly higher  
▼ 2007 significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s"

indicates data are available for at least 50 but less than 70% of the students.

A diamond (◊) indicates the country did not participate in the assessment.



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Exhibit 7.1 Class Size for Science Instruction with Trends (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	33 or More Students		
	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1995
Algeria	r 34 (4.6)	0 0	0 0
Armenia	22 (2.8)	--	0 0
Australia	2 (1.3)	-1 (2.1)	-2 (2.3)
Austria	0 (0.0)	0 0	0 (0.0)
Chinese Taipei	53 (3.6)	-1 (5.2)	0 0
Colombia	57 (4.4)	0 0	0 0
Czech Republic	0 (0.0)	0 0	-1 (0.1)
Denmark	r 0 (0.0)	0 0	0 0
El Salvador	43 (3.7)	0 0	0 0
England	r 11 (2.0)	-7 (4.7)	-5 (4.5)
Georgia	13 (2.4)	0 0	0 0
Germany	0 (0.0)	0 0	0 0
Hong Kong SAR	r 75 (3.4)	9 (5.8)	-4 (6.6)
Hungary	0 (0.0)	-1 (0.9)	-2 (1.1)
Iran, Islamic Rep. of	s 16 (2.9)	-12 (4.9) ▼	-29 (7.1) ▼
Italy	0 (0.0)	0 (0.0)	--
Japan	48 (2.9)	-8 (4.1)	-1 (5.5)
Kazakhstan	3 (1.2)	0 0	0 0
Kuwait	s 10 (3.3)	0 0	--
Latvia	8 (1.5)	--	6 (2.0) ▲
Lithuania	0 (0.0)	0 (0.3)	0 0
Morocco	r 43 (4.6)	--	0 0
Netherlands	2 (1.3)	0 (1.9)	-10 (3.5) ▼
New Zealand	s 5 (1.8)	-5 (3.2)	-31 (4.8) ▼
Norway	5 (1.9)	3 (2.3)	5 (1.9) ▲
Qatar	s 17 (0.2)	0 0	0 0
Russian Federation	0 (0.3)	-1 (0.9)	0 0
Scotland	s 7 (2.0)	-1 (3.3)	2 (3.1)
Singapore	95 (1.3)	-1 (1.8)	-2 (1.6)
Slovak Republic	1 (0.6)	0 0	0 0
Slovenia	1 (0.6)	1 (0.6)	1 (0.6)
Sweden	6 (1.9)	0 0	0 0
Tunisia	r 11 (2.8)	-26 (5.2) ▼	0 0
Ukraine	5 (1.4)	0 0	0 0
United States	r 14 (2.0)	9 (2.4) ▲	9 (2.7) ▲
Yemen	r 75 (3.8)	0 0	0 0
<b>International Avg.</b>	<b>19 (0.4)</b>		
<b>Benchmarking Participants</b>			
Alberta, Canada	4 (1.4)	0 0	4 (1.4) ▲
British Columbia, Canada	r 1 (0.8)	0 0	0 0
Dubai, UAE	--	0 0	0 0
Massachusetts, US	r 9 (4.2)	0 0	0 0
Minnesota, US	s 20 (7.1)	0 0	--
Ontario, Canada	4 (1.4)	1 (2.2)	0 (2.4)
Quebec, Canada	r 1 (0.3)	0 (0.3)	1 (0.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ 2007 significantly higher  
▼ 2007 significantly lower

Exhibit 7.1 Class Size for Science Instruction with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Overall Average Class Size				1–24 Students				
	2007	Difference from 2003	Difference from 1999	Difference from 1995	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1999	Difference in Percent from 1995	
Algeria	r	37 (0.6)	0 0	0 0	0 0	5 (1.5)	0 0	0 0	0 0
Armenia	s	25 (0.4)	-6 (0.9) ▼	0 0	0 0	38 (3.8)	9 (4.6) ▲	0 0	0 0
Australia	s	25 (0.4)	-1 (0.5) ▼	--	-2 (0.5) ▼	32 (3.1)	-2 (4.9)	--	7 (5.2)
Bahrain		31 (0.2)	-1 (0.2) ▼	0 0	0 0	7 (0.9)	2 (1.2)	0 0	0 0
Bosnia and Herzegovina		24 (0.4)	0 0	0 0	0 0	47 (3.4)	0 0	0 0	0 0
Botswana		37 (0.3)	0 (0.5)	0 0	0 0	1 (0.5)	-1 (1.1)	0 0	0 0
Bulgaria		20 (0.5)	--	--	0 0	71 (4.2)	--	--	--
Chinese Taipei		35 (0.4)	-1 (0.6) ▼	-4 (0.6) ▼	0 0	2 (1.4)	-1 (2.1)	2 (1.4)	0 0
Colombia	s	36 (0.9)	0 0	0 0	-9 (2.7) ▼	12 (2.4)	0 0	0 0	7 (3.8)
Cyprus	s	24 (0.1)	-1 (0.1) ▼	-5 (0.3) ▼	-7 (0.4) ▼	54 (2.1)	24 (2.5) ▲	46 (3.1) ▲	50 (3.0) ▲
Czech Republic	r	24 (0.3)	0 0	0 (0.5)	-1 (0.6) ▼	50 (4.2)	0 0	-4 (6.7)	14 (6.4) ▲
Egypt		39 (0.6)	0 (0.9)	0 0	0 0	4 (1.5)	2 (1.9)	0 0	0 0
El Salvador		30 (0.8)	0 0	0 0	0 0	35 (3.7)	0 0	0 0	0 0
England	s	26 (0.6)	0 (0.8)	--	--	32 (3.6)	-1 (5.9)	--	--
Georgia		24 (0.5)	0 0	0 0	0 0	51 (5.1)	0 0	0 0	0 0
Ghana	r	44 (1.9)	7 (2.2) ▲	0 0	0 0	14 (2.4)	-3 (3.7)	0 0	0 0
Hong Kong SAR		39 (0.3)	0 (0.4)	0 (0.5)	-1 (0.5)	3 (1.3)	3 (1.3) ▲	2 (1.4)	2 (1.3)
Hungary	r	23 (0.4)	-1 (0.5)	0 (0.6)	1 (0.6)	64 (3.4)	4 (5.3)	0 (5.2)	-6 (5.1)
Indonesia	r	36 (0.9)	-4 (1.0) ▼	-14 (2.3) ▼	0 0	9 (2.4)	6 (2.9)	8 (2.4) ▲	0 0
Iran, Islamic Rep. of	r	26 (0.5)	-3 (0.7) ▼	-7 (0.9) ▼	-11 (1.5) ▼	35 (3.2)	14 (4.3) ▲	25 (3.7) ▲	26 (4.4) ▲
Israel	r	33 (0.4)	0 (0.6)	6 (0.8) ▲	--	4 (1.2)	-6 (2.7) ▼	-28 (4.2) ▼	--
Italy		22 (0.2)	0 (0.3)	2 (0.4) ▲	--	73 (2.9)	-5 (4.3)	-14 (4.0) ▼	--
Japan		35 (0.3)	0 (0.4)	-1 (0.4) ▼	-2 (0.5) ▼	4 (1.6)	1 (1.9)	3 (1.6)	2 (1.7)
Jordan		35 (0.7)	1 (0.9)	0 (0.9)	0 0	14 (2.4)	0 (3.5)	5 (3.3)	0 0
Korea, Rep. of	s	37 (0.3)	1 (0.5)	-7 (0.9) ▼	-14 (1.4) ▼	2 (1.2)	1 (1.4)	2 (1.2)	-4 (2.1)
Kuwait	s	31 (0.8)	0 0	0 0	--	12 (3.1)	0 0	0 0	--
Lebanon		27 (0.7)	-1 (1.0)	0 0	0 0	41 (4.1)	5 (5.5)	0 0	0 0
Lithuania	r	25 (0.3)	0 (0.4)	2 (0.5) ▲	3 (0.6) ▲	36 (3.1)	-3 (4.1)	-19 (4.9) ▼	-47 (4.5) ▼
Malaysia		36 (0.4)	-1 (0.5)	-2 (0.6) ▼	0 0	1 (0.8)	0 (1.1)	1 (0.9)	0 0
Malta		20 (0.0)	0 0	0 0	0 0	81 (0.2)	0 0	0 0	0 0
Norway	s	25 (0.5)	0 (0.6)	0 0	2 (0.9) ▲	44 (4.1)	10 (5.6)	0 0	-1 (7.0)
Oman		31 (0.5)	0 0	0 0	0 0	11 (2.4)	0 0	0 0	0 0
Palestinian Nat'l Auth.		38 (0.5)	-1 (0.8)	0 0	0 0	7 (1.6)	0 (2.6)	0 0	0 0
Qatar	r	26 (0.0)	0 0	0 0	0 0	18 (0.1)	0 0	0 0	0 0
Romania		21 (0.3)	-3 (0.6) ▼	-3 (0.5) ▼	-6 (0.9) ▼	75 (3.0)	22 (5.3) ▲	27 (4.9) ▲	38 (5.6) ▲
Russian Federation		21 (0.3)	-2 (0.5) ▼	-3 (0.6) ▼	-4 (0.5) ▼	62 (2.8)	13 (4.6) ▲	23 (4.7) ▲	20 (4.6) ▲
Saudi Arabia	r	30 (1.1)	--	0 0	0 0	29 (4.5)	--	0 0	0 0
Scotland	s	20 (0.6)	0 (0.7)	0 0	1 (0.9)	91 (2.0)	-4 (2.5)	0 0	-9 (2.2) ▼
Serbia		24 (0.4)	-2 (0.6) ▼	0 0	0 0	52 (3.7)	13 (5.2) ▲	0 0	0 0
Singapore		38 (0.2)	0 (0.3)	1 (0.4) ▲	1 (0.4) ▲	1 (0.5)	-1 (0.8)	-3 (1.4) ▼	0 (1.0)
Slovenia	r	22 (0.3)	-1 (0.4) ▼	--	-3 (0.4) ▼	82 (2.5)	12 (4.5) ▲	--	39 (4.7) ▲
Sweden	r	24 (0.6)	3 (0.7) ▲	0 0	--	60 (3.9)	-14 (5.2) ▼	0 0	--
Syrian Arab Republic		32 (0.5)	0 0	0 0	0 0	21 (2.9)	0 0	0 0	0 0
Thailand		38 (0.6)	0 0	-7 (1.7) ▼	--	11 (2.3)	0 0	6 (2.9)	--
Tunisia		32 (0.4)	-2 (0.5) ▼	-2 (0.5) ▼	0 0	5 (1.6)	2 (2.0)	1 (2.3)	0 0
Turkey		33 (0.6)	0 0	--	0 0	18 (3.3)	0 0	--	0 0
Ukraine		25 (0.4)	0 0	0 0	0 0	36 (3.2)	0 0	0 0	0 0
United States	r	28 (0.9)	4 (1.0) ▲	-1 (1.3)	--	43 (3.0)	-7 (4.1)	1 (4.5)	--
‡ Morocco	r	34 (0.8)	--	--	--	7 (3.1)	--	--	--
International Avg.		30 (0.1)				31 (0.4)			
<b>Benchmarking Participants</b>									
Basque Country, Spain		22 (0.5)	-2 (0.6) ▼	0 0	0 0	66 (3.7)	16 (5.2) ▲	0 0	0 0
British Columbia, Canada	s	27 (0.8)	0 0	2 (1.1)	0 0	25 (4.0)	0 0	-15 (10.4)	0 0
Dubai, UAE	s	28 (0.5)	0 0	0 0	0 0	23 (1.7)	0 0	0 0	0 0
Massachusetts, US	r	29 (2.3)	0 0	1 (3.3)	0 0	50 (7.1)	0 0	-12 (9.1)	0 0
Minnesota, US	r	31 (1.7)	0 0	0 0	--	19 (6.5)	0 0	0 0	--
Ontario, Canada	s	26 (0.5)	0 (0.6)	-4 (2.3)	-4 (1.2) ▼	33 (4.0)	10 (5.5)	5 (6.3)	22 (5.8) ▲
Quebec, Canada	r	32 (0.9)	2 (1.0) ▲	3 (1.1) ▲	-1 (4.6)	12 (2.9)	-1 (4.1)	0 (5.4)	-12 (8.3)

▲ 2007 significantly higher

▼ 2007 significantly lower

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

Exhibit 7.1 Class Size for Science Instruction with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	25-40 Students				41 or More Students			
	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1999	Difference in Percent from 1995	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1999	Difference in Percent from 1995
Algeria	r 61 (3.6)	0 0	0 0	0 0	34 (3.4)	0 0	0 0	0 0
Armenia	s 61 (3.8)	13 (5.0) ▲	0 0	0 0	0 (0.0)	-22 (2.9) ▼	0 0	0 0
Australia	s 68 (3.1)	2 (4.9)	--	-7 (5.2)	0 (0.0)	0 (0.0)	--	0 (0.0)
Bahrain	92 (0.9)	0 (1.2)	0 0	0 0	0 (0.0)	-3 (0.1) ▼	0 0	0 0
Bosnia and Herzegovina	53 (3.4)	0 0	0 0	0 0	0 (0.2)	0 0	0 0	0 0
Botswana	76 (3.6)	5 (5.9)	0 0	0 0	23 (3.6)	-4 (5.8)	0 0	0 0
Bulgaria	29 (4.2)	--	--	--	0 (0.0)	--	--	--
Chinese Taipei	88 (3.0)	9 (4.6)	18 (4.7) ▲	0 0	10 (2.6)	-7 (4.1)	-20 (4.5) ▼	0 0
Colombia	s 64 (4.7)	0 0	0 0	24 (7.9) ▲	24 (4.3)	0 0	0 0	-31 (7.7) ▼
Cyprus	s 46 (2.1)	-24 (2.5) ▼	-46 (3.2) ▼	-50 (3.0) ▼	0 (0.1)	0 (0.1)	0 (0.1)	0 (0.1)
Czech Republic	r 50 (4.2)	0 0	4 (6.7)	-14 (6.4) ▼	0 (0.0)	0 0	0 (0.0)	0 (0.0)
Egypt	53 (3.7)	-13 (5.8) ▼	0 0	0 0	43 (3.7)	12 (5.7) ▲	0 0	0 0
El Salvador	50 (4.0)	0 0	0 0	0 0	16 (3.3)	0 0	0 0	0 0
England	s 65 (3.8)	0 (5.9)	--	--	3 (1.4)	1 (1.8)	--	--
Georgia	48 (5.2)	0 0	0 0	0 0	1 (0.6)	0 0	0 0	0 0
Ghana	r 43 (4.5)	-2 (6.3)	0 0	0 0	44 (4.7)	5 (6.9)	0 0	0 0
Hong Kong SAR	52 (4.4)	-4 (6.2)	-9 (5.5)	-5 (7.0)	45 (4.4)	1 (6.1)	7 (5.5)	3 (7.0)
Hungary	r 36 (3.3)	-5 (5.3)	0 (5.1)	6 (5.1)	1 (0.3)	1 (0.3)	0 (0.3)	1 (0.3)
Indonesia	r 63 (4.6)	16 (6.4) ▲	37 (6.2) ▲	0 0	28 (4.5)	-21 (6.3) ▼	-44 (6.2) ▼	0 0
Iran, Islamic Rep. of	r 64 (3.3)	-11 (4.7) ▼	-18 (4.2) ▼	-5 (6.4)	1 (1.1)	-2 (1.8)	-7 (2.5) ▼	-21 (5.6) ▼
Israel	r 93 (2.3)	5 (3.6)	25 (4.5) ▲	--	3 (1.9)	1 (2.4)	3 (1.9)	--
Italy	27 (2.9)	5 (4.3)	14 (4.0) ▲	--	0 (0.0)	0 (0.0)	0 (0.0)	--
Japan	91 (2.2)	-6 (2.6) ▼	-4 (3.1)	0 (3.8)	5 (1.6)	4 (1.9) ▲	1 (2.6)	-3 (3.5)
Jordan	56 (4.2)	-2 (6.1)	-5 (5.7)	0 0	30 (3.9)	1 (5.4)	1 (5.4)	0 0
Korea, Rep. of	s 76 (2.8)	1 (4.5)	36 (4.2) ▲	71 (3.5) ▲	21 (2.5)	-2 (4.3)	-37 (4.0) ▼	-67 (3.6) ▼
Kuwait	s 86 (3.2)	0 0	0 0	--	2 (1.1)	0 0	0 0	--
Lebanon	53 (4.0)	-5 (5.7)	0 0	0 0	6 (1.8)	0 (3.2)	0 0	0 0
Lithuania	r 64 (3.1)	2 (4.1)	18 (5.0) ▲	48 (4.4) ▲	1 (0.5)	1 (0.5)	1 (0.5)	-1 (1.1)
Malaysia	79 (3.4)	3 (4.8)	12 (5.3) ▲	0 0	20 (3.3)	-2 (4.7)	-13 (5.2) ▼	0 0
Malta	19 (0.2)	0 0	0 0	0 0	0 (0.0)	0 0	0 0	0 0
Norway	s 54 (4.2)	-12 (5.6) ▼	0 0	-2 (7.1)	2 (1.2)	2 (1.4)	0 0	2 (1.2)
Oman	89 (2.4)	0 0	0 0	0 0	0 (0.0)	0 0	0 0	0 0
Palestinian Nat'l Auth.	52 (4.0)	7 (5.6)	0 0	0 0	41 (3.7)	-8 (5.1)	0 0	0 0
Qatar	r 80 (0.2)	0 0	0 0	0 0	2 (0.1)	0 0	0 0	0 0
Romania	25 (3.1)	-22 (5.3) ▼	-27 (4.9) ▼	-36 (5.5) ▼	0 (0.2)	-1 (0.8)	0 (0.2)	-2 (1.3)
Russian Federation	38 (2.8)	-13 (4.6) ▼	-23 (4.7) ▼	-20 (4.6) ▼	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Saudi Arabia	r 62 (4.6)	--	0 0	0 0	8 (2.5)	--	0 0	0 0
Scotland	s 7 (1.7)	1 (2.3)	0 0	7 (1.7) ▲	3 (1.1)	2 (1.2)	0 0	2 (1.1)
Serbia	48 (3.7)	-13 (5.1) ▼	0 0	0 0	0 (0.2)	0 (0.5)	0 0	0 0
Singapore	79 (2.2)	8 (3.4) ▲	3 (4.6)	0 (4.6)	20 (2.2)	-7 (3.3) ▼	0 (4.5)	1 (4.4)
Slovenia	r 17 (2.5)	-12 (4.5) ▼	--	-39 (4.7) ▼	1 (0.4)	1 (0.4)	--	1 (0.4)
Sweden	r 37 (3.7)	12 (5.0) ▲	0 0	--	3 (1.4)	1 (1.6)	0 0	--
Syrian Arab Republic	67 (3.9)	0 0	0 0	0 0	12 (2.7)	0 0	0 0	0 0
Thailand	46 (3.8)	0 0	6 (5.4)	--	43 (3.3)	0 0	-12 (5.0) ▼	--
Tunisia	94 (1.9)	-3 (2.4)	-1 (2.7)	0 0	1 (1.0)	1 (1.3)	1 (1.3)	0 0
Turkey	62 (3.9)	0 0	--	0 0	20 (2.6)	0 0	--	0 0
Ukraine	64 (3.1)	0 0	0 0	0 0	1 (0.8)	0 0	0 0	0 0
United States	r 46 (2.7)	-1 (3.9)	-7 (4.0)	--	11 (2.0)	8 (2.3) ▲	6 (2.4) ▲	--
‡ Morocco	r 75 (5.3)	--	--	--	18 (4.8)	--	--	--
International Avg.	58 (0.5)				11 (0.3)			

Benchmarking Participants

Basque Country, Spain	34 (3.7)	-16 (5.2) ▼	0 0	0 0	0 (0.0)	0 (0.0)	0 0	0 0
British Columbia, Canada	s 68 (4.7)	0 0	11 (11.0)	0 0	7 (2.7)	0 0	5 (3.1)	0 0
Dubai, UAE	s 71 (2.2)	0 0	0 0	0 0	6 (2.0)	0 0	0 0	0 0
Massachusetts, US	r 34 (7.0)	0 0	2 (8.8)	0 0	16 (6.5)	0 0	11 (7.1)	0 0
Minnesota, US	r 68 (7.8)	0 0	0 0	--	13 (5.2)	0 0	0 0	--
Ontario, Canada	s 65 (4.1)	-11 (5.6) ▼	0 (6.7)	-20 (6.1) ▼	2 (1.0)	2 (1.0)	-5 (2.8)	-3 (2.4)
Quebec, Canada	r 79 (4.1)	-8 (5.0)	-9 (6.2)	9 (9.2)	9 (3.1)	9 (3.1) ▲	9 (3.1) ▲	4 (5.1)

▲ 2007 significantly higher  
▼ 2007 significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Exhibit 7.2 Achievement and Class Size for Science Instruction

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	1–19 Students		20–32 Students		33 or More Students		
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Algeria	r	6 (1.8)	366 (25.4)	60 (4.4)	360 (7.4)	34 (4.6)	339 (14.6)
Armenia		19 (3.0)	510 (14.2)	60 (4.2)	485 (8.4)	22 (2.8)	470 (8.4)
Australia		17 (2.8)	524 (8.5)	81 (2.9)	531 (4.0)	2 (1.3)	~ ~
Austria		37 (2.9)	530 (3.3)	63 (2.9)	523 (3.5)	0 (0.0)	~ ~
Chinese Taipei		4 (1.5)	542 (9.1)	43 (4.0)	552 (3.8)	53 (3.6)	563 (2.6)
Colombia		19 (3.1)	395 (15.0)	24 (4.6)	382 (17.2)	57 (4.4)	411 (8.5)
Czech Republic		29 (3.9)	511 (6.1)	71 (3.9)	517 (3.3)	0 (0.0)	~ ~
Denmark	r	34 (4.1)	521 (5.0)	66 (4.1)	517 (3.6)	0 (0.0)	~ ~
El Salvador		19 (2.8)	357 (10.7)	38 (4.0)	378 (8.3)	43 (3.7)	414 (4.7)
England		8 (2.2)	554 (10.8)	81 (2.9)	538 (3.1)	11 (2.0)	553 (9.9)
Georgia		38 (3.8)	421 (8.5)	49 (4.6)	412 (6.8)	13 (2.4)	435 (6.6)
Germany		21 (2.4)	520 (5.6)	78 (2.4)	530 (2.5)	0 (0.0)	~ ~
Hong Kong SAR		1 (0.5)	~ ~	25 (3.3)	534 (6.4)	75 (3.4)	561 (3.8)
Hungary		35 (3.7)	510 (5.6)	65 (3.7)	549 (4.1)	0 (0.0)	~ ~
Iran, Islamic Rep. of		25 (2.8)	414 (7.9)	58 (3.8)	438 (6.3)	16 (2.9)	457 (12.5)
Italy		44 (2.6)	535 (4.7)	56 (2.6)	535 (4.2)	0 (0.0)	~ ~
Japan		5 (0.8)	531 (14.9)	47 (2.9)	549 (2.6)	48 (2.9)	548 (2.7)
Kazakhstan		30 (4.5)	533 (14.3)	68 (4.6)	532 (5.6)	3 (1.2)	563 (25.7)
Kuwait	s	11 (3.0)	355 (20.2)	79 (4.3)	349 (7.2)	10 (3.3)	356 (20.0)
Latvia		46 (2.7)	532 (3.5)	46 (2.9)	551 (3.3)	8 (1.5)	563 (5.0)
Lithuania		37 (3.0)	502 (4.1)	63 (3.0)	522 (2.6)	0 (0.0)	~ ~
Morocco	r	17 (3.2)	294 (19.0)	40 (5.1)	311 (15.5)	43 (4.6)	294 (8.9)
Netherlands		27 (3.3)	519 (4.9)	71 (3.5)	524 (3.3)	2 (1.3)	~ ~
New Zealand	s	10 (2.1)	504 (8.7)	85 (2.4)	512 (3.0)	5 (1.8)	536 (8.9)
Norway		42 (3.3)	475 (5.4)	53 (3.6)	478 (3.9)	5 (1.9)	470 (10.0)
Qatar	s	8 (0.1)	310 (6.1)	76 (0.2)	289 (2.8)	17 (0.2)	328 (6.0)
Russian Federation		33 (2.7)	536 (10.0)	67 (2.7)	552 (4.0)	0 (0.3)	~ ~
Scotland	r	12 (2.8)	516 (10.9)	81 (3.4)	497 (3.1)	7 (2.0)	520 (9.6)
Singapore		0 (0.0)	~ ~	5 (1.2)	495 (17.0)	95 (1.3)	592 (3.8)
Slovak Republic		33 (2.7)	525 (7.6)	66 (2.8)	527 (6.1)	1 (0.6)	~ ~
Slovenia		46 (2.9)	512 (3.0)	53 (3.0)	524 (2.9)	1 (0.6)	~ ~
Sweden		33 (3.3)	523 (4.5)	61 (3.5)	527 (3.5)	6 (1.9)	525 (12.9)
Tunisia		17 (2.8)	275 (14.4)	72 (3.9)	325 (7.3)	11 (2.8)	351 (26.0)
Ukraine		30 (3.3)	453 (5.5)	65 (3.5)	483 (3.5)	5 (1.4)	476 (13.2)
United States	r	22 (2.2)	537 (5.7)	65 (2.7)	540 (3.7)	14 (2.0)	539 (6.6)
Yemen	r	9 (2.0)	246 (21.4)	16 (3.4)	206 (18.6)	75 (3.8)	191 (8.7)
<b>International Avg.</b>		<b>23 (0.5)</b>	<b>467 (2.0)</b>	<b>58 (0.6)</b>	<b>474 (1.6)</b>	<b>19 (0.4)</b>	<b>461 (2.6)</b>
<b>Benchmarking Participants</b>							
Alberta, Canada		23 (3.1)	547 (5.1)	73 (3.2)	541 (4.9)	4 (1.4)	529 (18.8)
British Columbia, Canada	r	25 (3.4)	529 (5.1)	74 (3.5)	539 (3.8)	1 (0.8)	~ ~
Dubai, UAE		--	--	--	--	--	--
Massachusetts, US	r	16 (5.3)	562 (9.8)	75 (6.2)	578 (5.8)	9 (4.2)	548 (21.2)
Minnesota, US	s	14 (4.5)	536 (12.6)	66 (7.8)	560 (6.9)	20 (7.1)	552 (12.4)
Ontario, Canada		16 (3.3)	522 (13.6)	80 (3.7)	536 (3.7)	4 (1.4)	553 (12.2)
Quebec, Canada	r	16 (2.8)	513 (6.8)	84 (2.8)	520 (3.1)	1 (0.3)	~ ~

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



## Exhibit 7.2 Achievement and Class Size for Science Instruction (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	1–24 Students		25–40 Students		41 or More Students		
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Algeria	r	5 (1.5)	402 (7.9)	61 (3.6)	408 (2.4)	34 (3.4)	410 (2.7)
Armenia		38 (3.8)	497 (8.5)	61 (3.8)	482 (5.7)	0 (0.0)	~ ~
Australia		32 (3.1)	502 (6.0)	68 (3.1)	526 (5.1)	0 (0.0)	~ ~
Bahrain		7 (0.9)	486 (4.5)	92 (0.9)	464 (1.9)	0 (0.0)	~ ~
Bosnia and Herzegovina		47 (3.4)	463 (4.0)	53 (3.4)	468 (4.2)	0 (0.2)	~ ~
Botswana		1 (0.5)	~ ~	76 (3.6)	356 (4.0)	23 (3.6)	342 (8.0)
Bulgaria		71 (4.2)	461 (8.1)	29 (4.2)	490 (9.2)	0 (0.0)	~ ~
Chinese Taipei		2 (1.4)	~ ~	88 (3.0)	556 (3.7)	10 (2.6)	616 (6.6)
Colombia		12 (2.4)	393 (14.9)	64 (4.7)	422 (4.6)	24 (4.3)	415 (6.4)
Cyprus	r	54 (2.1)	453 (2.8)	46 (2.1)	447 (2.9)	0 (0.1)	~ ~
Czech Republic		50 (4.2)	531 (2.9)	50 (4.2)	546 (3.3)	0 (0.0)	~ ~
Egypt		4 (1.5)	420 (13.6)	53 (3.7)	411 (5.2)	43 (3.7)	404 (5.4)
El Salvador		35 (3.7)	368 (5.5)	50 (4.0)	394 (4.0)	16 (3.3)	402 (9.5)
England	r	32 (3.6)	515 (7.8)	65 (3.8)	555 (5.5)	3 (1.4)	543 (19.5)
Georgia		51 (5.1)	422 (5.9)	48 (5.2)	419 (7.7)	1 (0.6)	~ ~
Ghana		14 (2.4)	286 (12.0)	43 (4.5)	292 (9.5)	44 (4.7)	319 (9.7)
Hong Kong SAR		3 (1.3)	409 (7.9)	52 (4.4)	517 (7.5)	45 (4.4)	552 (7.0)
Hungary		64 (3.4)	529 (4.0)	36 (3.3)	557 (4.9)	1 (0.3)	~ ~
Indonesia		10 (2.2)	427 (14.4)	63 (4.1)	427 (4.2)	27 (3.9)	435 (7.8)
Iran, Islamic Rep. of		35 (3.2)	443 (4.7)	64 (3.3)	466 (5.1)	1 (1.1)	~ ~
Israel	r	4 (1.2)	436 (35.4)	93 (2.3)	466 (5.2)	3 (1.9)	497 (72.2)
Italy		73 (2.9)	491 (3.2)	27 (2.9)	507 (5.7)	0 (0.0)	~ ~
Japan		4 (1.6)	541 (24.3)	91 (2.2)	551 (2.2)	5 (1.6)	611 (22.1)
Jordan		14 (2.4)	486 (15.7)	56 (4.2)	481 (5.9)	30 (3.9)	483 (7.3)
Korea, Rep. of		2 (1.2)	~ ~	76 (2.8)	554 (2.1)	21 (2.5)	555 (4.2)
Kuwait	s	12 (3.1)	413 (18.0)	86 (3.2)	416 (4.0)	2 (1.1)	~ ~
Lebanon		41 (4.1)	387 (8.9)	53 (4.0)	434 (9.0)	6 (1.8)	391 (21.9)
Lithuania		36 (3.1)	496 (4.0)	64 (3.1)	531 (3.3)	1 (0.5)	~ ~
Malaysia		1 (0.8)	~ ~	79 (3.4)	468 (7.2)	20 (3.3)	479 (11.3)
Malta		81 (0.2)	443 (1.5)	19 (0.2)	490 (2.9)	0 (0.0)	~ ~
Norway		44 (4.1)	482 (3.8)	54 (4.2)	491 (2.6)	2 (1.2)	~ ~
Oman		11 (2.4)	408 (6.1)	89 (2.4)	425 (3.4)	0 (0.0)	~ ~
Palestinian Nat'l Auth.		7 (1.6)	424 (12.9)	52 (4.0)	404 (5.4)	41 (3.7)	400 (5.7)
Qatar	r	18 (0.1)	320 (3.4)	80 (0.2)	316 (1.8)	2 (0.1)	~ ~
Romania		75 (3.0)	453 (4.3)	25 (3.1)	488 (7.8)	0 (0.2)	~ ~
Russian Federation		62 (2.8)	519 (4.0)	38 (2.8)	547 (5.6)	0 (0.0)	~ ~
Saudi Arabia	r	29 (4.5)	400 (6.6)	62 (4.6)	400 (4.4)	8 (2.5)	401 (19.7)
Scotland	r	91 (2.0)	496 (3.7)	7 (1.7)	520 (12.2)	3 (1.1)	491 (11.9)
Serbia		52 (3.7)	465 (4.3)	48 (3.7)	477 (4.7)	0 (0.2)	~ ~
Singapore		1 (0.5)	~ ~	79 (2.2)	568 (5.2)	20 (2.2)	564 (8.9)
Slovenia		82 (2.5)	537 (2.6)	17 (2.5)	540 (3.2)	1 (0.4)	~ ~
Sweden	r	60 (3.9)	507 (3.7)	37 (3.7)	513 (3.4)	3 (1.4)	509 (10.6)
Syrian Arab Republic		21 (2.9)	463 (6.2)	67 (3.9)	448 (3.7)	12 (2.7)	448 (8.7)
Thailand		11 (2.3)	438 (10.3)	46 (3.8)	448 (5.2)	43 (3.3)	504 (8.1)
Tunisia		5 (1.6)	431 (6.7)	94 (1.9)	445 (2.2)	1 (1.0)	~ ~
Turkey		18 (3.3)	449 (10.4)	62 (3.9)	457 (5.1)	20 (2.6)	454 (8.8)
Ukraine		36 (3.2)	473 (6.7)	64 (3.1)	493 (4.0)	1 (0.8)	~ ~
United States	r	43 (3.0)	525 (4.8)	46 (2.7)	515 (5.1)	11 (2.0)	532 (7.3)
‡ Morocco	r	5 (2.1)	431 (18.6)	75 (4.0)	405 (4.5)	20 (3.7)	392 (5.4)
International Avg.		31 (0.4)	453 (1.6)	58 (0.5)	469 (0.9)	11 (0.3)	467 (3.5)
<b>Benchmarking Participants</b>							
Basque Country, Spain		66 (3.7)	490 (3.9)	34 (3.7)	511 (4.1)	0 (0.0)	~ ~
British Columbia, Canada	s	25 (4.0)	524 (4.6)	68 (4.7)	531 (4.3)	7 (2.7)	529 (16.7)
Dubai, UAE	s	23 (1.7)	494 (8.4)	71 (2.2)	493 (2.9)	6 (2.0)	469 (17.6)
Massachusetts, US		50 (7.1)	546 (9.3)	34 (7.0)	557 (12.9)	16 (6.5)	566 (15.1)
Minnesota, US	r	19 (6.5)	528 (15.0)	68 (7.8)	535 (6.0)	13 (5.2)	537 (16.3)
Ontario, Canada		33 (4.0)	527 (6.3)	65 (4.1)	527 (3.9)	2 (1.0)	~ ~
Quebec, Canada	r	12 (2.9)	496 (6.1)	79 (4.1)	517 (5.4)	9 (3.1)	517 (12.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 7.3 **Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors (SCFL)**

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	High SCFL (Few or No Limitations)		Medium SCFL (Some Limitations)		Low SCFL (A Lot of Limitations)	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Netherlands	82 (3.0)	528 (3.4)	11 (2.7)	507 (12.3)	7 (2.0)	496 (7.6)
Armenia	78 (3.4)	483 (6.4)	14 (2.6)	495 (25.1)	8 (2.3)	496 (19.7)
Austria	77 (2.4)	533 (2.4)	16 (2.0)	508 (5.4)	7 (1.5)	496 (13.8)
Germany	76 (2.7)	536 (2.5)	18 (2.3)	510 (5.4)	6 (1.4)	482 (12.8)
Scotland	r 76 (3.5)	507 (2.8)	19 (3.1)	487 (7.4)	5 (1.9)	466 (10.2)
Kazakhstan	74 (4.2)	533 (6.9)	21 (3.9)	531 (11.1)	4 (1.8)	533 (12.7)
Denmark	r 71 (4.2)	524 (3.4)	21 (3.8)	511 (5.4)	8 (2.5)	498 (11.2)
Japan	70 (3.7)	549 (2.4)	26 (3.3)	546 (3.2)	4 (1.7)	541 (5.6)
New Zealand	69 (2.7)	512 (2.9)	21 (2.4)	497 (7.4)	10 (1.6)	479 (8.4)
England	67 (3.8)	549 (3.8)	25 (3.5)	525 (5.5)	9 (2.0)	530 (9.6)
Norway	67 (3.7)	479 (4.1)	26 (3.4)	475 (5.2)	7 (1.8)	468 (7.7)
Czech Republic	63 (3.9)	517 (4.1)	26 (3.6)	508 (5.2)	11 (2.3)	512 (4.6)
Hungary	63 (4.0)	553 (3.5)	27 (3.3)	521 (6.8)	10 (2.9)	472 (14.3)
Sweden	62 (3.6)	533 (3.2)	26 (3.2)	511 (5.7)	11 (2.2)	512 (7.7)
Australia	62 (3.0)	536 (4.8)	24 (2.5)	517 (5.6)	13 (2.8)	510 (12.7)
United States	53 (2.9)	548 (3.4)	29 (2.7)	534 (5.1)	17 (1.9)	516 (6.7)
Slovenia	53 (3.3)	520 (3.0)	37 (3.2)	515 (3.3)	10 (1.6)	516 (6.0)
Russian Federation	53 (3.6)	553 (5.5)	33 (3.4)	541 (6.0)	14 (2.4)	534 (14.9)
Georgia	52 (5.4)	427 (6.2)	42 (5.0)	407 (6.1)	6 (2.5)	391 (16.1)
Lithuania	50 (4.0)	519 (2.9)	36 (3.9)	508 (3.9)	14 (2.7)	509 (5.5)
El Salvador	48 (4.6)	396 (6.5)	36 (4.7)	386 (9.2)	15 (3.3)	370 (9.9)
Ukraine	44 (4.2)	478 (4.0)	37 (3.9)	470 (6.1)	19 (3.2)	472 (6.8)
Italy	43 (3.1)	542 (5.2)	37 (3.1)	530 (4.5)	20 (2.4)	530 (6.3)
Colombia	41 (5.2)	411 (10.8)	35 (4.3)	386 (10.8)	24 (4.6)	407 (9.1)
Yemen	41 (4.5)	179 (12.1)	43 (4.6)	212 (11.0)	16 (3.6)	189 (14.9)
Qatar	r 39 (0.2)	295 (3.0)	48 (0.2)	280 (3.2)	14 (0.1)	303 (5.6)
Chinese Taipei	37 (4.2)	555 (3.8)	35 (4.1)	555 (3.9)	28 (3.9)	561 (3.9)
Tunisia	36 (3.6)	322 (10.5)	35 (3.5)	318 (10.9)	29 (3.9)	326 (12.2)
Latvia	36 (3.8)	547 (4.3)	43 (4.0)	538 (3.5)	21 (3.5)	547 (4.6)
Slovak Republic	35 (4.1)	539 (5.5)	34 (3.4)	527 (6.6)	30 (3.6)	509 (10.7)
Morocco	35 (4.1)	298 (12.6)	30 (4.0)	315 (11.9)	35 (4.4)	287 (14.9)
Hong Kong SAR	35 (4.2)	566 (5.3)	48 (4.5)	547 (4.8)	18 (3.4)	545 (10.1)
Algeria	34 (4.3)	358 (8.3)	38 (4.4)	348 (13.2)	28 (3.7)	361 (9.5)
Kuwait	s 33 (4.5)	362 (11.7)	42 (4.9)	334 (10.2)	25 (4.2)	342 (12.2)
Singapore	32 (2.7)	614 (7.4)	31 (2.6)	577 (7.5)	37 (2.8)	573 (6.0)
Iran, Islamic Rep. of	21 (3.3)	439 (11.7)	30 (4.0)	428 (8.8)	49 (3.8)	439 (6.2)
International Avg.	53 (0.6)	482 (1.5)	31 (0.6)	470 (1.6)	16 (0.5)	464 (2.0)
<b>Benchmarking Participants</b>						
Massachusetts, US	r 60 (5.1)	572 (5.9)	30 (5.0)	572 (6.4)	10 (4.6)	566 (18.7)
Minnesota, US	r 54 (5.7)	563 (5.4)	23 (6.9)	540 (24.7)	24 (6.4)	542 (11.1)
Ontario, Canada	53 (5.2)	544 (5.1)	30 (4.6)	530 (6.4)	18 (2.9)	512 (8.7)
Quebec, Canada	r 51 (4.3)	526 (3.7)	27 (3.8)	513 (4.5)	22 (3.5)	509 (6.2)
Alberta, Canada	51 (3.8)	550 (5.4)	23 (3.1)	539 (6.2)	26 (3.8)	529 (8.2)
British Columbia, Canada	r 35 (3.8)	534 (5.8)	43 (4.7)	541 (4.6)	23 (3.5)	530 (5.9)
Dubai, UAE	x x	x x	x x	x x	x x	x x

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on teachers' responses to five statements about student factors limiting science instruction: 1) Students with different academic abilities; 2) Students who come from a wide range of backgrounds; 3) Students with special needs; 4) Uninterested students; and 5) Disruptive students. Average is computed across the five statements based on a 4-point scale: 1. Not at all/Not applicable; 2. A little; 3. Some; and 4. A lot. High level indicates average is less than or equal to 2. Medium level indicates average is greater than 2 and less than 3. Low level indicates average is greater than or equal to 3.

(i) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

**Exhibit 7.3 Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction due to Student Factors (SCFL) (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	High SCFL (Few or No Limitations)			Medium SCFL (Some Limitations)			Low SCFL (A Lot of Limitations)		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Armenia	62 (2.0)	490 (7.6)	31 (3.8) ▲	31 (2.0)	488 (5.0)	-11 (3.3) ▼	8 (1.0)	474 (5.8)	-20 (2.5) ▼
England	60 (3.1)	563 (5.6)	-3 (5.3)	28 (2.9)	515 (6.1)	3 (3.9)	12 (1.9)	499 (10.0)	0 (3.9)
Japan	59 (4.0)	563 (2.4)	-4 (5.0)	36 (3.8)	542 (3.8)	0 (4.9)	6 (1.9)	535 (13.8)	4 (2.2) ▲
Hungary	57 (2.5)	549 (3.8)	-1 (3.6)	34 (2.3)	528 (4.3)	-2 (3.2)	9 (1.3)	513 (6.4)	2 (1.7)
Saudi Arabia	54 (4.0)	405 (3.7)	--	30 (3.7)	402 (7.1)	--	16 (3.4)	390 (9.5)	--
Ukraine	52 (3.1)	492 (4.7)	0 0	35 (3.0)	483 (4.6)	0 0	14 (1.9)	470 (5.3)	0 0
Slovenia	50 (2.8)	537 (2.6)	0 (4.2)	40 (2.4)	538 (3.0)	2 (3.8)	10 (1.5)	538 (3.9)	-2 (2.3)
Oman	47 (4.4)	433 (4.7)	0 0	37 (4.4)	411 (7.2)	0 0	15 (3.0)	416 (9.4)	0 0
Egypt	47 (4.2)	419 (4.7)	15 (5.8) ▲	42 (4.3)	403 (5.7)	-1 (6.0)	10 (2.8)	376 (14.0)	-14 (4.5) ▼
Russian Federation	46 (2.4)	541 (5.1)	9 (3.0) ▲	37 (1.8)	523 (4.5)	-4 (2.9)	17 (1.7)	512 (4.8)	-6 (3.2)
Georgia	46 (3.4)	426 (6.0)	0 0	42 (3.7)	418 (5.0)	0 0	11 (2.2)	417 (11.8)	0 0
Indonesia	46 (4.6)	440 (6.0)	9 (5.7)	34 (4.0)	431 (6.7)	-14 (5.3) ▼	20 (2.8)	431 (9.1)	5 (3.7)
Lebanon	45 (3.4)	423 (9.0)	9 (5.1)	38 (3.1)	410 (10.7)	-3 (4.7)	17 (2.5)	395 (10.2)	-6 (3.5)
Scotland	45 (3.0)	511 (4.4)	3 (4.0)	36 (2.4)	483 (4.9)	-4 (3.7)	20 (2.2)	484 (6.8)	0 (3.4)
Czech Republic	44 (2.4)	548 (2.7)	0 0	42 (2.1)	534 (2.7)	0 0	14 (1.4)	523 (2.7)	0 0
Norway	44 (3.5)	492 (3.4)	-5 (5.7)	45 (3.7)	482 (2.8)	4 (5.8)	11 (2.0)	482 (4.6)	1 (3.4)
Sweden	42 (2.9)	518 (3.8)	-16 (4.2) ▼	43 (2.9)	505 (3.7)	9 (4.1) ▲	15 (2.2)	496 (4.8)	7 (3.0) ▲
Colombia	41 (4.5)	429 (5.5)	0 0	43 (5.6)	412 (6.6)	0 0	16 (3.8)	398 (9.7)	0 0
United States	41 (2.8)	535 (4.6)	-2 (4.0)	34 (2.5)	516 (4.4)	-4 (3.9)	25 (2.7)	497 (6.2)	6 (3.5)
Qatar	41 (0.1)	321 (2.0)	0 0	41 (0.2)	320 (2.2)	0 0	18 (0.1)	291 (3.3)	0 0
Australia	40 (3.3)	532 (6.7)	-8 (5.0)	39 (4.1)	512 (7.2)	2 (5.3)	21 (3.4)	499 (6.6)	6 (4.1)
Lithuania	40 (2.4)	529 (3.3)	-32 (3.1) ▼	43 (2.2)	517 (2.9)	16 (2.9) ▲	18 (1.5)	502 (4.5)	16 (1.6) ▲
Malta	40 (0.3)	492 (1.6)	0 0	42 (0.3)	435 (1.9)	0 0	18 (0.2)	407 (3.0)	0 0
Tunisia	39 (3.9)	444 (3.5)	16 (5.3) ▲	39 (4.0)	446 (3.3)	-10 (5.5)	22 (3.4)	444 (4.1)	-6 (4.9)
Korea, Rep. of	38 (3.9)	557 (2.9)	2 (5.2)	51 (3.9)	550 (2.6)	-3 (4.9)	10 (2.4)	553 (5.5)	0 (3.3)
Syrian Arab Republic	37 (3.9)	454 (5.3)	0 0	40 (3.9)	448 (4.4)	0 0	23 (3.0)	451 (6.8)	0 0
Malaysia	36 (3.8)	501 (10.4)	-31 (5.6) ▼	44 (3.8)	466 (8.5)	15 (5.5) ▲	19 (3.4)	430 (9.6)	16 (3.7) ▲
Singapore	35 (1.9)	616 (4.6)	-1 (3.2)	39 (2.2)	558 (7.8)	-2 (3.2)	26 (2.1)	513 (9.0)	3 (3.1)
Bulgaria	35 (3.2)	492 (10.4)	--	44 (2.3)	461 (6.7)	--	21 (2.3)	446 (9.9)	--
Serbia	34 (2.6)	474 (4.2)	-10 (3.4) ▼	42 (2.1)	471 (3.8)	6 (3.0)	23 (2.2)	466 (4.5)	5 (3.0)
Bosnia and Herzegovina	32 (2.2)	471 (4.2)	0 0	43 (2.2)	463 (3.4)	0 0	25 (2.3)	464 (4.1)	0 0
Romania	32 (2.9)	467 (6.5)	-6 (3.9)	39 (2.9)	464 (4.2)	1 (3.8)	29 (2.3)	454 (5.9)	5 (3.3)
Jordan	31 (3.5)	492 (8.2)	13 (4.8) ▲	40 (4.0)	475 (6.7)	-14 (5.8) ▼	28 (3.7)	480 (7.8)	1 (5.3)
Bahrain	30 (2.8)	473 (4.0)	9 (3.9) ▲	48 (2.9)	461 (3.4)	2 (5.0)	22 (2.7)	471 (6.4)	-12 (4.7) ▼
Ghana	30 (3.6)	314 (11.2)	0 (5.6)	47 (3.6)	308 (8.6)	2 (5.7)	23 (3.3)	276 (11.7)	-2 (5.2)
Hong Kong SAR	29 (4.5)	557 (8.5)	3 (5.7)	41 (4.8)	537 (7.4)	-2 (6.5)	30 (4.0)	489 (10.6)	-1 (5.9)
Palestinian Nat'l Auth.	28 (4.0)	408 (8.7)	3 (5.3)	45 (4.4)	408 (5.8)	4 (6.3)	27 (3.3)	392 (8.1)	-7 (5.6)
El Salvador	28 (3.9)	392 (6.9)	0 0	43 (4.8)	385 (5.8)	0 0	29 (4.1)	386 (6.3)	0 0
Kuwait	25 (3.8)	412 (7.9)	0 0	49 (4.8)	417 (5.5)	0 0	26 (4.4)	416 (8.4)	0 0
Algeria	25 (3.2)	406 (2.6)	0 0	46 (3.8)	407 (2.6)	0 0	29 (3.1)	412 (3.1)	0 0
Israel	22 (3.0)	490 (9.8)	-7 (4.5)	35 (3.9)	474 (6.6)	-4 (5.1)	43 (4.1)	453 (9.0)	11 (5.0) ▲
Turkey	22 (3.6)	497 (8.9)	0 0	39 (4.2)	449 (6.3)	0 0	39 (3.9)	436 (6.7)	0 0
Cyprus	18 (0.8)	453 (2.8)	4 (1.2) ▲	47 (1.4)	450 (2.6)	6 (1.9) ▲	35 (1.4)	449 (2.7)	-10 (1.8) ▼
Chinese Taipei	18 (3.1)	575 (7.8)	-9 (5.2)	43 (3.8)	561 (5.6)	8 (5.4)	39 (4.0)	553 (5.6)	1 (6.0)
Thailand	18 (3.4)	495 (18.6)	0 0	54 (4.5)	477 (6.0)	0 0	29 (3.9)	444 (5.9)	0 0
Botswana	17 (3.5)	382 (9.5)	-3 (5.1)	44 (4.5)	352 (4.8)	-1 (6.6)	39 (4.7)	345 (5.4)	3 (6.3)
Iran, Islamic Rep. of	15 (2.7)	458 (7.3)	5 (3.7)	45 (3.6)	466 (5.8)	11 (5.3) ▲	39 (3.7)	451 (5.1)	-15 (5.2) ▼
Italy	14 (1.9)	504 (5.2)	-16 (4.3) ▼	41 (3.2)	499 (4.0)	-3 (5.0)	45 (3.3)	491 (4.4)	18 (4.5) ▲
‡ Morocco	22 (2.9)	427 (5.9)	--	44 (4.9)	402 (5.0)	--	34 (4.7)	394 (4.3)	--
International Avg.	37 (0.5)	477 (1.0)		41 (0.5)	462 (0.8)		22 (0.4)	451 (1.1)	
<b>Benchmarking Participants</b>									
Dubai, UAE	67 (3.8)	501 (4.8)	0 0	26 (2.8)	471 (8.5)	0 0	7 (2.5)	479 (7.9)	0 0
Ontario, Canada	54 (4.8)	536 (4.1)	7 (6.8)	29 (4.3)	520 (5.1)	-3 (6.2)	16 (3.1)	515 (9.7)	-5 (4.8)
Massachusetts, US	50 (6.1)	563 (8.3)	0 0	31 (4.3)	551 (8.0)	0 0	19 (4.5)	534 (17.7)	0 0
British Columbia, Canada	42 (4.6)	534 (4.8)	0 0	35 (4.3)	525 (4.8)	0 0	23 (3.0)	521 (6.3)	0 0
Basque Country, Spain	38 (4.7)	509 (4.3)	-1 (6.6)	47 (4.4)	494 (3.8)	6 (6.7)	15 (3.1)	481 (8.4)	-5 (5.2)
Quebec, Canada	32 (4.3)	541 (7.5)	-33 (6.1) ▼	43 (4.9)	497 (5.0)	13 (6.6)	25 (3.9)	498 (8.8)	20 (4.3) ▲
Minnesota, US	21 (5.5)	536 (12.4)	0 0	51 (8.5)	545 (6.3)	0 0	28 (6.1)	523 (7.5)	0 0

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on teachers' responses to five statements about student factors limiting science instruction: 1) Students with different academic abilities; 2) Students who come from a wide range of backgrounds; 3) Students with special needs; 4) Uninterested students; and 5) Disruptive students. Average is computed across the five statements based on a 4-point scale: 1. Not at all/Not applicable; 2. A little; 3. Some; and 4. A lot. High level indicates average is less than or equal to 2. Medium level indicates average is greater than 2 and less than 3. Low level indicates average is greater than or equal to 3.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

2007 percent significantly higher ▲ 2007 percent significantly lower ▼

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

### How Is Scientific Inquiry Emphasized in Science Lessons?

Because of the high level of interest in incorporating scientific inquiry into science class, Exhibits 7.4 and 7.5 present reports, by students and by their teachers, respectively, about the frequency with which they engage in a range of inquiry-related instructional activities. The science activities were similar at both grades but were tailored to the differences in ability level between the grades. Activities included making an observation and describing what was seen, giving an explanation about what was being studied, watching the teacher demonstrate an experiment or investigation, design or plan an experiment or investigation, conduct an experiment or investigation, work in small groups, and, at eighth grade only, relate what is being learned in science to daily life. Also at eighth grade, results are presented in one panel for the 29 countries and 7 benchmarking participants that teach eighth-grade science as a single, integrated subject and in four separate panels for the 20 countries that teach the sciences separately as biology, earth science, chemistry, and physics. Exhibit 7.4 shows the percentages of students reporting that the science inquiry activities occurred in at least half the lessons in science class, whereas Exhibit 7.5 shows the percentages of students whose teachers reported the activity occurred in at least half the lessons.

According to fourth-grade students, the most frequent science investigation activities were writing or giving an explanation for something being studied and watching the teacher do a science experiment, with, respectively, an average of 69 and 67 percent of students reporting that they devoted time to these activities at least once or twice a month. Working with other students in small groups (56%) and making observations and recording what was seen (52%) were next most frequent, followed by doing a science experiment or investigation (49%) and designing an experiment or investigation (47%).

At the eighth grade among general/integrated science countries, making observations, giving explanations, and watching the teacher demonstrate an experiment or investigation were equally frequent activities, with 65–67 percent of students, on average, reporting devoting time to them in

at least half the science lessons. Designing an experiment or investigation, conducting an experiment or investigation, working in small groups, and relating what is being learned in science to daily life also were about equally frequent (50–57%). By comparison, among countries teaching the sciences as separate subjects at the eighth grade, giving explanations about what is being studied was a more frequently reported activity in all four subjects (71–75%), and designing and conducting experiments or investigations and working in small groups were less frequent in biology and earth science than in integrated science.

At both grades, teachers generally reported engaging less frequently than the students in the scientific inquiry activities. At fourth grade, the most frequent teacher-reported activity was relating what students are learning in science to their daily lives—an activity not included in the student questionnaire. The next most frequent activity was asking for explanations about something students are studying. On average, 69 percent of students had teachers who ask them for explanations in at least half of their science lessons, a percentage that agreed with students' own reports. However, only about one-fourth to one-third of fourth-grade students had teachers who reported engaging in the other scientific inquiry activities in as many as half their science lessons.

Teacher reports at eighth grade resembled those at fourth grade, regardless of whether science was taught as a single subject or as separate subjects. Like at fourth grade, eighth-grade science teachers most frequently reported asking students to give explanations for something they are studying and to relate what they are studying to their daily lives. Approximately 71–85 percent of students were taught science or a science subject by teachers who reported doing these activities in about half their lessons. The other scientific inquiry activities were less frequently reported by eighth-grade science teachers, similar to the situation at fourth grade.

## Exhibit 7.4 Students' Reports on Doing Science Investigations

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percentage of Students Who Reported Doing the Activity Once or Twice a Month or More					
	Look at Something Like the Weather or a Plant Growing and Write Down What I See	Write or Give an Explanations For Something I Am Studying in Science	Watch the Teacher Do a Science Experiment	Design or Plan a Science Experiment or Investigation	Do a Science Experiment or Investigation	Work with Other Students in a Small Group on a Science Experiment or Investigation
Algeria	73 (1.6)	80 (1.0)	81 (1.1)	76 (1.3)	75 (1.4)	71 (1.3)
Armenia	52 (1.4)	r 69 (1.6)	r 63 (1.3)	r 37 (1.5)	r 33 (1.5)	r 36 (1.6)
Australia	34 (1.4)	57 (1.5)	45 (2.4)	36 (1.3)	41 (2.0)	52 (2.1)
Austria	34 (0.8)	58 (1.2)	62 (1.1)	32 (0.9)	33 (1.0)	37 (1.0)
Chinese Taipei	63 (1.0)	77 (0.9)	88 (0.7)	43 (1.2)	65 (1.1)	83 (1.0)
Colombia	75 (1.1)	81 (0.8)	71 (1.3)	74 (1.2)	76 (1.2)	71 (1.3)
Czech Republic	47 (1.3)	68 (1.0)	61 (1.8)	26 (1.3)	29 (1.2)	39 (1.6)
Denmark	30 (1.4)	55 (1.6)	48 (2.6)	29 (1.8)	27 (1.3)	60 (2.0)
El Salvador	69 (1.4)	76 (1.2)	61 (1.9)	50 (1.5)	51 (1.6)	65 (1.4)
England	45 (1.3)	77 (1.0)	73 (1.4)	71 (1.7)	76 (1.4)	80 (1.1)
Georgia	59 (1.5)	77 (1.2)	57 (1.3)	38 (1.5)	34 (1.3)	39 (1.7)
Germany	40 (1.0)	69 (0.8)	56 (1.1)	27 (0.9)	25 (0.9)	38 (1.2)
Hong Kong SAR	39 (1.0)	47 (1.0)	36 (1.5)	21 (0.8)	22 (0.8)	33 (1.4)
Hungary	55 (1.1)	67 (1.2)	73 (1.4)	31 (1.0)	24 (1.1)	29 (1.4)
Iran, Islamic Rep. of	63 (1.9)	82 (1.3)	89 (1.1)	67 (2.0)	73 (1.8)	73 (1.6)
Italy	52 (1.2)	72 (0.8)	69 (1.5)	45 (1.2)	47 (1.3)	41 (1.3)
Japan	79 (1.3)	68 (1.2)	68 (1.7)	58 (1.3)	63 (1.1)	88 (0.6)
Kazakhstan	68 (2.8)	85 (1.5)	68 (3.3)	53 (2.4)	52 (2.3)	55 (2.1)
Kuwait	71 (1.7)	83 (0.9)	84 (0.9)	77 (1.1)	77 (1.3)	81 (1.0)
Latvia	65 (1.1)	65 (1.3)	74 (1.4)	62 (1.5)	71 (1.5)	60 (1.4)
Lithuania	57 (1.2)	78 (1.1)	74 (1.1)	39 (1.1)	36 (1.3)	44 (1.2)
Morocco	63 (2.2)	80 (1.2)	78 (1.6)	66 (1.9)	65 (1.9)	67 (2.0)
Netherlands	12 (0.7)	25 (1.2)	43 (1.6)	11 (0.7)	13 (0.9)	27 (1.8)
New Zealand	39 (1.1)	54 (1.1)	47 (1.3)	39 (1.1)	40 (1.2)	53 (1.3)
Norway	33 (1.1)	55 (1.1)	61 (1.4)	38 (1.0)	45 (1.1)	49 (1.3)
Qatar	69 (0.5)	76 (0.5)	84 (0.4)	74 (0.6)	75 (0.5)	77 (0.6)
Russian Federation	58 (1.3)	86 (1.1)	57 (1.9)	40 (2.0)	36 (2.0)	33 (1.6)
Scotland	33 (1.4)	58 (1.6)	57 (2.2)	38 (1.7)	46 (1.9)	64 (1.7)
Singapore	34 (0.9)	63 (0.7)	81 (0.9)	31 (0.7)	46 (0.9)	63 (1.0)
Slovak Republic	44 (1.5)	72 (1.2)	82 (1.3)	38 (1.3)	45 (1.3)	54 (1.3)
Slovenia	61 (1.2)	86 (0.7)	86 (0.8)	70 (1.1)	71 (1.0)	78 (0.9)
Sweden	29 (1.2)	52 (1.4)	49 (2.1)	30 (1.3)	32 (1.8)	47 (2.0)
Tunisia	69 (1.9)	84 (1.1)	86 (1.1)	82 (1.6)	82 (1.3)	74 (1.6)
Ukraine	73 (1.2)	87 (0.7)	69 (1.4)	51 (1.5)	50 (1.5)	48 (1.7)
United States	39 (1.0)	67 (0.7)	63 (1.3)	43 (1.0)	56 (1.2)	62 (1.2)
Yemen	51 (3.1)	r 67 (2.3)	61 (3.0)	r 44 (2.7)	r 37 (2.6)	r 45 (2.7)
<b>International Avg.</b>	<b>52 (0.2)</b>	<b>69 (0.2)</b>	<b>67 (0.3)</b>	<b>47 (0.2)</b>	<b>49 (0.2)</b>	<b>56 (0.3)</b>
<b>Benchmarking Participants</b>						
Alberta, Canada	42 (1.7)	78 (0.9)	78 (1.2)	48 (1.5)	61 (1.5)	77 (1.1)
British Columbia, Canada	44 (1.5)	71 (1.2)	66 (1.5)	34 (1.4)	45 (1.5)	56 (1.5)
Dubai, UAE	r 50 (1.6)	r 76 (1.2)	r 77 (1.3)	r 60 (1.4)	r 64 (1.9)	r 64 (2.1)
Massachusetts, US	38 (1.9)	74 (1.6)	58 (2.1)	41 (2.0)	53 (2.7)	62 (3.3)
Minnesota, US	39 (2.4)	66 (1.3)	70 (2.5)	41 (2.6)	60 (3.0)	69 (2.6)
Ontario, Canada	35 (1.5)	75 (1.3)	62 (1.9)	40 (1.7)	50 (1.5)	65 (1.8)
Quebec, Canada	49 (1.5)	63 (1.2)	54 (2.2)	54 (1.5)	56 (1.6)	57 (1.8)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.

## Exhibit 7.4 Students' Reports on Doing Science Investigations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## General/Integrated Science

Country	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More						
	Make Observations and Describe What Was Seen	Give Explanations About What Is Being Studied	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Relate What Is Being Learned in Science to Our Daily Lives
Australia	69 (1.2)	59 (1.0)	60 (1.4)	52 (1.2)	59 (1.3)	68 (1.4)	39 (1.1)
Bahrain	68 (1.0)	65 (1.0)	77 (0.8)	56 (1.1)	50 (0.8)	51 (1.0)	64 (1.0)
Botswana	54 (1.0)	72 (1.0)	60 (1.0)	39 (0.8)	43 (0.9)	47 (1.1)	72 (0.9)
Chinese Taipei	35 (1.3)	42 (1.3)	41 (1.2)	27 (1.1)	29 (1.3)	28 (1.3)	38 (1.2)
Colombia	72 (1.5)	75 (1.5)	50 (1.9)	43 (1.6)	49 (1.6)	58 (1.4)	65 (1.7)
Egypt	80 (1.0)	78 (0.8)	78 (0.8)	67 (1.1)	63 (1.3)	60 (1.1)	75 (1.0)
El Salvador	68 (1.1)	63 (1.1)	67 (1.0)	55 (1.2)	47 (1.2)	57 (1.2)	59 (1.0)
England	67 (1.2)	61 (1.1)	61 (1.2)	51 (1.3)	60 (1.4)	70 (1.2)	41 (1.0)
Ghana	70 (1.5)	84 (0.8)	73 (1.4)	54 (1.5)	54 (1.2)	51 (1.4)	81 (0.8)
Hong Kong SAR	62 (1.4)	57 (1.1)	61 (1.2)	42 (1.2)	68 (1.3)	71 (1.4)	63 (1.2)
Iran, Islamic Rep. of	74 (1.2)	76 (1.0)	85 (0.9)	52 (1.2)	66 (1.2)	58 (1.4)	62 (1.3)
Israel	53 (1.5)	70 (1.2)	69 (1.6)	48 (1.7)	52 (1.9)	42 (1.8)	51 (1.3)
Italy	41 (1.1)	78 (1.0)	22 (1.1)	12 (0.9)	11 (0.9)	10 (0.9)	32 (0.8)
Japan	66 (1.6)	38 (1.2)	62 (1.4)	45 (1.5)	72 (1.7)	76 (1.7)	29 (0.9)
Jordan	83 (1.1)	82 (1.1)	77 (1.0)	64 (1.2)	62 (1.3)	62 (1.3)	76 (1.1)
Korea, Rep. of	29 (0.9)	26 (0.7)	46 (1.2)	21 (0.8)	28 (1.1)	29 (1.0)	35 (1.0)
Kuwait	78 (0.8)	70 (0.9)	89 (0.7)	72 (1.1)	67 (1.1)	71 (1.0)	66 (0.8)
Malaysia	69 (1.2)	48 (1.2)	78 (1.0)	46 (1.4)	63 (1.7)	66 (1.6)	59 (1.2)
Norway	39 (1.3)	44 (1.1)	37 (1.5)	31 (1.4)	42 (2.0)	43 (1.8)	32 (0.9)
Oman	75 (1.1)	73 (1.1)	83 (0.8)	63 (1.1)	58 (1.2)	67 (1.3)	76 (0.8)
Palestinian Nat'l Auth.	69 (1.6)	74 (1.0)	75 (1.5)	56 (1.7)	51 (1.7)	53 (1.7)	69 (1.1)
Qatar	79 (0.4)	67 (0.6)	83 (0.5)	66 (0.6)	65 (0.6)	67 (0.5)	66 (0.6)
Saudi Arabia	64 (1.1)	65 (1.1)	74 (1.2)	49 (1.2)	48 (1.1)	45 (1.5)	66 (1.0)
Scotland	68 (1.2)	66 (0.8)	72 (1.0)	61 (1.2)	75 (1.2)	80 (0.8)	49 (0.9)
Singapore	61 (0.9)	66 (0.9)	55 (1.0)	37 (0.8)	50 (1.0)	54 (1.0)	59 (0.9)
Thailand	75 (1.0)	63 (1.0)	78 (1.0)	61 (1.1)	64 (1.3)	74 (1.1)	64 (0.9)
Tunisia	84 (1.0)	87 (0.8)	93 (0.9)	69 (1.1)	66 (1.2)	56 (1.2)	63 (1.0)
Turkey	66 (1.4)	78 (1.1)	73 (1.3)	54 (1.4)	54 (1.4)	46 (1.5)	59 (1.3)
United States	68 (1.1)	68 (0.8)	60 (1.3)	51 (1.1)	57 (1.6)	67 (1.5)	51 (0.9)
International Avg.	65 (0.2)	65 (0.2)	67 (0.2)	50 (0.2)	54 (0.2)	56 (0.2)	57 (0.2)
<b>Benchmarking Participants</b>							
Basque Country, Spain	46 (1.6)	78 (1.2)	38 (1.8)	23 (1.5)	25 (1.6)	35 (2.2)	50 (1.8)
British Columbia, Canada	74 (1.1)	69 (1.1)	65 (1.3)	48 (1.4)	56 (1.5)	67 (1.4)	50 (1.0)
Dubai, UAE	r 70 (1.2)	r 74 (1.0)	r 70 (1.4)	r 49 (1.0)	r 48 (2.0)	r 53 (1.6)	r 65 (1.1)
Massachusetts, US	75 (1.7)	72 (1.4)	66 (2.0)	55 (1.9)	63 (2.2)	74 (2.2)	51 (2.4)
Minnesota, US	72 (2.3)	67 (1.8)	66 (2.5)	52 (2.8)	60 (2.9)	70 (2.6)	51 (2.1)
Ontario, Canada	71 (1.5)	67 (1.4)	56 (2.0)	45 (1.8)	49 (2.1)	56 (2.2)	49 (1.3)
Quebec, Canada	57 (1.4)	59 (1.2)	53 (1.8)	56 (1.5)	59 (1.7)	61 (1.7)	43 (1.4)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An

"s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



Exhibit 7.4 Students' Reports on Doing Science Investigations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Biology

Country	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More						
	Make Observations and Describe What Was Seen	Give Explanations About What Is Being Studied	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Relate What Is Being Learned in Science to Our Daily Lives
Algeria	65 (1.1)	84 (0.6)	82 (0.8)	53 (1.0)	51 (1.0)	49 (1.2)	59 (1.1)
Armenia	48 (1.4)	71 (1.2)	63 (1.4)	37 (1.6)	31 (1.1)	25 (1.2)	68 (1.1)
Bosnia and Herzegovina	57 (1.1)	81 (0.9)	41 (1.4)	24 (1.1)	20 (1.1)	22 (1.2)	73 (1.0)
Bulgaria	39 (1.5)	r 72 (1.6)	33 (1.6)	r 27 (1.6)	r 22 (1.3)	r 23 (1.2)	r 59 (1.7)
Cyprus	x x	x x	x x	x x	x x	x x	x x
Czech Republic	25 (0.9)	78 (0.8)	27 (1.2)	11 (0.7)	13 (0.9)	15 (0.8)	46 (1.2)
Georgia	46 (1.5)	71 (1.2)	63 (1.2)	24 (1.3)	21 (1.0)	28 (1.4)	56 (1.4)
Hungary	27 (1.2)	83 (1.0)	39 (1.7)	20 (1.2)	14 (1.0)	10 (1.0)	64 (1.5)
Indonesia	53 (1.5)	57 (1.3)	71 (1.2)	36 (1.6)	35 (1.4)	52 (1.3)	53 (1.2)
Lebanon	76 (1.3)	78 (1.1)	72 (1.4)	57 (1.5)	52 (1.4)	46 (1.6)	70 (1.4)
Lithuania	15 (0.9)	52 (1.7)	14 (1.0)	9 (0.8)	9 (0.8)	12 (0.8)	39 (1.2)
Malta	65 (1.1)	r 64 (1.2)	45 (0.9)	r 42 (1.0)	r 45 (1.1)	r 53 (1.2)	r 61 (1.1)
Romania	56 (1.6)	66 (1.1)	61 (1.8)	33 (1.8)	28 (1.6)	29 (1.6)	58 (1.3)
Russian Federation	34 (1.2)	84 (0.9)	27 (1.2)	20 (1.0)	15 (0.6)	19 (0.8)	61 (1.1)
Serbia	51 (1.3)	76 (1.1)	29 (1.2)	16 (0.9)	14 (0.8)	15 (1.0)	68 (1.3)
Slovenia	50 (1.4)	76 (1.0)	42 (1.3)	31 (1.3)	29 (1.3)	30 (1.5)	65 (1.0)
Sweden	49 (1.1)	46 (1.2)	45 (1.2)	34 (1.1)	39 (1.3)	43 (1.4)	35 (1.0)
Syrian Arab Republic	67 (0.9)	77 (0.8)	83 (0.9)	57 (1.2)	49 (1.1)	48 (1.2)	59 (1.2)
Ukraine	45 (1.4)	89 (0.8)	38 (1.3)	37 (1.2)	32 (1.3)	25 (1.2)	65 (1.3)
‡ Morocco	73 (1.1)	82 (1.2)	84 (1.1)	58 (1.3)	53 (1.5)	44 (1.5)	64 (1.1)
International Avg.	49 (0.3)	73 (0.3)	51 (0.3)	33 (0.3)	30 (0.3)	31 (0.3)	59 (0.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Earth Science

Country	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More						
	Make Observations and Describe What Was Seen	Give Explanations About What Is Being Studied	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Relate What Is Being Learned in Science to Our Daily Lives
Algeria	r 68 (1.7)	r 79 (1.0)	r 82 (1.1)	r 55 (1.6)	r 49 (1.7)	r 49 (1.3)	r 59 (1.3)
Armenia	44 (1.3)	65 (1.2)	53 (1.6)	37 (1.3)	30 (1.4)	27 (0.9)	59 (1.3)
Bosnia and Herzegovina	60 (1.3)	80 (0.9)	34 (1.1)	23 (1.0)	19 (0.9)	26 (1.2)	70 (1.1)
Bulgaria	37 (1.7)	r 71 (1.5)	r 26 (1.6)	r 25 (1.6)	r 21 (1.4)	r 26 (1.6)	r 54 (1.5)
Cyprus	67 (0.8)	77 (0.8)	40 (1.0)	27 (0.9)	24 (0.8)	24 (0.8)	58 (1.0)
Czech Republic	21 (0.7)	72 (1.0)	13 (0.5)	6 (0.4)	6 (0.3)	9 (0.6)	45 (1.1)
Georgia	48 (1.8)	r 66 (1.6)	r 56 (1.5)	r 23 (1.4)	r 21 (1.4)	r 29 (1.6)	r 53 (1.4)
Hungary	24 (1.2)	77 (1.3)	27 (1.3)	16 (0.9)	11 (0.7)	12 (0.9)	54 (1.3)
Indonesia	--	--	--	--	--	--	--
Lebanon	--	--	--	--	--	--	--
Lithuania	14 (0.7)	56 (1.6)	9 (0.7)	8 (0.7)	7 (0.5)	13 (0.7)	45 (1.1)
Malta	35 (0.7)	48 (0.8)	20 (0.7)	14 (0.5)	11 (0.5)	13 (0.6)	48 (0.7)
Romania	62 (1.6)	72 (1.0)	61 (1.9)	35 (1.3)	29 (1.4)	28 (1.4)	58 (1.4)
Russian Federation	32 (1.4)	84 (0.9)	21 (1.1)	17 (1.1)	13 (0.9)	22 (1.0)	59 (0.9)
Serbia	47 (1.5)	69 (1.2)	17 (0.9)	13 (0.8)	11 (0.7)	16 (1.0)	62 (1.2)
Slovenia	34 (1.1)	76 (0.9)	16 (0.9)	14 (0.8)	13 (0.8)	17 (1.2)	60 (1.1)
Sweden	42 (1.1)	47 (1.1)	26 (0.9)	20 (0.8)	18 (0.8)	29 (1.0)	44 (1.1)
Syrian Arab Republic	70 (1.0)	77 (1.0)	81 (1.2)	57 (1.1)	51 (1.3)	48 (1.1)	60 (1.1)
Ukraine	40 (1.3)	88 (0.8)	27 (1.2)	33 (1.3)	25 (1.1)	26 (1.3)	62 (1.2)
‡ Morocco	74 (1.1)	r 80 (0.9)	82 (1.0)	55 (1.5)	r 53 (1.6)	42 (1.8)	r 59 (1.4)
International Avg.	45 (0.3)	71 (0.3)	38 (0.3)	27 (0.3)	23 (0.3)	25 (0.3)	56 (0.3)

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

## Exhibit 7.4 Students' Reports on Doing Science Investigations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Chemistry

Country	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More						
	Make Observations and Describe What Was Seen	Give Explanations About What Is Being Studied	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Relate What Is Being Learned in Science to Our Daily Lives
Algeria	69 (1.0)	82 (0.8)	85 (0.7)	57 (1.2)	57 (1.1)	49 (1.3)	59 (1.3)
Armenia	55 (1.7)	r 71 (1.5)	63 (1.7)	46 (1.6)	40 (1.3)	r 29 (1.0)	r 56 (1.3)
Bosnia and Herzegovina	63 (1.1)	78 (0.9)	56 (1.6)	39 (1.5)	38 (1.6)	32 (1.4)	66 (1.0)
Bulgaria	54 (2.2)	r 72 (1.7)	r 52 (2.3)	r 42 (2.0)	r 41 (1.9)	r 35 (1.7)	r 48 (1.8)
Cyprus	79 (0.9)	81 (0.8)	79 (0.8)	65 (0.9)	66 (0.9)	49 (1.0)	55 (0.8)
Czech Republic	61 (1.5)	80 (0.8)	66 (1.6)	36 (1.2)	48 (1.4)	33 (1.4)	45 (1.2)
Georgia	51 (1.6)	69 (1.5)	63 (1.6)	28 (1.8)	23 (1.4)	32 (1.5)	48 (1.6)
Hungary	71 (1.7)	78 (1.2)	74 (1.8)	60 (1.5)	61 (1.7)	18 (1.1)	56 (1.5)
Indonesia	--	--	--	--	--	--	--
Lebanon	79 (1.1)	79 (1.1)	77 (1.0)	61 (1.2)	59 (1.4)	48 (1.3)	66 (1.2)
Lithuania	32 (1.4)	56 (1.4)	33 (1.7)	21 (1.2)	21 (1.2)	16 (0.9)	38 (1.0)
Malta	s 67 (1.3)	s 67 (1.5)	s 59 (1.3)	s 47 (1.3)	s 52 (1.5)	s 50 (1.4)	s 54 (1.6)
Romania	63 (1.4)	71 (1.2)	70 (1.7)	51 (1.6)	52 (1.7)	39 (1.8)	52 (1.5)
Russian Federation	64 (1.5)	89 (0.7)	67 (1.6)	48 (1.4)	38 (1.7)	34 (1.2)	54 (1.1)
Serbia	51 (1.3)	68 (1.1)	45 (1.7)	28 (1.2)	31 (1.3)	23 (1.2)	53 (1.2)
Slovenia	73 (1.0)	81 (0.9)	72 (1.1)	60 (1.2)	62 (1.1)	47 (1.6)	57 (1.2)
Sweden	57 (1.1)	51 (1.2)	59 (1.0)	50 (1.1)	59 (1.3)	54 (1.2)	34 (0.9)
Syrian Arab Republic	72 (1.1)	77 (0.9)	84 (0.8)	59 (1.1)	54 (1.2)	48 (1.1)	57 (1.3)
Ukraine	69 (1.4)	90 (0.7)	70 (1.4)	58 (1.5)	58 (1.6)	36 (1.4)	59 (1.2)
‡ Morocco	r 78 (1.8)	r 82 (1.2)	r 85 (1.0)	r 62 (2.1)	r 58 (1.8)	r 44 (2.0)	r 63 (1.9)
International Avg.	64 (0.3)	75 (0.3)	66 (0.3)	48 (0.3)	48 (0.3)	38 (0.3)	54 (0.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Physics

Country	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More						
	Make Observations and Describe What Was Seen	Give Explanations About What Is Being Studied	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Relate What Is Being Learned in Science to Our Daily Lives
Algeria	73 (0.9)	82 (0.7)	84 (0.7)	57 (0.8)	56 (1.0)	47 (1.1)	63 (1.0)
Armenia	60 (1.6)	r 73 (1.1)	64 (1.4)	r 48 (1.5)	r 45 (1.5)	r 34 (1.3)	r 63 (1.2)
Bosnia and Herzegovina	65 (1.1)	79 (1.0)	54 (1.3)	38 (1.2)	36 (1.2)	31 (1.1)	67 (1.0)
Bulgaria	49 (1.7)	r 74 (1.4)	r 48 (1.9)	r 39 (1.8)	r 38 (1.9)	r 34 (1.7)	r 53 (1.6)
Cyprus	82 (0.7)	81 (0.7)	78 (0.7)	67 (0.9)	66 (0.8)	49 (1.1)	65 (0.9)
Czech Republic	46 (1.4)	78 (1.1)	52 (1.5)	26 (1.1)	34 (1.1)	27 (1.3)	49 (1.2)
Georgia	53 (1.4)	71 (1.2)	65 (1.5)	28 (1.1)	25 (1.3)	34 (1.7)	54 (1.4)
Hungary	65 (1.8)	78 (1.3)	68 (1.9)	54 (1.7)	57 (1.9)	20 (1.6)	60 (1.4)
Indonesia	53 (1.4)	55 (1.2)	68 (1.2)	36 (1.4)	35 (1.4)	43 (1.6)	51 (1.3)
Lebanon	77 (1.2)	78 (1.2)	75 (1.2)	60 (1.1)	58 (1.5)	48 (1.3)	71 (1.2)
Lithuania	30 (1.3)	58 (1.2)	34 (1.6)	19 (0.8)	21 (1.1)	16 (0.7)	47 (1.3)
Malta	60 (0.7)	61 (0.7)	58 (0.7)	47 (0.7)	49 (0.7)	45 (0.6)	52 (0.8)
Romania	62 (1.4)	69 (1.3)	67 (1.9)	48 (1.7)	46 (1.6)	36 (1.6)	53 (1.3)
Russian Federation	59 (1.6)	88 (0.7)	63 (1.6)	43 (1.4)	40 (1.3)	36 (1.3)	58 (1.0)
Serbia	49 (1.3)	68 (1.3)	38 (1.7)	23 (1.3)	23 (1.2)	20 (1.1)	54 (1.2)
Slovenia	60 (1.3)	77 (1.0)	61 (1.3)	47 (1.3)	49 (1.3)	32 (1.3)	62 (1.1)
Sweden	52 (1.1)	48 (1.2)	53 (1.2)	44 (1.2)	52 (1.2)	49 (1.3)	38 (1.3)
Syrian Arab Republic	76 (1.0)	76 (0.8)	82 (0.9)	59 (1.2)	56 (1.1)	51 (1.2)	61 (1.0)
Ukraine	63 (1.3)	90 (0.6)	66 (1.3)	53 (1.4)	56 (1.3)	40 (1.2)	63 (1.1)
‡ Morocco	82 (1.2)	r 81 (1.3)	86 (1.0)	r 63 (1.7)	r 57 (1.8)	r 44 (1.7)	r 66 (1.4)
International Avg.	61 (0.3)	73 (0.2)	63 (0.3)	45 (0.3)	45 (0.3)	37 (0.3)	58 (0.3)

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).



## Exhibit 7.5 Teachers' Reports on Students Doing Science Investigations

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More						
	Observe Natural Phenomena such as the Weather or a Plant Growing and Describe What They See	Give Explanations About Something They Are Studying	Watch Me Do a Science Experiment	Design or Plan Experiments or Investigations	Do Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Relate What Students Are Learning in Science to Their Daily Lives
Algeria	20 (4.7)	88 (2.8)	43 (4.9)	17 (3.3)	24 (3.7)	28 (3.7)	75 (5.0)
Armenia	70 (3.4)	59 (4.0)	56 (3.9)	56 (4.5)	62 (3.7)	65 (4.0)	62 (3.7)
Australia	16 (2.4)	48 (3.1)	11 (2.7)	18 (2.9)	29 (3.3)	38 (3.5)	57 (3.5)
Austria	9 (1.9)	58 (3.1)	3 (1.0)	2 (0.9)	6 (1.6)	12 (2.3)	71 (2.9)
Chinese Taipei	21 (3.1)	59 (4.0)	37 (4.2)	44 (4.2)	64 (4.2)	69 (4.1)	65 (3.9)
Colombia	46 (5.0)	89 (3.3)	31 (4.6)	31 (4.7)	34 (4.8)	38 (3.8)	92 (2.4)
Czech Republic	21 (3.6)	82 (2.9)	9 (2.0)	3 (1.4)	7 (2.1)	7 (2.3)	89 (2.8)
Denmark	r 18 (3.1)	r 41 (4.0)	r 8 (2.4)	r 15 (3.3)	r 50 (4.6)	r 55 (4.7)	r 45 (4.6)
El Salvador	30 (3.9)	74 (3.9)	7 (2.4)	11 (2.7)	15 (3.2)	21 (3.6)	82 (3.2)
England	25 (3.6)	72 (3.5)	10 (2.5)	53 (4.0)	58 (3.9)	61 (4.0)	70 (3.5)
Georgia	32 (3.7)	86 (4.3)	17 (3.4)	11 (2.5)	8 (2.1)	19 (3.3)	74 (4.6)
Germany	12 (2.2)	64 (3.1)	3 (1.1)	7 (1.7)	14 (2.4)	19 (2.6)	70 (2.7)
Hong Kong SAR	7 (2.2)	65 (4.5)	6 (2.1)	4 (1.6)	6 (2.2)	11 (2.9)	65 (4.2)
Hungary	18 (3.0)	70 (4.0)	8 (2.0)	6 (1.9)	6 (1.7)	10 (2.3)	82 (3.5)
Iran, Islamic Rep. of	49 (4.2)	73 (3.3)	66 (3.6)	58 (4.3)	68 (3.8)	62 (3.9)	80 (2.6)
Italy	29 (3.1)	91 (1.9)	23 (2.5)	25 (2.7)	31 (3.1)	22 (2.7)	72 (3.0)
Japan	64 (3.3)	61 (4.2)	36 (4.0)	56 (3.8)	86 (2.6)	82 (3.0)	54 (4.2)
Kazakhstan	52 (5.3)	99 (0.7)	18 (3.9)	15 (3.6)	15 (4.1)	19 (4.2)	98 (0.9)
Kuwait	r 18 (3.0)	r 77 (3.9)	r 75 (3.9)	r 31 (4.0)	r 45 (4.5)	r 62 (4.2)	r 91 (2.3)
Latvia	43 (3.8)	75 (3.5)	34 (4.2)	47 (4.2)	56 (4.2)	42 (4.3)	96 (1.6)
Lithuania	25 (3.2)	44 (3.6)	9 (2.3)	6 (1.6)	4 (1.4)	16 (2.6)	83 (2.7)
Morocco	21 (3.6)	83 (2.9)	54 (3.8)	32 (4.4)	34 (4.0)	41 (4.3)	79 (3.8)
Netherlands	8 (2.5)	39 (4.0)	4 (1.9)	3 (1.5)	11 (3.2)	16 (3.5)	54 (4.7)
New Zealand	14 (1.9)	57 (3.0)	5 (1.4)	22 (2.6)	31 (2.8)	46 (3.1)	52 (3.0)
Norway	11 (2.6)	30 (3.7)	2 (0.9)	3 (1.1)	5 (1.6)	7 (1.8)	42 (3.9)
Qatar	r 27 (0.1)	r 79 (0.2)	r 64 (0.2)	r 41 (0.1)	46 (0.2)	r 68 (0.2)	r 91 (0.1)
Russian Federation	45 (4.0)	96 (0.7)	20 (2.7)	10 (1.7)	13 (2.1)	26 (3.2)	90 (2.2)
Scotland	r 18 (3.0)	r 62 (4.3)	r 16 (3.1)	r 24 (3.6)	r 46 (4.2)	r 54 (4.8)	r 66 (3.8)
Singapore	15 (2.0)	76 (2.2)	36 (2.4)	13 (1.6)	49 (3.0)	48 (2.5)	69 (2.4)
Slovak Republic	47 (3.9)	69 (3.5)	28 (3.0)	21 (3.2)	28 (3.5)	19 (2.7)	89 (2.4)
Slovenia	34 (2.9)	82 (2.5)	21 (2.4)	17 (2.3)	39 (3.2)	31 (2.8)	90 (1.9)
Sweden	12 (2.8)	36 (3.4)	5 (1.7)	12 (2.5)	24 (3.2)	29 (3.5)	50 (3.5)
Tunisia	36 (4.1)	72 (3.9)	58 (3.8)	48 (4.5)	58 (4.2)	59 (4.2)	74 (3.4)
Ukraine	82 (3.3)	96 (1.6)	26 (3.4)	14 (2.8)	14 (2.8)	26 (3.5)	90 (2.5)
United States	28 (2.6)	78 (2.3)	16 (2.2)	20 (2.5)	44 (2.9)	52 (2.8)	76 (2.2)
Yemen	13 (3.2)	64 (4.1)	37 (4.5)	24 (4.3)	16 (3.3)	23 (4.1)	77 (3.7)
International Avg.	29 (0.6)	69 (0.6)	25 (0.5)	23 (0.5)	32 (0.5)	36 (0.6)	74 (0.5)
<b>Benchmarking Participants</b>							
Alberta, Canada	27 (3.4)	68 (3.5)	18 (2.6)	29 (4.2)	53 (3.9)	58 (3.8)	75 (3.6)
British Columbia, Canada	r 28 (4.2)	r 63 (4.2)	r 17 (4.0)	r 13 (2.7)	r 28 (4.1)	r 33 (3.2)	r 61 (4.4)
Dubai, UAE	s 51 (4.8)	s 88 (2.2)	s 60 (4.5)	s 66 (4.2)	s 67 (4.5)	s 60 (4.9)	s 96 (1.1)
Massachusetts, US	30 (6.1)	71 (6.8)	r 17 (3.9)	36 (6.4)	56 (7.4)	63 (7.0)	74 (5.3)
Minnesota, US	36 (7.0)	74 (5.2)	14 (4.3)	23 (7.1)	65 (6.7)	74 (5.9)	73 (7.7)
Ontario, Canada	21 (4.3)	69 (4.6)	19 (3.9)	20 (4.1)	48 (5.4)	56 (4.5)	72 (3.6)
Quebec, Canada	16 (3.4)	59 (3.8)	16 (3.3)	28 (4.0)	45 (4.1)	47 (4.3)	57 (4.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

## Exhibit 7.5 Teachers' Reports on Students Doing Science Investigations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## General/Integrated Science

Country	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More						
	Observe Natural Phenomena and Describe What They See	Give Explanations About Something They Are Studying	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Relate What Students Are Learning in Science to Their Daily Lives
Australia	24 (3.6)	68 (2.7)	15 (2.7)	16 (2.4)	67 (3.3)	60 (3.5)	73 (3.1)
Bahrain	36 (2.4)	67 (3.1)	62 (2.5)	17 (2.4)	33 (3.0)	42 (3.1)	80 (2.9)
Botswana	23 (3.7)	75 (3.9)	39 (4.0)	22 (4.2)	36 (4.9)	48 (4.7)	88 (2.9)
Chinese Taipei	26 (3.9)	57 (3.9)	16 (3.0)	10 (2.4)	12 (2.7)	9 (2.5)	62 (4.1)
Colombia	54 (5.0)	87 (2.3)	22 (3.8)	32 (3.8)	34 (4.3)	45 (4.8)	92 (2.5)
Egypt	43 (4.2)	72 (3.3)	73 (4.0)	24 (3.4)	31 (3.7)	47 (4.0)	86 (2.4)
El Salvador	41 (4.3)	79 (3.4)	16 (3.0)	21 (3.5)	20 (3.7)	37 (3.9)	81 (3.6)
England	32 (3.1)	84 (2.1)	47 (3.5)	24 (3.2)	70 (2.9)	73 (2.8)	80 (2.5)
Ghana	48 (4.0)	89 (2.6)	57 (4.2)	44 (3.9)	40 (3.6)	33 (4.0)	89 (2.5)
Hong Kong SAR	21 (3.7)	66 (4.3)	19 (3.8)	13 (3.0)	70 (4.5)	67 (3.8)	63 (4.7)
Iran, Islamic Rep. of	41 (3.9)	73 (3.6)	64 (3.4)	52 (3.6)	62 (3.9)	45 (3.5)	79 (3.3)
Israel	26 (3.4)	83 (3.1)	50 (4.0)	30 (3.7)	31 (4.0)	25 (3.9)	82 (3.4)
Italy	48 (3.0)	89 (2.0)	8 (1.6)	8 (1.6)	9 (1.7)	9 (1.6)	69 (2.8)
Japan	42 (4.2)	30 (3.7)	28 (3.9)	18 (3.2)	68 (4.2)	69 (4.0)	47 (4.4)
Jordan	45 (4.2)	68 (3.8)	77 (3.5)	37 (3.7)	59 (4.2)	56 (3.8)	84 (3.4)
Korea, Rep. of	37 (3.7)	81 (3.1)	34 (3.6)	22 (3.3)	39 (4.2)	33 (3.5)	84 (3.3)
Kuwait	r 36 (4.2)	r 72 (4.7)	r 77 (4.3)	r 34 (4.4)	r 47 (4.3)	r 67 (4.6)	r 84 (3.2)
Malaysia	38 (3.7)	84 (3.0)	25 (3.1)	32 (4.0)	53 (4.1)	61 (4.1)	83 (3.0)
Norway	8 (2.1)	29 (3.2)	10 (1.9)	14 (2.3)	28 (3.4)	30 (3.6)	54 (3.5)
Oman	28 (3.7)	58 (4.1)	54 (4.5)	40 (4.3)	47 (3.7)	66 (4.0)	82 (3.6)
Palestinian Nat'l Auth.	51 (4.3)	65 (4.1)	76 (3.3)	43 (4.0)	47 (3.9)	42 (3.8)	87 (2.7)
Qatar	18 (0.1)	60 (0.2)	56 (0.2)	32 (0.1)	48 (0.2)	63 (0.2)	76 (0.1)
Saudi Arabia	46 (4.8)	63 (4.8)	58 (4.4)	19 (3.6)	34 (4.4)	40 (4.5)	86 (3.2)
Scotland	r 28 (2.8)	r 79 (2.6)	r 28 (2.7)	r 24 (2.6)	r 83 (2.1)	r 87 (1.8)	r 78 (2.3)
Singapore	21 (2.4)	73 (2.1)	20 (2.3)	6 (1.4)	40 (2.5)	34 (2.3)	76 (2.3)
<sup>a</sup> Sweden	19 (2.7)	65 (2.8)	28 (3.3)	21 (3.1)	66 (3.1)	67 (3.0)	81 (3.0)
Thailand	34 (4.0)	80 (3.6)	35 (3.8)	51 (3.9)	67 (3.9)	81 (2.8)	84 (3.1)
Tunisia	59 (4.0)	79 (3.8)	70 (4.0)	50 (4.0)	62 (3.7)	79 (3.2)	79 (3.7)
Turkey	51 (4.5)	79 (3.5)	54 (4.6)	36 (4.1)	50 (4.1)	30 (3.7)	89 (3.0)
United States	30 (2.9)	80 (2.1)	23 (2.2)	24 (2.9)	48 (3.2)	61 (3.3)	80 (2.3)
International Avg.	35 (0.7)	71 (0.6)	41 (0.6)	27 (0.6)	47 (0.7)	50 (0.6)	79 (0.6)
<b>Benchmarking Participants</b>							
Basque Country, Spain	38 (4.9)	88 (3.3)	5 (1.9)	5 (2.0)	4 (1.6)	12 (2.5)	86 (3.4)
British Columbia, Canada	r 24 (3.7)	r 75 (3.9)	r 30 (3.9)	r 7 (2.0)	r 41 (4.7)	r 41 (4.5)	r 72 (4.3)
Dubai, UAE	s 63 (2.9)	s 88 (3.8)	s 48 (5.7)	s 37 (3.7)	s 52 (4.3)	s 55 (3.6)	s 88 (3.1)
Massachusetts, US	38 (6.2)	76 (6.8)	19 (5.1)	19 (4.7)	47 (6.8)	59 (6.6)	75 (5.2)
Minnesota, US	37 (6.2)	78 (5.8)	13 (4.8)	8 (3.7)	51 (8.5)	67 (8.1)	69 (6.5)
Ontario, Canada	19 (3.8)	71 (4.5)	18 (3.4)	21 (3.9)	38 (4.2)	49 (4.6)	74 (4.3)
Quebec, Canada	28 (3.9)	60 (4.5)	22 (4.2)	35 (4.4)	56 (5.6)	45 (5.4)	66 (4.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

<sup>a</sup> Sweden: Summarizes reports from physics, biology, and chemistry teachers as well as integrated/general science teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 7.5 Teachers' Reports on Students Doing Science Investigations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Biology

Country	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More						
	Observe Natural Phenomena and Describe What They See	Give Explanations About Something They Are Studying	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Relate What Students Are Learning in Science to Their Daily Lives
<sup>b</sup> Algeria	37 (4.1)	90 (2.7)	59 (4.3)	22 (3.9)	36 (4.0)	71 (3.6)	81 (3.7)
Armenia	56 (4.6)	62 (4.2)	50 (4.3)	56 (4.4)	56 (4.4)	58 (4.6)	65 (4.1)
Bosnia and Herzegovina	30 (3.7)	75 (3.7)	33 (3.5)	12 (2.3)	9 (2.3)	22 (3.3)	85 (2.9)
Bulgaria	37 (5.0)	97 (1.8)	25 (4.2)	8 (2.8)	12 (3.5)	18 (3.3)	95 (2.3)
Cyprus	--	--	--	--	--	--	--
Czech Republic	34 (3.8)	74 (3.4)	12 (2.8)	2 (1.1)	11 (2.6)	5 (1.7)	89 (2.7)
Georgia	37 (5.5)	84 (3.9)	31 (4.8)	15 (4.6)	11 (3.1)	26 (4.4)	89 (3.4)
Hungary	12 (2.8)	78 (3.4)	11 (2.6)	4 (1.6)	7 (2.2)	8 (2.3)	92 (2.3)
<sup>c</sup> Indonesia	24 (3.0)	87 (2.8)	44 (3.8)	21 (4.0)	31 (4.4)	45 (3.9)	79 (3.6)
Lebanon	50 (5.1)	77 (4.5)	39 (4.6)	38 (4.4)	34 (4.4)	32 (4.1)	82 (4.2)
Lithuania	12 (2.3)	51 (3.7)	5 (1.2)	5 (1.9)	6 (1.9)	10 (1.9)	89 (2.5)
<sup>d</sup> Malta	26 (0.9)	74 (0.9)	5 (0.4)	7 (0.4)	28 (0.9)	25 (0.9)	84 (0.7)
Romania	58 (4.0)	84 (2.7)	29 (3.9)	18 (2.7)	14 (2.5)	33 (3.4)	91 (2.1)
Russian Federation	25 (3.0)	95 (1.4)	16 (2.5)	12 (2.2)	15 (2.9)	20 (3.2)	94 (1.7)
Serbia	23 (3.3)	81 (3.3)	17 (3.3)	5 (1.8)	4 (1.5)	14 (2.8)	84 (3.0)
Slovenia	49 (3.9)	50 (4.0)	11 (2.6)	8 (2.4)	8 (2.1)	10 (2.2)	84 (3.0)
<sup>f</sup> Syrian Arab Republic	31 (4.2)	80 (3.7)	69 (3.9)	14 (3.2)	25 (4.1)	20 (4.0)	85 (3.6)
Ukraine	23 (3.6)	95 (1.6)	19 (3.2)	16 (3.2)	15 (2.9)	22 (3.2)	97 (1.2)
<sup>e</sup> <sup>‡</sup> Morocco	49 (5.8)	81 (5.1)	54 (6.2)	25 (4.0)	<sup>r</sup> 33 (5.9)	39 (6.1)	74 (5.6)
International Avg.	34 (0.9)	79 (0.8)	29 (0.9)	16 (0.7)	20 (0.8)	26 (0.8)	85 (0.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Earth Science

Country	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More						
	Observe Natural Phenomena and Describe What They See	Give Explanations About Something They Are Studying	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Relate What Students Are Learning in Science to Their Daily Lives
<sup>b</sup> Algeria	--	--	--	--	--	--	--
Armenia	49 (4.7)	56 (4.7)	43 (4.5)	40 (4.5)	39 (4.2)	43 (4.0)	64 (3.9)
Bosnia and Herzegovina	14 (2.8)	71 (3.8)	29 (3.9)	10 (2.5)	5 (1.7)	23 (3.9)	73 (3.6)
Bulgaria	30 (4.5)	94 (2.2)	3 (1.8)	6 (2.3)	6 (2.7)	18 (3.8)	93 (2.3)
Cyprus	<sup>r</sup> 47 (1.9)	<sup>r</sup> 76 (1.4)	<sup>r</sup> 19 (1.0)	<sup>s</sup> 15 (0.6)	<sup>s</sup> 15 (1.0)	<sup>r</sup> 23 (1.8)	<sup>r</sup> 93 (0.7)
Czech Republic	10 (2.2)	79 (3.6)	<sup>r</sup> 4 (1.7)	<sup>r</sup> 1 (0.8)	<sup>r</sup> 1 (0.8)	<sup>r</sup> 5 (1.7)	<sup>r</sup> 85 (3.0)
Georgia	39 (5.3)	83 (4.8)	25 (4.3)	12 (3.4)	12 (3.4)	23 (4.0)	81 (5.3)
Hungary	15 (3.0)	77 (4.1)	8 (2.4)	4 (1.6)	3 (1.3)	6 (1.8)	89 (2.8)
<sup>c</sup> Indonesia	--	--	--	--	--	--	--
Lebanon	--	--	--	--	--	--	--
Lithuania	7 (2.1)	45 (3.6)	2 (1.1)	2 (0.8)	3 (1.3)	8 (2.1)	84 (3.0)
<sup>d</sup> Malta	23 (0.4)	89 (0.3)	7 (0.2)	8 (0.2)	8 (0.3)	10 (0.2)	85 (0.3)
Romania	50 (4.4)	83 (3.2)	25 (3.3)	14 (3.1)	14 (2.9)	32 (3.6)	83 (3.4)
Russian Federation	21 (2.8)	94 (1.9)	10 (2.2)	10 (2.2)	12 (2.7)	21 (2.6)	85 (3.1)
Serbia	14 (2.6)	79 (3.7)	26 (4.2)	6 (1.8)	6 (1.8)	11 (2.1)	80 (3.1)
Slovenia	--	--	--	--	--	--	--
<sup>f</sup> Syrian Arab Republic	--	--	--	--	--	--	--
Ukraine	28 (4.1)	96 (1.7)	9 (2.5)	21 (3.7)	16 (3.6)	28 (4.2)	92 (2.3)
<sup>e</sup> <sup>‡</sup> Morocco	--	--	--	--	--	--	--
International Avg.	27 (0.9)	79 (0.9)	16 (0.8)	11 (0.7)	11 (0.7)	19 (0.8)	84 (0.9)

<sup>b</sup> Algeria: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.<sup>c</sup> Indonesia: Data reported in biology and physics panels include data from integrated/general science teachers.<sup>d</sup> Malta: Data reported in earth science panel include data from environmental studies teachers.<sup>e</sup> Morocco: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.<sup>f</sup> Syrian Arab Republic: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.<sup>‡</sup> Did not satisfy guidelines for sample participation rates (see Appendix A).

Exhibit 7.5 Teachers' Reports on Students Doing Science Investigations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Chemistry

Country	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More						
	Observe Natural Phenomena and Describe What They See	Give Explanations About Something They Are Studying	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Relate What Students Are Learning in Science to Their Daily Lives
<sup>b</sup> Algeria	--	--	--	--	--	--	--
Armenia	47 (4.2)	55 (4.8)	48 (4.2)	45 (4.3)	45 (4.8)	53 (4.5)	52 (4.4)
Bosnia and Herzegovina	28 (3.7)	75 (3.4)	35 (3.9)	12 (1.9)	9 (2.2)	15 (2.9)	80 (3.2)
Bulgaria	34 (5.0)	99 (0.9)	46 (5.0)	12 (3.1)	15 (3.6)	20 (3.5)	93 (2.4)
Cyprus	r 39 (1.1)	r 77 (1.3)	r 60 (1.6)	r 22 (1.1)	r 34 (1.8)	r 44 (1.5)	r 81 (1.7)
Czech Republic	46 (4.6)	70 (3.5)	48 (4.2)	5 (1.7)	13 (2.9)	10 (2.4)	91 (2.5)
Georgia	37 (5.8)	82 (5.3)	38 (5.4)	11 (3.5)	12 (3.4)	21 (4.6)	77 (4.9)
Hungary	12 (3.0)	80 (3.3)	74 (3.8)	11 (2.8)	18 (3.0)	9 (2.4)	94 (1.6)
<sup>c</sup> Indonesia	--	--	--	--	--	--	--
Lebanon	50 (4.9)	75 (4.3)	51 (4.4)	44 (4.2)	49 (4.5)	29 (4.1)	85 (3.4)
Lithuania	9 (2.4)	51 (4.2)	29 (4.1)	8 (2.4)	11 (2.6)	10 (2.3)	74 (3.2)
<sup>d</sup> Malta	15 (0.8)	57 (1.1)	15 (0.8)	11 (0.7)	31 (1.2)	23 (0.9)	59 (1.2)
Romania	65 (4.0)	90 (2.5)	58 (4.3)	16 (2.7)	26 (4.0)	34 (4.2)	92 (2.1)
Russian Federation	18 (2.3)	95 (1.6)	72 (3.4)	20 (3.2)	27 (3.6)	26 (3.9)	80 (2.3)
Serbia	21 (3.6)	83 (3.3)	36 (4.5)	8 (3.0)	6 (2.8)	6 (2.0)	78 (3.6)
Slovenia	35 (3.8)	61 (4.1)	49 (3.7)	10 (2.7)	15 (3.3)	11 (2.8)	78 (3.5)
<sup>f</sup> Syrian Arab Republic	--	--	--	--	--	--	--
Ukraine	28 (3.5)	97 (1.3)	62 (4.0)	25 (3.5)	21 (3.5)	16 (3.0)	88 (2.9)
<sup>e</sup> <sup>‡</sup> Morocco	--	--	--	--	--	--	--
International Avg.	32 (1.0)	76 (0.8)	48 (1.0)	17 (0.7)	22 (0.8)	22 (0.8)	80 (0.8)

## Physics

Country	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More						
	Observe Natural Phenomena and Describe What They See	Give Explanations About Something They Are Studying	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Relate What Students Are Learning in Science to Their Daily Lives
<sup>b</sup> Algeria	r 41 (5.0)	r 87 (3.2)	r 77 (3.7)	r 33 (5.2)	r 56 (4.8)	r 71 (4.3)	r 77 (4.1)
Armenia	51 (5.6)	54 (5.1)	44 (4.9)	48 (4.9)	45 (4.9)	51 (5.6)	43 (5.0)
Bosnia and Herzegovina	29 (3.9)	84 (3.0)	37 (3.6)	9 (2.0)	9 (2.1)	13 (2.5)	84 (3.2)
Bulgaria	55 (5.0)	99 (0.8)	57 (5.3)	12 (2.4)	19 (3.7)	16 (3.6)	95 (2.2)
Cyprus	84 (1.4)	r 92 (1.3)	r 76 (1.7)	32 (2.0)	r 40 (2.1)	61 (2.0)	95 (0.9)
Czech Republic	56 (4.5)	83 (2.8)	63 (4.1)	14 (2.6)	20 (3.1)	20 (3.1)	90 (2.6)
Georgia	41 (4.8)	97 (1.4)	44 (4.9)	29 (4.8)	29 (5.4)	38 (4.3)	91 (3.0)
Hungary	18 (3.3)	85 (2.9)	76 (3.3)	9 (2.5)	23 (3.4)	15 (3.1)	95 (2.0)
<sup>c</sup> Indonesia	25 (3.2)	89 (2.6)	47 (4.0)	19 (3.0)	31 (3.9)	36 (4.1)	78 (3.7)
Lebanon	53 (4.7)	80 (4.2)	48 (4.7)	42 (4.1)	41 (4.4)	30 (4.0)	83 (4.1)
Lithuania	17 (2.7)	52 (4.4)	56 (4.2)	7 (2.0)	9 (2.4)	10 (2.3)	92 (2.3)
<sup>d</sup> Malta	40 (0.5)	69 (0.5)	38 (0.5)	16 (0.3)	39 (0.5)	32 (0.5)	82 (0.3)
Romania	73 (4.1)	90 (2.5)	65 (4.3)	14 (2.9)	29 (4.0)	33 (3.8)	92 (2.0)
Russian Federation	30 (3.8)	96 (1.3)	70 (3.3)	11 (2.1)	15 (2.8)	20 (3.3)	81 (3.1)
Serbia	29 (4.1)	77 (3.5)	42 (4.2)	6 (2.0)	9 (2.6)	6 (1.9)	88 (2.6)
Slovenia	63 (3.9)	58 (4.3)	58 (4.2)	14 (3.1)	16 (2.8)	14 (2.6)	86 (2.7)
<sup>f</sup> Syrian Arab Republic	35 (3.8)	79 (3.6)	69 (4.1)	19 (3.9)	30 (4.3)	19 (3.6)	81 (3.6)
Ukraine	43 (4.1)	97 (1.3)	72 (3.9)	22 (3.5)	27 (4.1)	22 (3.2)	87 (2.5)
<sup>e</sup> <sup>‡</sup> Morocco	r 41 (4.6)	r 75 (4.6)	r 80 (4.1)	r 28 (5.2)	r 40 (5.7)	r 27 (5.0)	r 88 (2.9)
International Avg.	43 (0.9)	81 (0.7)	59 (0.9)	20 (0.8)	28 (0.9)	28 (0.8)	85 (0.7)

- <sup>b</sup> Algeria: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.
- <sup>c</sup> Indonesia: Data reported in biology and physics panels include data from integrated/general science teachers.
- <sup>d</sup> Malta: Data reported in earth science panel include data from environmental studies teachers.

- <sup>e</sup> Morocco: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.
- <sup>f</sup> Syrian Arab Republic: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.
- <sup>‡</sup> Did not satisfy guidelines for sample participation rates (see Appendix A).

### How Are Different Learning Activities Emphasized in Science Lessons?

In addition to classroom activities related to scientific inquiry, TIMSS asked students and teachers about how often students were asked to engage in various other learning activities in science class, including reading science textbooks, memorizing science facts and procedures and using scientific formulas and laws to solve problems (eighth grade only). The percentages of students reporting that they did the activity in science lessons *at least once a week, once or twice a month, and rarely or never* are presented in Exhibit 7.6, whereas Exhibit 7.7 shows the percentages of students whose teachers reported asking them to do the activity in *every or almost every lesson, about half the lessons, and some lessons or never*. At the fourth grade, students reported about equal emphasis on reading in class and memorizing science facts, with 43 and 44 percent, respectively, reporting that they performed these activities at least once a week. At eighth grade, students in single-science countries reported about equal emphasis on reading textbooks, memorizing science facts and procedures, and using scientific formulas and laws to solve problems (32–37% of students, on average, reported doing these in every or almost every lesson). In the separate science countries, students reported more emphasis in chemistry and physics classes on using scientific formulas and laws to solve problems than in biology and earth science.

Fourth-grade teachers (Exhibit 7.7) reported relatively more emphasis on reading textbooks and less on memorizing facts and procedures, whereas at eighth grade (in single-science countries), teachers spread their emphasis equally across textbook reading, memorization, and applying formulas and laws to solve problems. In line with students' reports, teachers in countries teaching the sciences as separate subjects placed relatively more emphasis in chemistry and physics classes than in biology and earth science classes on using formulas and laws to solve science problems.



Exhibit 7.6 Students' Reports on Learning Activities in Science Lessons

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percentage of Students Who Reported					
	Reading Books About Science			Memorizing Science Facts		
	At Least Once a Week	Once or Twice a Month	Rarely or Never	At Least Once a Week	Once or Twice a Month	Rarely or Never
Australia	25 (1.1)	30 (1.1)	46 (1.2)	32 (1.3)	32 (1.1)	36 (1.4)
Austria	39 (1.0)	28 (0.9)	33 (0.9)	42 (1.1)	29 (0.9)	29 (0.9)
Chinese Taipei	40 (1.1)	32 (0.8)	28 (0.9)	53 (1.1)	28 (0.7)	19 (0.9)
Colombia	65 (1.2)	19 (0.8)	16 (0.8)	45 (1.2)	26 (0.7)	29 (1.2)
Czech Republic	40 (1.0)	23 (1.0)	37 (1.1)	58 (1.1)	22 (0.9)	19 (0.8)
Denmark	19 (1.6)	28 (1.3)	53 (1.9)	30 (1.4)	36 (1.1)	34 (1.5)
El Salvador	66 (1.2)	19 (0.9)	14 (0.8)	34 (1.2)	26 (0.9)	40 (1.6)
England	27 (1.2)	30 (1.2)	43 (1.6)	42 (1.3)	32 (1.0)	25 (1.0)
Georgia	68 (1.5)	16 (1.0)	16 (1.2)	69 (1.5)	18 (1.0)	14 (1.0)
Germany	31 (0.9)	31 (0.8)	39 (0.9)	19 (0.8)	29 (0.9)	52 (1.1)
Hong Kong SAR	29 (1.0)	33 (0.9)	37 (1.2)	42 (1.2)	31 (0.9)	26 (1.1)
Hungary	34 (1.0)	26 (1.0)	40 (1.1)	46 (1.3)	26 (0.9)	27 (1.1)
Iran, Islamic Rep. of	45 (1.5)	23 (1.0)	32 (1.9)	52 (1.9)	23 (1.6)	25 (1.6)
Italy	46 (1.1)	24 (0.8)	30 (1.1)	47 (1.3)	21 (0.9)	32 (1.3)
Japan	10 (0.6)	16 (0.8)	75 (1.1)	20 (0.9)	30 (1.1)	51 (1.5)
Kazakhstan	74 (2.2)	17 (1.4)	10 (1.3)	57 (2.6)	27 (1.9)	17 (2.0)
Kuwait	61 (1.2)	22 (1.0)	17 (0.9)	66 (1.4)	19 (1.0)	16 (0.8)
Latvia	46 (1.2)	26 (1.0)	28 (1.1)	44 (1.3)	31 (1.1)	25 (1.1)
Lithuania	45 (1.1)	28 (0.8)	27 (1.1)	56 (1.1)	28 (0.9)	16 (0.8)
Morocco	46 (1.8)	21 (1.2)	33 (2.2)	47 (2.0)	25 (1.2)	29 (1.9)
Netherlands	20 (1.1)	16 (1.0)	65 (1.4)	15 (0.8)	23 (1.3)	62 (1.5)
New Zealand	29 (0.9)	29 (0.7)	41 (0.9)	30 (0.9)	30 (0.7)	40 (0.9)
Norway	28 (1.2)	26 (0.9)	45 (1.3)	22 (1.0)	26 (0.9)	52 (1.2)
Qatar	53 (0.6)	24 (0.6)	22 (0.6)	54 (0.6)	22 (0.5)	23 (0.6)
Russian Federation	67 (1.7)	20 (1.3)	13 (1.0)	65 (2.2)	18 (1.3)	17 (2.1)
Scotland	25 (1.0)	28 (1.2)	46 (1.3)	31 (1.2)	30 (1.2)	39 (1.2)
Singapore	45 (0.9)	30 (0.7)	25 (0.9)	44 (0.9)	32 (0.7)	24 (0.8)
Slovak Republic	47 (1.3)	23 (1.0)	30 (1.4)	52 (1.6)	19 (0.8)	29 (1.4)
Slovenia	50 (1.2)	26 (0.7)	24 (1.1)	81 (0.8)	13 (0.7)	6 (0.4)
Sweden	18 (0.9)	29 (0.8)	53 (1.1)	15 (0.7)	31 (1.0)	54 (1.2)
Tunisia	57 (1.4)	21 (1.0)	22 (1.4)	61 (1.6)	21 (1.0)	18 (1.3)
Ukraine	56 (1.3)	35 (1.3)	8 (0.5)	39 (1.5)	31 (1.2)	29 (1.2)
United States	45 (0.8)	26 (0.6)	29 (0.6)	47 (0.7)	28 (0.6)	25 (0.6)
Yemen	r 30 (1.9)	r 20 (1.5)	r 50 (2.8)	r 34 (2.2)	r 25 (1.6)	r 41 (2.4)
International Avg.	43 (0.2)	25 (0.2)	33 (0.2)	44 (0.2)	26 (0.2)	30 (0.2)
<b>Benchmarking Participants</b>						
Alberta, Canada	32 (1.2)	32 (0.9)	36 (1.4)	45 (1.1)	34 (0.9)	20 (0.9)
British Columbia, Canada	38 (1.4)	33 (1.0)	29 (1.1)	40 (1.4)	33 (0.9)	27 (1.4)
Dubai, UAE	r 54 (1.2)	r 25 (0.9)	r 22 (1.0)	r 55 (1.4)	r 25 (1.2)	r 20 (1.0)
Massachusetts, US	35 (1.9)	34 (1.7)	31 (1.7)	41 (1.8)	33 (1.3)	26 (1.1)
Minnesota, US	29 (1.7)	29 (1.6)	41 (2.7)	41 (2.2)	30 (1.5)	29 (2.3)
Ontario, Canada	35 (1.4)	34 (1.3)	30 (1.3)	39 (1.8)	33 (1.3)	28 (1.5)
Quebec, Canada	28 (1.2)	28 (1.1)	43 (1.5)	19 (0.9)	28 (1.1)	53 (1.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.

Exhibit 7.6 Students' Reports on Learning Activities in Science Lessons (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

General/Integrated Science

Country	Percentage of Students Who Reported									
	Reading Science Textbooks and Other Resource Materials			Memorizing Science Facts and Principles			Using Scientific Formulas and Laws to Solve Problems			
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	
Australia	44 (2.0)	27 (1.1)	29 (1.8)	22 (1.0)	34 (1.0)	43 (1.3)	18 (1.1)	31 (1.0)	50 (1.1)	
Bahrain	31 (1.0)	22 (0.7)	47 (1.1)	49 (0.9)	25 (0.8)	26 (0.8)	36 (0.9)	25 (0.8)	39 (1.0)	
Botswana	56 (1.1)	18 (0.6)	25 (1.0)	24 (0.9)	26 (0.7)	50 (1.0)	37 (1.2)	20 (0.7)	44 (1.1)	
Chinese Taipei	24 (1.1)	23 (0.7)	52 (1.4)	22 (1.0)	30 (0.9)	48 (1.2)	24 (1.0)	31 (0.8)	45 (1.2)	
Colombia	36 (1.5)	24 (0.7)	40 (1.4)	35 (1.1)	29 (0.7)	36 (1.2)	37 (1.5)	23 (0.9)	40 (1.3)	
Egypt	40 (0.9)	25 (0.8)	35 (1.1)	56 (0.7)	25 (0.7)	19 (0.7)	49 (0.8)	27 (0.7)	24 (0.8)	
El Salvador	50 (1.5)	21 (0.8)	29 (1.4)	36 (1.1)	25 (0.8)	39 (1.1)	42 (1.2)	21 (0.7)	37 (1.3)	
England	28 (1.7)	31 (1.0)	41 (1.6)	19 (0.8)	32 (0.8)	49 (1.0)	16 (0.6)	35 (0.8)	49 (1.0)	
Ghana	57 (1.3)	21 (1.0)	22 (1.2)	38 (1.3)	31 (1.0)	31 (1.1)	46 (1.5)	22 (0.9)	31 (1.4)	
Hong Kong SAR	25 (1.1)	30 (1.0)	45 (1.1)	12 (0.8)	30 (0.9)	59 (1.3)	11 (0.7)	31 (0.9)	58 (1.2)	
Iran, Islamic Rep. of	36 (1.3)	30 (1.1)	35 (1.2)	36 (1.4)	29 (1.1)	35 (1.5)	43 (1.3)	31 (1.1)	26 (1.3)	
Israel	40 (1.3)	31 (1.0)	29 (1.0)	28 (1.0)	32 (0.9)	40 (1.1)	22 (1.0)	26 (1.1)	52 (1.4)	
Italy	52 (1.2)	23 (0.8)	25 (1.0)	29 (0.9)	26 (0.8)	44 (1.2)	26 (1.2)	21 (0.8)	53 (1.5)	
Japan	41 (1.3)	33 (0.8)	27 (1.3)	34 (0.9)	44 (0.8)	22 (0.9)	28 (0.9)	43 (0.7)	28 (1.0)	
Jordan	38 (1.3)	24 (0.9)	38 (1.2)	57 (1.5)	25 (0.8)	18 (1.1)	65 (1.3)	21 (0.8)	14 (0.8)	
Korea, Rep. of	26 (0.8)	31 (0.7)	43 (0.8)	17 (0.7)	33 (0.8)	50 (0.9)	20 (0.7)	34 (0.7)	46 (0.8)	
Kuwait	34 (0.9)	24 (0.8)	42 (1.1)	57 (0.9)	22 (0.7)	21 (0.7)	44 (0.9)	28 (0.9)	28 (0.8)	
Malaysia	35 (1.5)	35 (1.0)	31 (1.2)	24 (1.4)	35 (0.9)	41 (1.5)	24 (1.1)	36 (0.8)	40 (1.3)	
Norway	34 (1.0)	33 (0.8)	32 (1.1)	15 (0.6)	29 (0.7)	56 (0.9)	10 (0.5)	24 (0.7)	66 (0.9)	
Oman	30 (1.3)	30 (1.0)	40 (1.3)	48 (1.1)	30 (1.0)	22 (0.9)	39 (1.2)	28 (0.8)	33 (1.3)	
Palestinian Nat'l Auth.	28 (1.4)	24 (0.9)	48 (1.6)	46 (1.4)	27 (1.0)	27 (1.1)	42 (1.2)	30 (0.8)	28 (0.9)	
Qatar	29 (0.4)	28 (0.6)	44 (0.6)	44 (0.5)	28 (0.5)	28 (0.6)	39 (0.6)	31 (0.5)	30 (0.5)	
Saudi Arabia	26 (1.0)	22 (0.8)	53 (1.2)	45 (1.3)	22 (0.9)	32 (1.1)	33 (1.1)	25 (0.9)	42 (1.1)	
Scotland	40 (1.6)	31 (1.1)	30 (1.3)	25 (1.0)	34 (0.8)	41 (1.0)	22 (1.0)	32 (0.7)	46 (1.0)	
Singapore	41 (1.0)	34 (0.7)	25 (1.0)	36 (1.0)	36 (0.8)	27 (0.9)	32 (1.0)	37 (0.8)	31 (1.0)	
Thailand	23 (0.8)	40 (0.8)	37 (1.0)	25 (0.9)	42 (0.8)	34 (1.0)	19 (0.8)	37 (0.7)	44 (1.1)	
Tunisia	38 (1.2)	24 (0.8)	38 (1.1)	55 (1.1)	19 (0.8)	26 (0.9)	30 (1.2)	22 (0.8)	49 (1.2)	
Turkey	31 (1.2)	27 (0.8)	42 (1.4)	20 (1.0)	26 (0.8)	55 (1.3)	43 (1.2)	25 (0.9)	32 (1.2)	
United States	47 (1.3)	26 (0.7)	26 (1.1)	36 (1.0)	32 (0.7)	32 (0.9)	34 (1.0)	32 (0.8)	33 (1.0)	
International Avg.	37 (0.2)	27 (0.2)	36 (0.2)	34 (0.2)	30 (0.2)	36 (0.2)	32 (0.2)	29 (0.2)	39 (0.2)	
<b>Benchmarking Participants</b>										
Basque Country, Spain	60 (1.4)	19 (1.1)	21 (1.2)	30 (1.6)	31 (1.3)	39 (1.6)	40 (1.8)	29 (1.4)	32 (2.2)	
British Columbia, Canada	61 (1.5)	24 (0.8)	15 (1.2)	37 (1.1)	36 (0.8)	28 (0.9)	27 (1.1)	38 (0.8)	35 (1.2)	
Dubai, UAE	r 50 (1.3)	r 23 (0.9)	r 27 (0.9)	r 51 (1.3)	r 27 (1.0)	r 22 (1.1)	r 42 (1.0)	r 31 (1.2)	r 27 (1.0)	
Massachusetts, US	39 (2.9)	29 (1.7)	32 (3.2)	33 (1.6)	33 (1.1)	34 (1.7)	31 (1.5)	33 (1.3)	35 (1.9)	
Minnesota, US	45 (4.8)	28 (1.9)	28 (4.4)	28 (2.1)	33 (1.3)	39 (2.4)	22 (2.3)	35 (1.5)	43 (2.5)	
Ontario, Canada	54 (2.2)	28 (1.2)	18 (1.6)	33 (1.4)	36 (1.1)	32 (1.4)	27 (1.2)	37 (1.3)	35 (1.6)	
Quebec, Canada	29 (1.6)	35 (1.0)	36 (1.7)	14 (0.7)	28 (0.9)	58 (1.2)	12 (0.7)	29 (1.1)	59 (1.5)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by students.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.6 Students' Reports on Learning Activities in Science Lessons (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Biology

Country	Percentage of Students Who Reported								
	Reading Science Textbooks and Other Resource Materials			Memorizing Science Facts and Principles			Using Scientific Formulas and Laws to Solve Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
Algeria	25 (0.8)	22 (0.7)	53 (0.9)	40 (0.8)	24 (0.6)	36 (0.9)	24 (0.9)	21 (0.6)	54 (1.2)
Armenia	44 (1.1)	17 (0.8)	38 (1.2)	36 (1.2)	21 (0.9)	43 (1.1)	27 (1.3)	17 (0.9)	56 (1.4)
Bosnia and Herzegovina	52 (1.5)	20 (0.8)	29 (1.4)	49 (1.0)	24 (0.7)	27 (0.9)	25 (0.9)	16 (0.7)	59 (1.1)
Bulgaria	40 (1.5)	21 (1.2)	39 (1.3)	r 42 (1.9)	r 20 (0.9)	r 38 (1.7)	r 19 (1.2)	r 13 (1.0)	r 68 (1.6)
Cyprus	x x	x x	x x	x x	x x	x x	x x	x x	x x
Czech Republic	47 (2.2)	28 (1.0)	24 (1.8)	40 (1.2)	29 (0.7)	31 (1.2)	11 (0.7)	18 (0.8)	71 (1.1)
Georgia	43 (1.1)	20 (0.9)	37 (1.1)	52 (1.3)	19 (1.1)	30 (1.0)	24 (1.1)	16 (0.9)	60 (1.4)
Hungary	39 (1.6)	28 (1.0)	33 (1.5)	19 (1.2)	22 (0.8)	59 (1.4)	7 (0.6)	12 (0.6)	81 (1.0)
Indonesia	36 (1.2)	35 (0.8)	29 (1.1)	23 (0.9)	34 (0.9)	43 (1.2)	25 (1.4)	26 (0.8)	49 (1.5)
Lebanon	31 (1.2)	31 (0.9)	38 (1.3)	50 (1.6)	26 (1.3)	25 (1.3)	38 (1.6)	29 (1.1)	33 (1.8)
Lithuania	62 (1.2)	18 (0.9)	20 (0.9)	13 (0.8)	17 (0.8)	70 (1.1)	10 (0.6)	13 (0.8)	76 (1.1)
Malta	43 (1.0)	20 (1.0)	36 (1.0)	r 31 (1.0)	r 29 (1.1)	r 41 (1.1)	r 13 (0.8)	r 19 (1.0)	r 68 (1.2)
Romania	41 (1.5)	23 (1.1)	36 (1.3)	35 (1.3)	22 (0.8)	43 (1.5)	17 (1.2)	13 (0.8)	70 (1.4)
Russian Federation	57 (1.3)	23 (0.9)	20 (1.0)	42 (1.0)	26 (0.7)	32 (0.9)	13 (0.6)	13 (0.7)	74 (1.1)
Serbia	44 (1.6)	20 (0.8)	36 (1.3)	27 (1.3)	16 (0.7)	56 (1.5)	13 (0.8)	11 (0.7)	77 (1.1)
Slovenia	33 (1.4)	39 (1.2)	28 (1.4)	50 (0.9)	34 (0.9)	17 (0.8)	16 (0.7)	24 (0.9)	60 (1.2)
Sweden	37 (1.1)	33 (0.8)	30 (1.1)	14 (0.6)	27 (0.8)	59 (1.0)	9 (0.5)	22 (0.8)	69 (1.0)
Syrian Arab Republic	33 (1.0)	24 (0.7)	43 (1.2)	54 (1.2)	22 (0.9)	25 (0.9)	35 (1.0)	23 (0.9)	42 (1.3)
Ukraine	60 (1.1)	23 (0.7)	17 (0.9)	60 (1.4)	22 (0.9)	18 (1.1)	17 (0.8)	20 (0.9)	62 (1.3)
‡ Morocco	34 (1.3)	24 (1.3)	42 (1.4)	46 (1.6)	22 (1.2)	32 (1.2)	29 (1.4)	23 (0.7)	48 (1.4)
International Avg.	42 (0.3)	25 (0.2)	33 (0.3)	38 (0.3)	24 (0.2)	38 (0.3)	20 (0.2)	18 (0.2)	62 (0.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Earth Science

Country	Percentage of Students Who Reported								
	Reading Science Textbooks and Other Resource Materials			Memorizing Science Facts and Principles			Using Scientific Formulas and Laws to Solve Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
Algeria	r 29 (1.3)	r 26 (1.2)	r 45 (1.3)	r 41 (1.2)	r 25 (1.1)	r 34 (1.2)	r 28 (1.3)	r 25 (1.4)	r 47 (1.9)
Armenia	45 (1.2)	18 (0.7)	38 (1.0)	37 (1.0)	20 (0.8)	42 (1.3)	26 (1.3)	18 (1.0)	56 (1.6)
Bosnia and Herzegovina	56 (1.2)	17 (0.7)	27 (1.1)	49 (1.2)	20 (0.9)	30 (1.0)	22 (0.8)	12 (0.6)	66 (1.1)
Bulgaria	r 40 (1.7)	r 22 (1.1)	r 39 (1.6)	r 39 (1.9)	r 21 (0.9)	r 40 (1.7)	r 16 (1.0)	r 13 (1.0)	r 71 (1.5)
Cyprus	40 (0.9)	22 (0.6)	38 (1.0)	27 (0.8)	28 (0.7)	44 (1.0)	11 (0.5)	15 (0.6)	74 (0.8)
Czech Republic	43 (1.7)	26 (1.1)	31 (1.6)	35 (1.1)	27 (0.7)	38 (1.2)	10 (0.7)	14 (0.7)	76 (1.0)
Georgia	40 (1.5)	19 (1.0)	41 (1.9)	r 50 (1.8)	r 20 (1.0)	r 30 (1.7)	r 21 (1.4)	r 15 (1.1)	r 64 (2.1)
Hungary	40 (1.6)	26 (1.0)	35 (1.4)	17 (1.0)	23 (0.8)	59 (1.3)	8 (0.6)	14 (0.7)	78 (1.1)
Indonesia	--	--	--	--	--	--	--	--	--
Lebanon	--	--	--	--	--	--	--	--	--
Lithuania	65 (1.2)	17 (0.8)	18 (0.9)	21 (1.0)	19 (0.6)	61 (1.1)	9 (0.6)	11 (0.7)	80 (0.9)
Malta	54 (0.8)	19 (0.6)	27 (0.6)	11 (0.5)	18 (0.6)	71 (0.7)	5 (0.3)	9 (0.5)	86 (0.6)
Romania	43 (1.5)	21 (0.7)	36 (1.3)	39 (1.4)	20 (0.8)	41 (1.5)	16 (0.9)	13 (0.7)	71 (1.2)
Russian Federation	59 (1.0)	22 (0.8)	19 (0.9)	43 (1.1)	23 (0.8)	34 (1.1)	15 (0.8)	13 (0.7)	72 (1.3)
Serbia	43 (1.5)	19 (0.9)	38 (1.3)	25 (1.5)	15 (0.8)	60 (1.7)	10 (0.7)	9 (0.7)	80 (1.1)
Slovenia	33 (1.1)	36 (0.9)	31 (1.2)	50 (1.0)	33 (0.9)	17 (0.8)	8 (0.5)	13 (0.6)	79 (1.0)
Sweden	38 (1.3)	32 (0.7)	30 (1.1)	16 (0.8)	29 (0.7)	56 (1.0)	8 (0.6)	18 (0.9)	75 (1.0)
Syrian Arab Republic	39 (1.0)	24 (0.8)	38 (1.0)	55 (1.3)	22 (0.8)	23 (0.9)	37 (1.1)	23 (0.8)	39 (1.2)
Ukraine	61 (1.1)	23 (0.7)	17 (0.9)	58 (1.4)	24 (1.0)	19 (1.0)	19 (1.0)	20 (0.9)	61 (1.4)
‡ Morocco	r 34 (1.3)	r 25 (1.1)	r 41 (1.3)	r 41 (1.7)	r 25 (1.0)	r 34 (1.5)	r 27 (1.1)	r 23 (0.8)	r 50 (1.2)
International Avg.	45 (0.3)	23 (0.2)	33 (0.3)	36 (0.3)	23 (0.2)	41 (0.3)	16 (0.2)	15 (0.2)	68 (0.3)

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).



Exhibit 7.6 Students' Reports on Learning Activities in Science Lessons (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Chemistry

Country	Percentage of Students Who Reported								
	Reading Science Textbooks and Other Resource Materials			Memorizing Science Facts and Principles			Using Scientific Formulas and Laws to Solve Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
Algeria	26 (0.9)	23 (0.8)	51 (1.0)	39 (1.1)	25 (0.7)	36 (1.0)	31 (1.0)	25 (0.7)	44 (1.0)
Armenia	r 41 (1.2)	r 18 (0.7)	r 41 (1.2)	r 36 (1.3)	r 20 (0.7)	r 44 (1.4)	r 50 (1.4)	r 18 (0.8)	r 32 (1.1)
Bosnia and Herzegovina	51 (1.2)	18 (0.6)	31 (1.2)	50 (1.0)	21 (0.6)	28 (1.0)	55 (1.0)	19 (0.7)	26 (1.0)
Bulgaria	r 38 (1.6)	r 22 (1.0)	r 40 (1.7)	r 40 (1.6)	r 21 (1.0)	r 38 (1.8)	r 46 (1.7)	r 23 (1.3)	r 32 (1.6)
Cyprus	35 (0.9)	24 (0.7)	41 (0.8)	33 (0.7)	28 (0.6)	39 (0.7)	37 (0.9)	28 (0.9)	35 (0.9)
Czech Republic	39 (1.6)	28 (0.9)	33 (1.9)	44 (1.1)	31 (0.9)	25 (0.9)	45 (1.3)	30 (0.8)	25 (0.9)
Georgia	38 (1.4)	18 (1.0)	44 (1.7)	46 (1.2)	20 (0.8)	34 (1.3)	49 (1.5)	17 (0.9)	34 (1.4)
Hungary	34 (1.5)	25 (0.8)	41 (1.6)	23 (1.0)	28 (0.9)	49 (1.3)	28 (1.0)	25 (0.9)	47 (1.4)
Indonesia	--	--	--	--	--	--	--	--	--
Lebanon	33 (1.2)	32 (1.2)	35 (1.3)	49 (1.5)	28 (1.1)	23 (1.1)	52 (1.6)	28 (1.4)	20 (1.0)
Lithuania	58 (1.4)	19 (0.9)	23 (1.2)	27 (1.1)	24 (0.8)	49 (1.3)	55 (1.1)	26 (0.7)	19 (1.0)
Malta	s 44 (1.7)	s 23 (1.2)	s 33 (1.4)	s 40 (1.6)	s 29 (1.5)	s 31 (1.3)	s 39 (1.5)	s 28 (1.3)	s 33 (1.4)
Romania	38 (1.3)	21 (0.9)	41 (1.5)	35 (1.2)	24 (0.9)	41 (1.2)	49 (1.6)	22 (0.9)	29 (1.3)
Russian Federation	57 (0.9)	21 (0.7)	22 (0.8)	70 (1.2)	18 (0.8)	12 (0.8)	73 (1.1)	17 (0.7)	10 (0.8)
Serbia	37 (1.3)	19 (0.7)	44 (1.2)	33 (1.2)	19 (0.7)	48 (1.3)	45 (0.8)	20 (0.8)	34 (0.9)
Slovenia	29 (1.2)	34 (1.1)	37 (1.5)	48 (1.0)	34 (0.9)	18 (0.9)	48 (1.0)	29 (0.9)	23 (0.7)
Sweden	33 (1.1)	32 (0.8)	34 (1.0)	15 (0.8)	29 (0.7)	56 (1.0)	14 (0.7)	29 (0.7)	57 (1.0)
Syrian Arab Republic	40 (1.1)	24 (0.7)	36 (1.0)	53 (1.0)	23 (0.6)	24 (0.9)	49 (1.1)	24 (0.8)	26 (0.8)
Ukraine	58 (1.1)	22 (0.7)	20 (0.9)	69 (1.1)	20 (0.7)	12 (0.8)	74 (1.1)	18 (0.8)	8 (0.6)
‡ Morocco	r 35 (1.0)	r 24 (0.9)	r 40 (1.1)	r 45 (2.3)	r 22 (1.3)	r 33 (2.2)	r 39 (1.7)	r 24 (1.2)	r 37 (1.3)
International Avg.	40 (0.3)	24 (0.2)	36 (0.3)	42 (0.3)	24 (0.2)	34 (0.3)	46 (0.3)	24 (0.2)	30 (0.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Physics

Country	Percentage of Students Who Reported								
	Reading Science Textbooks and Other Resource Materials			Memorizing Science Facts and Principles			Using Scientific Formulas and Laws to Solve Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
Algeria	25 (0.7)	23 (0.6)	51 (0.9)	37 (0.8)	26 (0.7)	37 (0.9)	31 (0.9)	24 (0.8)	44 (0.9)
Armenia	r 44 (1.2)	r 18 (0.7)	r 38 (1.1)	r 41 (1.4)	r 21 (0.8)	r 38 (1.4)	r 58 (1.3)	r 18 (0.8)	r 24 (1.3)
Bosnia and Herzegovina	50 (1.0)	18 (0.7)	32 (0.9)	53 (1.1)	19 (0.7)	27 (1.0)	62 (1.2)	17 (0.6)	21 (0.9)
Bulgaria	r 40 (1.6)	r 18 (0.9)	r 42 (1.5)	r 42 (1.9)	r 21 (1.2)	r 37 (1.7)	r 53 (1.8)	r 21 (1.1)	r 26 (1.5)
Cyprus	35 (0.9)	24 (0.8)	40 (1.0)	36 (0.8)	27 (0.8)	36 (0.8)	39 (0.8)	27 (0.8)	33 (0.9)
Czech Republic	39 (1.6)	29 (1.1)	32 (1.8)	42 (1.0)	30 (0.7)	29 (1.0)	49 (1.3)	27 (0.8)	24 (1.0)
Georgia	41 (1.1)	20 (1.0)	39 (1.0)	47 (1.5)	21 (1.0)	32 (1.3)	57 (1.3)	17 (1.0)	26 (1.2)
Hungary	34 (1.5)	25 (0.9)	41 (1.4)	31 (1.1)	28 (0.9)	41 (1.4)	33 (1.2)	30 (0.9)	37 (1.4)
Indonesia	29 (1.1)	34 (0.8)	36 (1.3)	21 (1.0)	30 (0.9)	48 (1.3)	31 (1.1)	30 (1.0)	39 (1.3)
Lebanon	36 (1.3)	31 (1.0)	33 (1.1)	50 (1.7)	27 (1.1)	23 (1.3)	53 (1.3)	27 (1.1)	20 (1.1)
Lithuania	64 (1.2)	16 (0.7)	20 (1.0)	32 (1.1)	23 (0.7)	44 (1.1)	61 (1.3)	21 (0.9)	18 (1.0)
Malta	33 (0.7)	22 (0.7)	45 (0.7)	33 (0.7)	27 (0.8)	40 (0.7)	48 (0.6)	26 (0.6)	26 (0.6)
Romania	38 (1.4)	21 (0.8)	41 (1.5)	37 (1.4)	23 (1.0)	39 (1.6)	48 (1.5)	23 (1.0)	29 (1.6)
Russian Federation	61 (1.0)	20 (0.6)	19 (0.9)	73 (0.9)	18 (0.7)	10 (0.6)	77 (0.9)	15 (0.7)	7 (0.6)
Serbia	36 (1.3)	19 (0.8)	46 (1.5)	36 (1.2)	20 (0.7)	44 (1.3)	54 (1.0)	19 (0.8)	27 (1.0)
Slovenia	23 (0.9)	33 (1.0)	44 (1.4)	51 (0.9)	31 (0.9)	18 (0.9)	64 (1.2)	23 (0.8)	13 (0.9)
Sweden	34 (1.1)	31 (0.9)	35 (1.1)	15 (0.7)	27 (0.7)	58 (1.0)	14 (0.8)	27 (0.8)	59 (1.0)
Syrian Arab Republic	41 (1.2)	25 (0.7)	34 (1.1)	52 (1.2)	23 (0.8)	25 (0.8)	47 (1.1)	25 (0.7)	28 (1.0)
Ukraine	59 (1.1)	21 (0.7)	20 (1.1)	67 (1.0)	20 (0.7)	12 (0.7)	73 (1.0)	18 (0.8)	8 (0.7)
‡ Morocco	r 37 (1.1)	r 24 (1.2)	r 39 (1.1)	r 46 (1.6)	r 23 (1.0)	r 31 (1.5)	r 39 (1.7)	r 25 (1.1)	r 36 (1.9)
International Avg.	40 (0.3)	24 (0.2)	36 (0.3)	42 (0.3)	24 (0.2)	33 (0.3)	50 (0.3)	23 (0.2)	27 (0.3)

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

Exhibit 7.7 Teachers' Reports on Learning Activities in Science Lessons

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percentage of Students Whose Teachers Reported Students					
	Reading Their Textbooks and Other Resource Materials			Memorizing Facts and Principles		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
Australia	4 (1.0)	13 (2.6)	83 (2.7)	2 (1.0)	9 (2.3)	89 (2.5)
Austria	13 (2.4)	38 (3.2)	49 (3.4)	1 (0.4)	4 (1.3)	96 (1.4)
Chinese Taipei	26 (3.9)	32 (3.8)	41 (4.0)	9 (2.4)	11 (2.9)	80 (3.4)
Colombia	44 (5.7)	19 (3.8)	37 (5.9)	12 (2.8)	13 (3.1)	75 (3.6)
Czech Republic	32 (3.6)	36 (3.5)	32 (3.5)	0 (0.0)	9 (2.5)	91 (2.5)
Denmark	r 18 (3.6)	r 38 (4.4)	r 44 (4.5)	r 2 (1.0)	r 7 (1.8)	r 91 (2.1)
El Salvador	33 (3.9)	20 (3.7)	47 (4.3)	22 (3.6)	17 (3.5)	61 (4.4)
England	2 (1.4)	14 (2.6)	83 (3.0)	4 (1.6)	7 (1.9)	90 (2.4)
Georgia	44 (4.1)	14 (3.1)	42 (4.7)	51 (4.8)	15 (3.5)	35 (4.6)
Germany	16 (2.2)	39 (3.2)	44 (3.2)	5 (1.4)	16 (2.5)	79 (2.8)
Hong Kong SAR	24 (3.7)	25 (4.0)	51 (4.3)	7 (2.2)	32 (3.8)	62 (3.9)
Hungary	69 (3.6)	16 (2.3)	15 (3.1)	39 (3.8)	28 (3.8)	33 (3.6)
Iran, Islamic Rep. of	49 (4.2)	26 (3.6)	25 (3.2)	24 (3.0)	29 (3.5)	47 (3.8)
Italy	51 (2.8)	25 (2.6)	24 (2.8)	44 (3.2)	23 (2.8)	33 (3.0)
Japan	27 (3.7)	36 (3.6)	37 (3.7)	23 (3.7)	31 (4.0)	45 (4.4)
Kazakhstan	86 (3.1)	7 (2.1)	7 (2.4)	69 (4.1)	12 (2.4)	18 (3.9)
Kuwait	r 50 (4.4)	r 14 (3.2)	r 35 (4.1)	r 62 (4.7)	r 23 (3.8)	r 15 (3.1)
Latvia	62 (3.6)	28 (3.6)	9 (2.1)	6 (1.8)	21 (2.9)	73 (3.1)
Lithuania	41 (3.5)	34 (3.3)	25 (3.1)	21 (2.7)	26 (3.3)	53 (3.4)
Morocco	54 (4.5)	16 (3.3)	31 (3.7)	56 (4.5)	15 (3.2)	29 (3.7)
Netherlands	r 41 (4.4)	r 37 (4.5)	r 21 (3.2)	3 (1.7)	14 (3.3)	82 (3.5)
New Zealand	3 (1.0)	18 (2.6)	80 (2.7)	1 (0.5)	4 (1.4)	95 (1.4)
Norway	6 (1.7)	33 (3.8)	62 (3.8)	0 (0.0)	4 (1.5)	96 (1.5)
Qatar	r 45 (0.2)	r 20 (0.1)	r 35 (0.2)	r 43 (0.2)	r 27 (0.2)	r 29 (0.2)
Russian Federation	80 (2.8)	12 (2.2)	8 (2.1)	33 (2.5)	28 (3.0)	39 (2.9)
Scotland	r 4 (1.3)	r 21 (4.0)	r 75 (4.1)	r 1 (0.1)	r 8 (2.2)	r 91 (2.4)
Singapore	23 (2.4)	29 (2.7)	48 (2.6)	14 (2.2)	26 (2.6)	60 (3.0)
Slovak Republic	39 (3.3)	37 (3.5)	24 (3.1)	8 (2.0)	9 (1.9)	83 (2.7)
Slovenia	23 (2.7)	32 (2.8)	45 (2.9)	12 (2.1)	25 (2.4)	63 (2.9)
Sweden	8 (1.5)	32 (3.5)	59 (3.6)	2 (1.3)	11 (2.4)	86 (2.7)
Tunisia	40 (4.2)	22 (3.1)	38 (3.8)	41 (4.0)	21 (3.1)	38 (4.1)
Ukraine	65 (3.6)	16 (2.8)	19 (2.9)	27 (3.6)	30 (3.8)	43 (4.0)
United States	34 (2.6)	26 (2.5)	40 (2.9)	14 (1.7)	22 (2.4)	64 (2.6)
Yemen	34 (4.3)	18 (3.7)	48 (4.2)	45 (4.9)	20 (3.6)	34 (4.7)
International Avg.	35 (0.6)	25 (0.5)	40 (0.6)	22 (0.5)	18 (0.5)	60 (0.5)
<b>Benchmarking Participants</b>						
Alberta, Canada	7 (2.5)	10 (2.4)	83 (3.3)	2 (1.3)	8 (2.5)	90 (2.8)
British Columbia, Canada	r 12 (3.2)	r 39 (4.7)	r 49 (4.2)	r 2 (1.0)	r 11 (2.3)	r 87 (2.5)
Dubai, UAE	s 79 (2.6)	s 6 (2.1)	s 16 (2.5)	s 68 (3.1)	s 9 (1.6)	s 23 (2.7)
Massachusetts, US	16 (5.0)	28 (6.4)	56 (5.4)	9 (2.9)	9 (4.1)	82 (4.1)
Minnesota, US	18 (5.9)	17 (6.0)	65 (7.0)	0 (0.0)	17 (5.9)	83 (5.9)
Ontario, Canada	21 (4.4)	24 (3.8)	54 (4.6)	1 (1.3)	14 (3.3)	85 (3.5)
Quebec, Canada	19 (3.2)	27 (4.1)	54 (3.7)	5 (2.0)	13 (2.8)	82 (3.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

## Exhibit 7.7 Teachers' Reports on Learning Activities in Science Lessons (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## General/Integrated Science

Country	Percentage of Students Whose Teachers Reported Students									
	Reading Their Textbooks and Other Resource Materials			Memorizing Facts and Principles			Using Scientific Formulae and Laws to Solve Routine Problems			
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	
Australia	12 (2.4)	30 (3.3)	59 (3.8)	4 (1.5)	14 (2.1)	82 (2.6)	1 (0.7)	11 (2.2)	87 (2.2)	
Bahrain	19 (2.5)	18 (2.1)	63 (2.9)	53 (2.6)	25 (2.1)	21 (2.7)	25 (2.6)	38 (2.8)	37 (2.4)	
Botswana	21 (3.1)	21 (3.1)	58 (4.2)	20 (4.1)	11 (2.9)	69 (4.0)	10 (2.5)	14 (2.9)	76 (3.5)	
Chinese Taipei	20 (3.0)	15 (2.5)	65 (3.3)	10 (2.5)	16 (3.2)	75 (3.8)	15 (2.9)	23 (3.2)	62 (4.0)	
Colombia	28 (3.9)	35 (4.5)	37 (4.9)	5 (1.8)	11 (2.7)	84 (3.2)	19 (3.3)	26 (4.4)	55 (4.9)	
Egypt	25 (3.4)	14 (2.8)	61 (4.0)	58 (4.1)	17 (3.0)	25 (3.7)	34 (4.1)	23 (3.2)	43 (4.1)	
El Salvador	25 (4.1)	25 (3.8)	51 (4.6)	15 (3.2)	25 (3.5)	59 (4.2)	10 (2.8)	22 (3.4)	68 (3.8)	
England	9 (1.7)	11 (2.0)	79 (2.5)	5 (1.4)	11 (1.7)	84 (2.3)	1 (0.4)	13 (1.9)	86 (2.0)	
Ghana	44 (4.6)	18 (3.8)	38 (4.3)	39 (4.4)	20 (3.2)	41 (4.3)	37 (4.3)	21 (3.1)	42 (4.2)	
Hong Kong SAR	14 (2.9)	21 (3.7)	65 (4.1)	7 (2.6)	26 (3.9)	67 (4.3)	1 (0.0)	18 (3.4)	81 (3.5)	
Iran, Islamic Rep. of	58 (3.8)	13 (2.7)	29 (3.7)	39 (4.2)	22 (3.1)	39 (3.8)	43 (3.7)	24 (3.6)	33 (3.7)	
Israel	20 (3.4)	20 (3.2)	60 (3.8)	11 (3.0)	15 (2.8)	73 (4.0)	9 (2.5)	14 (3.1)	77 (3.9)	
Italy	33 (3.0)	30 (2.8)	37 (3.2)	5 (1.4)	10 (2.0)	84 (2.4)	14 (2.2)	25 (3.0)	61 (3.4)	
Japan	25 (2.9)	24 (3.4)	51 (3.6)	24 (3.2)	36 (4.1)	40 (4.1)	13 (2.6)	31 (3.9)	56 (4.1)	
Jordan	35 (3.5)	28 (3.5)	37 (3.8)	42 (4.1)	37 (4.3)	21 (3.3)	41 (4.1)	41 (4.3)	17 (3.5)	
Korea, Rep. of	19 (3.0)	29 (3.8)	52 (4.1)	15 (3.1)	36 (3.9)	48 (4.4)	15 (2.8)	43 (4.0)	42 (4.1)	
Kuwait	r 19 (3.7)	r 23 (3.9)	r 58 (4.9)	r 51 (4.4)	r 35 (4.5)	r 14 (2.9)	r 42 (4.6)	r 28 (4.5)	r 30 (4.2)	
Malaysia	40 (4.7)	26 (3.7)	34 (3.7)	22 (3.6)	38 (4.2)	39 (3.9)	10 (2.5)	27 (3.4)	64 (3.9)	
Norway	8 (2.1)	26 (3.3)	66 (3.8)	1 (0.5)	5 (1.4)	94 (1.5)	1 (0.6)	6 (1.4)	94 (1.5)	
Oman	13 (2.6)	20 (3.6)	67 (4.1)	40 (3.8)	23 (3.2)	37 (3.8)	23 (3.6)	36 (4.6)	41 (4.0)	
Palestinian Nat'l Auth.	22 (3.3)	17 (2.9)	61 (4.2)	61 (3.6)	19 (3.3)	19 (3.3)	52 (4.1)	27 (3.8)	21 (3.7)	
Qatar	17 (0.1)	20 (0.1)	63 (0.2)	42 (0.2)	29 (0.1)	29 (0.2)	25 (0.2)	25 (0.1)	50 (0.2)	
Saudi Arabia	21 (3.7)	18 (3.6)	61 (4.7)	48 (4.2)	22 (3.7)	30 (4.1)	31 (4.3)	25 (4.3)	44 (4.9)	
Scotland	r 19 (2.4)	r 21 (2.1)	r 60 (2.9)	r 9 (1.9)	r 15 (2.2)	r 75 (2.6)	r 2 (0.7)	r 9 (1.6)	r 89 (1.8)	
Singapore	13 (1.7)	16 (2.1)	71 (2.4)	7 (1.4)	16 (2.0)	78 (2.2)	4 (0.9)	21 (2.3)	76 (2.4)	
<sup>a</sup> Sweden	6 (1.8)	17 (2.2)	77 (2.7)	1 (0.6)	6 (1.9)	93 (2.0)	1 (0.6)	1 (0.8)	98 (1.3)	
Thailand	23 (3.7)	43 (4.0)	34 (3.9)	24 (3.5)	45 (4.2)	31 (3.9)	13 (3.0)	40 (4.2)	47 (4.1)	
Tunisia	23 (4.0)	16 (2.9)	60 (4.4)	54 (4.4)	18 (3.5)	29 (3.8)	33 (3.7)	15 (2.8)	53 (3.7)	
Turkey	35 (4.3)	23 (3.5)	42 (4.8)	9 (2.8)	12 (3.0)	79 (3.9)	25 (4.0)	36 (4.2)	38 (4.1)	
United States	16 (2.1)	23 (2.2)	61 (2.8)	8 (1.6)	16 (2.0)	76 (2.6)	8 (1.6)	27 (2.6)	65 (2.8)	
International Avg.	23 (0.6)	22 (0.6)	55 (0.7)	24 (0.6)	21 (0.6)	55 (0.6)	19 (0.5)	24 (0.6)	58 (0.6)	
<b>Benchmarking Participants</b>										
Basque Country, Spain	r 22 (3.4)	r 32 (4.6)	r 46 (4.6)	r 7 (2.1)	r 19 (3.7)	r 74 (4.1)	r 2 (1.3)	r 21 (3.5)	r 77 (3.6)	
British Columbia, Canada	s 32 (4.1)	s 24 (5.9)	s 44 (5.4)	s 46 (4.3)	s 9 (1.9)	s 45 (4.4)	s 29 (3.1)	s 25 (4.5)	s 46 (5.7)	
Dubai, UAE	6 (2.4)	25 (5.3)	70 (5.7)	3 (2.1)	21 (6.0)	76 (6.4)	2 (1.3)	17 (4.7)	81 (4.6)	
Massachusetts, US	16 (5.7)	9 (2.6)	75 (6.0)	4 (2.4)	17 (4.6)	79 (5.1)	0 (0.0)	18 (4.5)	82 (4.5)	
Minnesota, US	14 (3.7)	29 (4.4)	56 (4.9)	4 (2.0)	16 (3.0)	80 (3.3)	2 (1.5)	19 (3.4)	79 (3.7)	
Ontario, Canada	14 (3.7)	29 (4.4)	56 (4.9)	4 (2.0)	16 (3.0)	80 (3.3)	2 (1.5)	19 (3.4)	79 (3.7)	
Quebec, Canada	13 (2.8)	21 (3.4)	66 (4.4)	10 (2.8)	20 (4.1)	69 (4.6)	5 (2.4)	16 (3.8)	79 (4.3)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

<sup>a</sup> Sweden: Summarizes reports from physics, biology, and chemistry teachers as well as integrated/general science teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 7.7 Teachers' Reports on Learning Activities in Science Lessons (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

## Biology

Country	Percentage of Students Whose Teachers Reported Students								
	Reading Their Textbooks and Other Resource Materials			Memorizing Facts and Principles			Using Scientific Formulae and Laws to Solve Routine Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
<sup>b</sup> Algeria	32 (4.4)	19 (3.4)	49 (4.1)	60 (4.7)	13 (3.1)	27 (4.2)	31 (4.2)	14 (3.1)	54 (4.5)
Armenia	21 (3.5)	38 (4.0)	41 (4.5)	25 (3.9)	39 (4.2)	36 (4.0)	16 (2.9)	34 (4.2)	50 (4.2)
Bosnia and Herzegovina	19 (2.9)	16 (3.1)	64 (3.9)	33 (3.8)	27 (3.7)	41 (3.8)	14 (2.7)	20 (3.2)	66 (3.8)
Bulgaria	32 (4.9)	23 (4.0)	45 (5.3)	50 (4.9)	26 (4.2)	25 (4.5)	33 (4.6)	25 (4.1)	42 (4.8)
Cyprus	--	--	--	--	--	--	--	--	--
Czech Republic	19 (3.2)	30 (4.2)	51 (4.1)	0 (0.0)	4 (1.4)	96 (1.4)	4 (1.3)	12 (2.1)	85 (2.5)
Georgia	67 (3.9)	16 (3.8)	17 (3.1)	79 (4.0)	9 (3.0)	12 (3.3)	r 35 (5.8)	r 15 (3.3)	r 50 (6.2)
Hungary	51 (4.3)	22 (3.5)	27 (4.0)	43 (3.7)	22 (3.2)	35 (3.9)	14 (2.9)	19 (2.8)	67 (3.8)
<sup>c</sup> Indonesia	27 (3.9)	42 (4.1)	31 (3.5)	14 (3.5)	30 (3.9)	56 (4.2)	25 (4.3)	34 (4.6)	41 (4.8)
Lebanon	42 (4.4)	21 (3.8)	38 (3.9)	44 (5.2)	25 (3.7)	31 (5.1)	38 (4.8)	24 (4.2)	38 (4.6)
Lithuania	39 (3.8)	29 (4.1)	33 (3.9)	41 (3.7)	27 (3.3)	32 (3.5)	4 (1.5)	9 (2.2)	87 (2.7)
<sup>d</sup> Malta	9 (0.5)	19 (0.7)	72 (0.9)	5 (0.3)	9 (0.8)	86 (0.8)	5 (0.4)	8 (0.5)	87 (0.6)
Romania	48 (4.5)	17 (3.1)	35 (4.3)	28 (4.1)	13 (2.9)	60 (4.0)	19 (3.8)	11 (2.8)	69 (4.2)
Russian Federation	38 (3.4)	28 (3.5)	34 (3.4)	37 (3.4)	21 (2.7)	42 (4.0)	11 (2.3)	21 (3.7)	68 (3.6)
Serbia	15 (3.0)	22 (4.1)	63 (4.3)	32 (4.2)	30 (3.7)	38 (3.7)	11 (2.5)	23 (3.8)	67 (4.3)
Slovenia	5 (1.8)	18 (3.1)	76 (3.3)	28 (3.6)	37 (3.9)	35 (3.8)	6 (1.9)	10 (2.3)	84 (3.0)
<sup>f</sup> Syrian Arab Republic	9 (2.8)	8 (2.9)	82 (4.0)	48 (5.5)	21 (4.5)	31 (4.6)	30 (4.2)	20 (4.2)	49 (5.1)
Ukraine	45 (4.2)	26 (3.6)	29 (4.1)	27 (3.9)	22 (3.5)	51 (3.8)	17 (3.2)	13 (2.9)	70 (3.9)
<sup>e</sup> <sup>‡</sup> Morocco	27 (5.6)	13 (3.4)	61 (6.2)	47 (6.3)	17 (3.3)	36 (6.1)	34 (5.0)	18 (3.4)	48 (4.8)
International Avg.	30 (0.9)	23 (0.8)	47 (1.0)	36 (1.0)	22 (0.8)	43 (0.9)	19 (0.8)	18 (0.8)	62 (1.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Earth Science

Country	Percentage of Students Whose Teachers Reported Students								
	Reading Their Textbooks and Other Resource Materials			Memorizing Facts and Principles			Using Scientific Formulae and Laws to Solve Routine Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
<sup>b</sup> Algeria	--	--	--	--	--	--	--	--	--
Armenia	24 (4.1)	38 (4.5)	38 (4.2)	25 (3.5)	39 (4.6)	36 (4.0)	19 (3.3)	49 (4.9)	33 (4.5)
Bosnia and Herzegovina	20 (3.0)	19 (3.2)	60 (3.7)	31 (4.0)	23 (3.6)	47 (4.5)	13 (3.0)	12 (2.8)	75 (3.7)
Bulgaria	32 (4.3)	36 (4.6)	32 (4.7)	39 (4.7)	33 (5.0)	28 (4.4)	18 (3.9)	23 (4.5)	59 (4.6)
Cyprus	r 53 (2.0)	r 21 (2.1)	r 25 (2.0)	r 16 (0.7)	r 18 (2.0)	r 67 (2.0)	s 3 (0.7)	s 18 (1.5)	s 79 (1.6)
Czech Republic	r 22 (3.6)	r 32 (4.7)	r 46 (4.4)	r 0 (0.0)	r 3 (2.1)	r 97 (2.1)	r 1 (1.0)	r 9 (3.1)	r 89 (3.3)
Georgia	69 (4.9)	19 (4.5)	12 (2.8)	68 (5.0)	18 (4.9)	14 (3.9)	r 18 (4.2)	r 8 (2.2)	r 73 (4.6)
Hungary	45 (4.1)	29 (3.9)	26 (3.4)	35 (3.8)	25 (2.9)	40 (3.6)	17 (3.0)	22 (3.5)	60 (4.4)
<sup>c</sup> Indonesia	--	--	--	--	--	--	--	--	--
Lebanon	--	--	--	--	--	--	--	--	--
Lithuania	40 (3.8)	27 (3.2)	33 (3.7)	42 (4.0)	29 (4.1)	29 (3.7)	6 (2.0)	9 (2.4)	85 (2.7)
<sup>d</sup> Malta	39 (0.4)	23 (0.4)	38 (0.5)	17 (0.3)	16 (0.4)	67 (0.4)	0 (0.0)	11 (0.2)	89 (0.2)
Romania	51 (4.2)	19 (3.3)	31 (4.2)	34 (4.3)	17 (3.2)	48 (4.7)	21 (3.1)	12 (2.3)	67 (3.7)
Russian Federation	33 (3.8)	26 (2.8)	41 (4.2)	30 (3.4)	23 (2.7)	47 (3.7)	9 (2.1)	17 (2.8)	74 (3.6)
Serbia	10 (2.5)	23 (3.9)	67 (4.3)	31 (4.3)	24 (3.9)	45 (4.2)	6 (2.2)	15 (4.0)	78 (4.4)
Slovenia	--	--	--	--	--	--	--	--	--
<sup>f</sup> Syrian Arab Republic	--	--	--	--	--	--	--	--	--
Ukraine	45 (4.6)	28 (3.9)	27 (3.7)	27 (3.9)	26 (3.8)	47 (4.4)	16 (3.4)	19 (3.5)	65 (4.3)
<sup>e</sup> <sup>‡</sup> Morocco	--	--	--	--	--	--	--	--	--
International Avg.	37 (1.0)	26 (1.0)	37 (1.0)	30 (1.0)	23 (1.0)	47 (1.0)	11 (0.8)	17 (0.9)	71 (1.0)

<sup>b</sup> Algeria: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.<sup>c</sup> Indonesia: Data reported in biology and physics panels include data from integrated/general science teachers.<sup>d</sup> Malta: Data reported in earth science panel include data from environmental studies teachers.<sup>e</sup> Morocco: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.<sup>f</sup> Syrian Arab Republic: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.<sup>‡</sup> Did not satisfy guidelines for sample participation rates (see Appendix A).

Exhibit 7.7 Teachers' Reports on Learning Activities in Science Lessons (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Chemistry

Country	Percentage of Students Whose Teachers Reported Students								
	Reading Their Textbooks and Other Resource Materials			Memorizing Facts and Principles			Using Scientific Formulae and Laws to Solve Routine Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
<sup>b</sup> Algeria	--	--	--	--	--	--	--	--	--
Armenia	13 (3.5)	40 (4.5)	47 (4.6)	21 (3.8)	40 (3.9)	39 (3.6)	33 (4.2)	19 (3.2)	48 (4.7)
Bosnia and Herzegovina	17 (3.0)	18 (3.3)	65 (3.8)	38 (4.2)	25 (3.8)	37 (3.7)	31 (3.7)	17 (3.0)	52 (4.1)
Bulgaria	31 (4.2)	22 (3.9)	47 (4.8)	46 (4.3)	29 (4.6)	25 (4.4)	52 (4.9)	29 (4.7)	19 (4.0)
Cyprus	r 48 (1.6)	r 15 (0.4)	r 36 (1.5)	r 20 (1.5)	r 13 (1.0)	r 67 (1.4)	r 13 (1.1)	r 17 (1.3)	r 70 (1.4)
Czech Republic	10 (2.8)	27 (3.4)	63 (3.9)	2 (1.4)	9 (2.3)	90 (2.7)	12 (2.8)	27 (3.5)	61 (3.9)
Georgia	65 (4.8)	19 (4.3)	16 (3.5)	74 (5.9)	17 (5.4)	9 (2.8)	66 (5.1)	18 (3.4)	16 (3.8)
Hungary	39 (3.9)	26 (3.7)	35 (4.1)	43 (4.2)	22 (3.5)	35 (4.3)	29 (4.0)	31 (3.9)	40 (4.5)
<sup>c</sup> Indonesia	--	--	--	--	--	--	--	--	--
Lebanon	34 (4.3)	27 (4.4)	39 (4.5)	48 (5.1)	24 (3.7)	28 (4.5)	48 (4.8)	33 (5.3)	19 (3.4)
Lithuania	28 (3.8)	22 (2.9)	51 (4.0)	41 (4.2)	30 (4.1)	28 (3.6)	30 (3.7)	44 (4.2)	26 (3.9)
<sup>d</sup> Malta	5 (0.7)	8 (0.7)	88 (0.9)	2 (0.3)	10 (0.9)	88 (0.9)	9 (0.8)	19 (1.0)	72 (1.1)
Romania	33 (3.8)	17 (3.2)	50 (4.2)	24 (3.4)	15 (2.9)	62 (4.1)	65 (4.0)	13 (3.0)	22 (3.2)
Russian Federation	29 (3.3)	18 (2.7)	53 (3.8)	34 (3.9)	23 (2.8)	43 (3.9)	45 (3.6)	36 (3.3)	19 (2.4)
Serbia	11 (3.2)	9 (2.2)	80 (3.7)	31 (3.7)	31 (4.3)	38 (3.7)	37 (4.2)	33 (4.1)	30 (3.9)
Slovenia	5 (1.8)	6 (2.0)	89 (2.6)	23 (3.4)	43 (4.2)	34 (4.1)	24 (3.5)	39 (4.0)	37 (4.1)
<sup>f</sup> Syrian Arab Republic	--	--	--	--	--	--	--	--	--
Ukraine	35 (4.4)	19 (3.3)	46 (4.0)	29 (4.1)	26 (3.5)	45 (4.2)	80 (3.4)	12 (2.5)	7 (2.2)
<sup>e</sup> <sup>‡</sup> Morocco	--	--	--	--	--	--	--	--	--
International Avg.	27 (0.9)	19 (0.8)	54 (1.0)	32 (1.0)	24 (0.9)	44 (0.9)	38 (1.0)	26 (0.9)	36 (0.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Physics

Country	Percentage of Students Whose Teachers Reported Students								
	Reading Their Textbooks and Other Resource Materials			Memorizing Facts and Principles			Using Scientific Formulae and Laws to Solve Routine Problems		
	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never	Every or Almost Every Lesson	About Half the Lessons	Some Lessons or Never
<sup>b</sup> Algeria	r 28 (4.1)	r 10 (2.8)	r 63 (4.5)	r 55 (5.0)	r 14 (3.5)	r 30 (4.4)	r 40 (4.7)	r 22 (4.1)	r 38 (4.4)
Armenia	16 (2.8)	38 (5.0)	46 (5.1)	19 (2.9)	33 (4.1)	49 (4.7)	39 (4.5)	18 (4.9)	43 (4.8)
Bosnia and Herzegovina	11 (2.6)	20 (3.3)	68 (3.9)	38 (3.9)	28 (3.3)	34 (3.7)	53 (4.0)	28 (3.1)	19 (3.4)
Bulgaria	27 (4.7)	24 (4.6)	49 (5.1)	54 (5.3)	27 (4.3)	19 (3.9)	70 (4.7)	27 (4.3)	4 (1.8)
Cyprus	36 (2.1)	26 (2.3)	38 (2.2)	r 13 (1.9)	r 24 (1.7)	r 63 (2.4)	r 17 (1.2)	r 42 (2.0)	r 41 (2.0)
Czech Republic	14 (3.0)	22 (3.4)	65 (4.4)	1 (0.9)	14 (2.8)	85 (2.9)	35 (3.8)	27 (3.5)	38 (4.0)
Georgia	62 (4.9)	18 (3.5)	20 (3.8)	80 (4.1)	11 (3.5)	9 (2.3)	73 (4.5)	10 (2.2)	17 (4.2)
Hungary	45 (4.3)	16 (2.6)	39 (4.4)	41 (4.0)	26 (3.9)	33 (4.0)	33 (4.2)	41 (4.3)	26 (3.9)
<sup>c</sup> Indonesia	24 (3.8)	37 (4.3)	39 (4.1)	14 (2.8)	30 (3.3)	56 (3.9)	35 (4.1)	50 (4.2)	15 (2.9)
Lebanon	28 (4.4)	27 (4.1)	44 (4.3)	49 (4.8)	20 (3.4)	32 (4.8)	50 (5.1)	27 (4.4)	23 (4.3)
Lithuania	32 (3.8)	23 (3.5)	45 (4.3)	46 (4.0)	25 (4.0)	29 (3.5)	77 (3.6)	19 (3.3)	3 (1.3)
<sup>d</sup> Malta	9 (0.2)	19 (0.4)	73 (0.4)	7 (0.2)	18 (0.3)	76 (0.4)	29 (0.4)	28 (0.4)	43 (0.5)
Romania	38 (4.2)	15 (2.9)	48 (3.7)	29 (3.6)	21 (3.2)	50 (4.0)	66 (3.8)	19 (3.5)	16 (2.9)
Russian Federation	23 (3.3)	17 (3.0)	60 (3.8)	36 (3.1)	16 (2.5)	48 (2.9)	77 (3.0)	19 (3.3)	4 (1.8)
Serbia	8 (2.2)	15 (3.0)	78 (3.7)	27 (4.0)	30 (4.1)	43 (4.3)	48 (4.4)	34 (4.2)	18 (3.1)
Slovenia	3 (0.9)	8 (2.3)	89 (2.5)	29 (3.8)	32 (3.4)	39 (3.6)	20 (3.2)	46 (4.0)	34 (4.1)
<sup>f</sup> Syrian Arab Republic	14 (3.5)	12 (3.2)	74 (3.9)	62 (4.3)	15 (3.0)	23 (3.3)	56 (4.9)	26 (4.5)	18 (3.0)
Ukraine	28 (3.8)	18 (3.0)	54 (4.3)	31 (3.6)	25 (3.5)	44 (4.1)	87 (3.0)	11 (2.8)	2 (1.1)
<sup>e</sup> <sup>‡</sup> Morocco	r 24 (5.0)	r 15 (3.9)	r 61 (5.6)	r 57 (5.9)	r 10 (3.3)	r 32 (5.1)	r 55 (5.3)	r 20 (4.9)	r 25 (4.7)
International Avg.	25 (0.8)	20 (0.8)	56 (0.9)	36 (0.9)	22 (0.8)	42 (0.9)	51 (0.9)	27 (0.9)	22 (0.8)

<sup>b</sup> Algeria: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.  
<sup>c</sup> Indonesia: Data reported in biology and physics panels include data from integrated/general science teachers.  
<sup>d</sup> Malta: Data reported in earth science panel include data from environmental studies teachers.

<sup>e</sup> Morocco: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.  
<sup>f</sup> Syrian Arab Republic: Data reported in biology panel are for biology/earth science teachers and data reported in physics panel are for physics/chemistry teachers.  
<sup>‡</sup> Did not satisfy guidelines for sample participation rates (see Appendix A).

### What Instructional Strategies Are Used in Science Classes?

Exhibit 7.8 presents teachers' reports on the extent of their reliance on textbooks in teaching science, and changes in this use since 2003. In most countries in 2007, the textbook remains the primary basis of science instruction at both the fourth and eighth grades. On average internationally, 52 percent of the students at fourth grade and 53 percent at eighth grade had teachers who reported using a textbook as the primary basis of their lessons. For another 34 percent of the fourth-grade students and 40 percent of the eighth-grade students, teachers reported using textbooks as a supplementary resource. There was very little textbook use in teaching fourth-grade science in Australia, New Zealand, Scotland, and Alberta, Canada.

There are some interesting trends at the fourth grade. For example, Iran and Slovenia have increases since 2003 in the use of textbooks as the primary basis for science teaching (by 33 percentage points in both) whereas Lithuania, Scotland, and the province of Ontario have reduced reliance on textbooks for science teaching. At the eighth grade, while Indonesia, Malaysia, Sweden, Tunisia, and the Basque Country in Spain increased the percentages of students for whom the textbook was used as the basis for science instruction, five countries had decreases in the percentage of students—Bahrain, Cyprus, Egypt, Lithuania, and Singapore.

Exhibit 7.9 provides a profile of the time spent on activities commonly encountered in eighth-grade science classes around the world, as reported by science teachers. Internationally on average, most time was spent on having students listen to lecture-style presentations (25%) and working on problems with teacher guidance (17%). Considerable time also was spent having students work on solving problems independently (13%), and listening to the teacher re-teach and clarify content or procedures (13%). Together, these four activities accounted for 68 percent of the class time at the eighth grade. A further 9 percent of class time was spent reviewing homework and 10 percent was spent taking tests or quizzes.



## Exhibit 7.8 Textbook Use in Teaching Science with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percentage of Students Taught by Teachers Reporting Textbook Use					
	Use Textbook to Teach Science				Do Not Use Textbook to Teach Science	
	As Primary Basis for Lessons		As Supplementary Resource			
	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003
Algeria	61 (4.8)	◊ ◊	35 (5.0)	◊ ◊	4 (1.8)	◊ ◊
Armenia	68 (3.4)	--	30 (3.4)	--	2 (0.8)	--
Australia	4 (1.1)	-5 (3.5)	14 (3.1)	1 (4.2)	82 (3.3)	3 (5.3)
Austria	14 (2.4)	◊ ◊	67 (3.2)	◊ ◊	19 (2.5)	◊ ◊
Chinese Taipei	90 (2.6)	5 (3.8)	8 (2.3)	-4 (3.6)	2 (1.1)	-1 (2.0)
Colombia	36 (5.7)	◊ ◊	57 (5.8)	◊ ◊	7 (2.2)	◊ ◊
Czech Republic	55 (4.4)	◊ ◊	44 (4.4)	◊ ◊	1 (0.6)	◊ ◊
Denmark	r 35 (4.4)	◊ ◊	43 (4.8)	◊ ◊	21 (4.0)	◊ ◊
El Salvador	15 (3.2)	◊ ◊	77 (3.3)	◊ ◊	8 (2.6)	◊ ◊
England	r 5 (1.3)	-1 (2.6)	63 (4.2)	5 (6.4)	32 (4.0)	-4 (6.3)
Georgia	84 (3.0)	◊ ◊	12 (2.7)	◊ ◊	4 (2.0)	◊ ◊
Germany	9 (1.7)	◊ ◊	58 (3.6)	◊ ◊	33 (3.3)	◊ ◊
Hong Kong SAR	r 93 (1.9)	7 (4.2)	6 (1.8)	-7 (4.2)	1 (0.8)	-1 (1.4)
Hungary	80 (2.9)	-1 (4.4)	20 (2.9)	1 (4.4)	0 (0.4)	0 (0.4)
Iran, Islamic Rep. of	r 100 (0.0)	33 (4.7) ▲	0 (0.0)	-28 (4.7) ▼	0 (0.0)	-5 (1.3) ▼
Italy	39 (3.1)	7 (4.5)	48 (2.9)	-13 (4.5) ▼	13 (2.1)	6 (2.6) ▲
Japan	71 (3.2)	-5 (4.6)	28 (3.3)	5 (4.6)	1 (0.0)	0 (0.7)
Kazakhstan	93 (2.4)	◊ ◊	7 (2.4)	◊ ◊	0 (0.0)	◊ ◊
Kuwait	r 44 (4.6)	◊ ◊	29 (3.9)	◊ ◊	27 (4.4)	◊ ◊
Latvia	79 (3.7)	--	21 (3.7)	--	0 (0.0)	--
Lithuania	63 (3.6)	-37 (3.6) ▼	36 (3.6)	36 (3.6) ▲	0 (0.0)	0 (0.0)
Morocco	69 (4.2)	--	30 (4.3)	--	1 (0.8)	--
Netherlands	r 72 (4.0)	-3 (5.9)	13 (3.1)	1 (4.5)	15 (3.2)	2 (4.4)
New Zealand	r 3 (0.9)	-1 (1.8)	18 (2.1)	4 (3.0)	80 (2.1)	-3 (3.4)
Norway	r 49 (3.8)	-4 (6.0)	42 (3.9)	2 (5.9)	8 (2.2)	2 (3.1)
Qatar	r 57 (0.2)	◊ ◊	25 (0.1)	◊ ◊	19 (0.2)	◊ ◊
Russian Federation	81 (2.7)	-1 (4.2)	18 (2.7)	2 (3.9)	1 (0.2)	-1 (1.3)
Scotland	s 5 (2.0)	-34 (5.0) ▼	27 (3.8)	-8 (6.0)	68 (4.1)	42 (5.9) ▲
Singapore	75 (2.7)	0 (4.9)	24 (2.8)	-1 (4.9)	1 (0.4)	1 (0.4)
Slovak Republic	62 (3.8)	◊ ◊	37 (3.8)	◊ ◊	0 (0.3)	◊ ◊
Slovenia	59 (3.1)	33 (4.7) ▲	41 (3.1)	-15 (5.2) ▼	0 (0.1)	-18 (3.4) ▼
Sweden	22 (2.7)	◊ ◊	59 (3.5)	◊ ◊	19 (2.7)	◊ ◊
Tunisia	r 29 (3.8)	-4 (5.7)	69 (3.9)	39 (5.7) ▲	3 (1.4)	-35 (4.5) ▼
Ukraine	67 (3.9)	◊ ◊	33 (3.9)	◊ ◊	0 (0.0)	◊ ◊
United States	r 43 (3.2)	-3 (4.5)	39 (3.1)	9 (4.3) ▲	17 (2.6)	-6 (3.6)
Yemen	49 (4.1)	◊ ◊	38 (4.0)	◊ ◊	13 (2.8)	◊ ◊
<b>International Avg.</b>	<b>52 (0.5)</b>		<b>34 (0.6)</b>		<b>14 (0.4)</b>	
<b>Benchmarking Participants</b>						
Alberta, Canada	5 (1.3)	◊ ◊	12 (2.5)	◊ ◊	83 (2.8)	◊ ◊
British Columbia, Canada	r 37 (4.2)	◊ ◊	44 (4.2)	◊ ◊	19 (3.3)	◊ ◊
Dubai, UAE	s 60 (4.7)	◊ ◊	35 (4.6)	◊ ◊	5 (0.5)	◊ ◊
Massachusetts, US	28 (6.2)	◊ ◊	32 (7.1)	◊ ◊	40 (7.7)	◊ ◊
Minnesota, US	23 (6.2)	◊ ◊	24 (6.6)	◊ ◊	53 (6.4)	◊ ◊
Ontario, Canada	21 (3.7)	-12 (5.9) ▼	59 (4.7)	14 (6.5) ▲	20 (3.4)	-2 (5.1)
Quebec, Canada	r 38 (4.9)	-2 (6.5)	28 (4.4)	10 (5.6)	34 (4.2)	-8 (6.3)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s"

indicates data are available for at least 50 but less than 70% of the students.

A diamond (◊) indicates the country did not participate in the assessment.



Exhibit 7.8 Textbook Use in Teaching Science with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students Taught by Teachers Reporting Textbook Use						
	Use Textbook to Teach Science				Do Not Use Textbook to Teach Science		
	As Primary Basis for Lessons		As Supplementary Resource				
	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	
Algeria	r	55 (3.6)	0 0	41 (3.5)	0 0	4 (1.3)	0 0
Armenia	r	77 (2.0)	5 (3.3)	14 (1.5)	-9 (2.9) ▼	9 (1.3)	4 (1.7) ▲
Australia	r	28 (3.4)	-3 (5.5)	56 (3.6)	6 (5.2)	16 (3.0)	-3 (4.3)
Bahrain		50 (3.3)	-18 (4.2) ▼	34 (2.6)	1 (3.7)	17 (2.9)	17 (2.9) ▲
Bosnia and Herzegovina	r	58 (2.5)	0 0	31 (2.4)	0 0	11 (1.6)	0 0
Botswana		28 (3.7)	3 (5.4)	69 (3.8)	-2 (5.7)	3 (1.2)	-2 (2.3)
Bulgaria		81 (2.4)	--	16 (2.2)	--	2 (1.2)	--
Chinese Taipei		75 (3.5)	-7 (4.9)	19 (3.1)	5 (4.4)	6 (2.6)	2 (3.1)
Columbia		14 (2.7)	0 0	66 (4.1)	0 0	20 (3.3)	0 0
Cyprus	r	53 (1.2)	-9 (1.8) ▼	45 (1.2)	9 (1.6) ▲	2 (0.3)	0 (0.8)
Czech Republic		43 (2.4)	0 0	56 (2.5)	0 0	1 (0.4)	0 0
Egypt		48 (4.5)	-18 (6.0) ▼	47 (4.7)	14 (6.2) ▲	4 (1.6)	4 (1.7) ▲
El Salvador		13 (2.8)	0 0	76 (3.9)	0 0	11 (2.7)	0 0
England	s	13 (2.3)	-5 (4.5)	72 (2.8)	0 (5.1)	15 (2.4)	6 (3.6)
Georgia		79 (2.8)	0 0	20 (2.7)	0 0	1 (0.6)	0 0
Ghana		34 (3.7)	0 (5.8)	65 (3.8)	7 (6.1)	1 (0.7)	-7 (2.6) ▼
Hong Kong SAR		87 (3.1)	-4 (4.1)	10 (2.6)	2 (3.7)	3 (1.6)	2 (1.8)
Hungary		70 (2.8)	4 (3.5)	30 (2.8)	-5 (3.6)	1 (0.4)	1 (0.4)
Indonesia	s	63 (4.4)	42 (5.9) ▲	34 (4.1)	10 (6.0)	3 (1.8)	-51 (5.0) ▼
Iran, Islamic Rep. of		85 (2.7)	4 (4.0)	8 (1.8)	-4 (3.0)	7 (2.3)	0 (3.0)
Israel	r	46 (4.6)	2 (6.0)	52 (4.5)	2 (5.9)	1 (0.5)	-4 (1.8) ▼
Italy		62 (3.0)	-1 (4.6)	34 (2.7)	-2 (4.5)	4 (1.3)	2 (1.5)
Japan		57 (3.5)	-5 (5.3)	38 (3.7)	1 (5.3)	5 (1.6)	3 (1.9)
Jordan		61 (4.1)	-7 (5.7)	32 (4.0)	0 (5.6)	7 (2.2)	7 (2.2) ▲
Korea, Rep. of	s	73 (3.4)	-6 (4.5)	24 (3.3)	6 (4.4)	3 (1.3)	0 (1.9)
Kuwait	r	53 (5.4)	0 0	26 (4.2)	0 0	21 (3.9)	0 0
Lebanon		49 (3.8)	-1 (5.5)	37 (3.3)	-9 (5.0)	14 (2.7)	9 (3.1) ▲
Lithuania		68 (2.2)	-32 (2.2) ▼	32 (2.2)	32 (2.2) ▲	0 (0.2)	0 (0.2)
Malaysia		65 (4.3)	21 (5.8) ▲	30 (4.1)	-13 (5.6) ▼	4 (1.6)	-8 (3.2) ▼
Malta		28 (0.2)	0 0	54 (0.2)	0 0	18 (0.2)	0 0
Norway		84 (2.9)	-3 (3.7)	14 (2.7)	1 (3.6)	2 (1.0)	2 (1.0)
Oman		49 (4.4)	0 0	46 (4.3)	0 0	5 (2.0)	0 0
Palestinian Nat'l Auth.		63 (4.6)	-8 (5.9)	30 (4.2)	1 (5.6)	7 (2.2)	6 (2.2) ▲
Qatar	r	58 (0.2)	0 0	25 (0.2)	0 0	16 (0.1)	0 0
Romania		71 (2.6)	1 (3.5)	27 (2.5)	-2 (3.4)	2 (0.7)	1 (0.8)
Russian Federation		72 (2.2)	5 (3.9)	28 (2.2)	-4 (3.9)	0 (0.0)	0 (0.2)
Saudi Arabia	x x	--	--	x x	--	x x	--
Scotland	s	22 (3.2)	-8 (5.4)	68 (3.2)	8 (5.2)	10 (1.8)	1 (2.7)
Serbia		67 (2.4)	2 (3.3)	32 (2.3)	-2 (3.3)	1 (0.5)	0 (0.7)
Singapore		44 (2.5)	-29 (3.5) ▼	41 (2.3)	14 (3.4) ▲	15 (1.5)	15 (1.5) ▲
Slovenia		53 (2.6)	-6 (4.2)	47 (2.6)	6 (4.2)	0 (0.0)	-1 (0.4)
Sweden		51 (3.2)	11 (4.5) ▲	46 (3.3)	-11 (4.6) ▼	3 (0.8)	0 (1.4)
Syrian Arab Republic		55 (4.0)	0 0	31 (3.4)	0 0	14 (2.5)	0 0
Thailand		54 (4.3)	0 0	32 (3.8)	0 0	14 (3.0)	0 0
Tunisia		28 (3.6)	15 (4.5) ▲	71 (3.6)	-13 (4.8) ▼	1 (0.0)	-2 (1.4)
Turkey		52 (4.8)	0 0	45 (4.7)	0 0	3 (1.4)	0 0
Ukraine		48 (3.0)	0 0	50 (3.1)	0 0	2 (0.5)	0 0
United States	r	38 (2.7)	-2 (4.4)	58 (2.8)	3 (4.7)	5 (1.2)	-2 (2.1)
‡ Morocco		27 (3.3)	--	72 (3.2)	--	0 (0.4)	--
International Avg.		53 (0.5)		40 (0.5)		7 (0.3)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Benchmarking Participants

Basque Country, Spain		86 (2.8)	12 (5.6) ▲	7 (2.1)	-14 (5.0) ▼	7 (2.5)	2 (3.1)
British Columbia, Canada	r	57 (4.0)	0 0	41 (4.0)	0 0	1 (0.9)	0 0
Dubai, UAE	s	64 (2.6)	0 0	30 (3.0)	0 0	6 (3.1)	0 0
Massachusetts, US		29 (5.0)	0 0	65 (6.0)	0 0	6 (3.6)	0 0
Minnesota, US		27 (6.0)	0 0	68 (6.9)	0 0	5 (3.8)	0 0
Ontario, Canada		43 (5.2)	0 (6.8)	54 (5.2)	1 (7.0)	4 (1.5)	0 (2.5)
Quebec, Canada	r	38 (4.5)	0 (6.9)	48 (4.7)	-3 (6.9)	14 (3.5)	3 (4.7)

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

A diamond (0) indicates the country did not participate in the assessment.



**Exhibit 7.9 Percentage of Time in Science Lessons Students Spend on Various Activities in a Typical Week**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Reviewing Homework	Listening to Lecture-style Presentations	Working Problems with Teacher's Guidance	Working Problems on Their Own Without Teacher's Guidance
Algeria	s 10 (0.4)	s 22 (1.5)	s 14 (0.7)	s 12 (0.7)
Armenia	12 (0.5)	24 (0.6)	15 (0.4)	13 (0.4)
Australia	7 (0.3)	19 (0.8)	20 (0.8)	15 (0.7)
Bahrain	r 10 (0.3)	r 24 (0.9)	r 16 (0.4)	r 10 (0.3)
Bosnia and Herzegovina	s 6 (0.2)	s 34 (1.1)	s 20 (0.6)	s 13 (0.5)
Botswana	r 11 (0.5)	r 20 (1.3)	r 17 (1.0)	r 15 (0.9)
Bulgaria	r 6 (0.3)	r 30 (1.0)	r 17 (0.6)	r 13 (0.5)
Chinese Taipei	10 (0.5)	48 (1.5)	11 (0.6)	5 (0.4)
Colombia	11 (0.6)	17 (1.0)	18 (1.3)	18 (1.1)
Cyprus	s 12 (0.2)	s 23 (0.4)	s 18 (0.2)	s 10 (0.2)
Czech Republic	5 (0.2)	31 (0.6)	18 (0.3)	15 (0.4)
Egypt	s 11 (0.7)	s 28 (1.4)	s 13 (0.8)	s 11 (0.6)
El Salvador	12 (0.5)	16 (0.7)	16 (0.7)	14 (0.7)
England	r 7 (0.3)	r 16 (0.9)	r 28 (1.0)	r 20 (0.8)
Georgia	r 12 (0.4)	r 23 (1.4)	r 12 (0.4)	r 9 (0.4)
Ghana	r 11 (0.7)	r 16 (0.9)	r 17 (0.8)	r 14 (0.6)
Hong Kong SAR	9 (0.6)	39 (1.6)	15 (1.0)	8 (0.9)
Hungary	r 8 (0.2)	r 20 (0.7)	r 19 (0.5)	r 16 (0.4)
Indonesia	s 12 (0.5)	s 24 (1.1)	s 15 (0.8)	s 11 (0.5)
Iran, Islamic Rep. of	9 (0.3)	17 (0.7)	15 (0.6)	12 (0.5)
Israel	x x	x x	x x	x x
Italy	12 (0.4)	29 (0.7)	13 (0.4)	10 (0.4)
Japan	r 3 (0.3)	r 47 (1.5)	r 15 (1.0)	r 5 (0.8)
Jordan	13 (0.5)	20 (1.1)	17 (0.5)	12 (0.5)
Korea, Rep. of	r 5 (0.3)	r 49 (1.6)	r 9 (0.4)	r 8 (0.4)
Kuwait	x x	x x	x x	x x
Lebanon	s 16 (0.8)	s 18 (1.2)	s 19 (0.8)	s 8 (0.7)
Lithuania	8 (0.2)	12 (0.5)	22 (0.5)	23 (0.5)
Malaysia	r 13 (0.6)	r 24 (1.4)	r 15 (0.7)	r 11 (0.6)
Malta	10 (0.0)	31 (0.1)	15 (0.0)	10 (0.1)
Norway	8 (0.4)	27 (0.8)	18 (0.9)	16 (0.7)
Oman	r 10 (0.7)	r 21 (1.5)	r 16 (0.8)	r 13 (0.6)
Palestinian Nat'l Auth.	s 11 (0.5)	s 25 (1.3)	s 16 (0.7)	s 11 (0.5)
Qatar	s 11 (0.0)	s 25 (0.1)	s 13 (0.0)	s 12 (0.0)
Romania	9 (0.3)	24 (0.8)	19 (0.5)	13 (0.4)
Russian Federation	12 (0.3)	23 (0.5)	19 (0.4)	16 (0.4)
Saudi Arabia	x x	x x	x x	x x
Scotland	r 6 (0.2)	r 23 (0.6)	r 28 (0.7)	r 18 (0.8)
Serbia	r 5 (0.2)	r 39 (0.8)	r 19 (0.6)	r 11 (0.4)
Singapore	12 (0.3)	34 (0.8)	14 (0.5)	10 (0.3)
Slovenia	6 (0.2)	28 (0.7)	22 (0.6)	16 (0.4)
Sweden	r 5 (0.3)	25 (0.7)	29 (0.8)	r 15 (0.9)
Syrian Arab Republic	s 12 (0.6)	s 28 (1.4)	s 14 (0.6)	s 10 (0.5)
Thailand	11 (0.6)	21 (1.2)	14 (0.7)	11 (0.6)
Tunisia	r 9 (0.7)	r 14 (1.2)	r 26 (1.5)	r 14 (1.0)
Turkey	8 (0.3)	18 (0.8)	19 (0.9)	12 (0.6)
Ukraine	12 (0.3)	16 (0.8)	15 (0.4)	15 (0.4)
United States	9 (0.4)	20 (0.8)	18 (0.6)	15 (0.6)
‡ Morocco	s 9 (0.7)	s 15 (1.2)	s 20 (1.2)	s 13 (0.8)
<b>International Avg.</b>	<b>9 (0.1)</b>	<b>25 (0.2)</b>	<b>17 (0.1)</b>	<b>13 (0.1)</b>
<b>Benchmarking Participants</b>				
Basque Country, Spain	13 (0.7)	30 (1.4)	14 (0.9)	15 (1.1)
British Columbia, Canada	r 9 (0.4)	r 23 (1.1)	r 17 (0.7)	r 17 (0.9)
Dubai, UAE	s 10 (0.3)	s 24 (0.9)	s 17 (0.7)	s 14 (0.4)
Massachusetts, US	10 (0.7)	19 (1.3)	18 (1.7)	16 (0.9)
Minnesota, US	9 (0.9)	20 (1.6)	17 (2.2)	15 (1.2)
Ontario, Canada	11 (0.6)	23 (1.0)	16 (0.8)	17 (0.9)
Quebec, Canada	7 (0.6)	26 (1.1)	16 (1.0)	13 (0.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



**TIMSS & PIRLS**  
International Study Center  
Lynch School of Education, Boston College

**Exhibit 7.9 Percentage of Time in Science Lessons Students Spend on Various Activities in a Typical Week (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Listening to Teacher Re-teach and Clarify Content/Procedures	Taking Tests or Quizzes	Participating in Classroom Management Tasks Not Related to the Lesson's Content / Purpose	Other Student Activities
Algeria	s 20 (1.3)	s 10 (0.7)	s 5 (0.3)	s 7 (0.6)
Armenia	13 (0.4)	11 (0.3)	6 (0.2)	5 (0.3)
Australia	11 (0.5)	7 (0.3)	10 (0.7)	12 (1.1)
Bahrain	r 13 (0.4)	r 12 (0.5)	r 8 (0.2)	r 7 (0.3)
Bosnia and Herzegovina	s 11 (0.4)	s 8 (0.3)	s 4 (0.2)	s 5 (0.4)
Botswana	r 13 (0.8)	r 11 (0.7)	r 6 (0.4)	r 7 (0.7)
Bulgaria	r 8 (0.3)	r 17 (0.6)	r 4 (0.4)	r 4 (0.4)
Chinese Taipei	9 (0.8)	8 (0.6)	4 (0.3)	3 (0.4)
Colombia	11 (0.6)	11 (0.6)	7 (0.5)	6 (0.5)
Cyprus	s 14 (0.2)	s 10 (0.1)	s 7 (0.2)	s 6 (0.2)
Czech Republic	10 (0.3)	10 (0.2)	5 (0.3)	6 (0.3)
Egypt	s 14 (0.8)	s 10 (0.5)	s 6 (0.4)	s 7 (0.5)
El Salvador	16 (0.7)	11 (0.5)	8 (0.4)	7 (0.5)
England	r 10 (0.4)	r 5 (0.2)	r 7 (0.4)	r 8 (0.6)
Georgia	r 9 (0.4)	r 18 (0.6)	r 6 (0.4)	r 10 (1.2)
Ghana	r 12 (0.7)	r 15 (0.6)	r 8 (0.5)	r 7 (0.4)
Hong Kong SAR	8 (0.4)	8 (0.9)	5 (0.4)	8 (1.0)
Hungary	r 13 (0.4)	r 14 (0.3)	r 4 (0.2)	r 7 (0.4)
Indonesia	s 12 (0.5)	s 13 (0.7)	s 7 (0.3)	s 7 (0.3)
Iran, Islamic Rep. of	15 (0.6)	14 (0.6)	8 (0.5)	9 (0.4)
Israel	x x	x x	x x	x x
Italy	16 (0.6)	10 (0.4)	5 (0.3)	5 (0.4)
Japan	r 14 (0.7)	r 5 (0.5)	r 2 (0.3)	r 8 (1.3)
Jordan	14 (0.5)	12 (0.5)	6 (0.3)	6 (0.4)
Korea, Rep. of	r 13 (0.8)	r 6 (0.4)	r 6 (0.5)	r 5 (0.5)
Kuwait	x x	x x	x x	x x
Lebanon	s 14 (0.9)	s 14 (0.6)	s 6 (0.4)	s 6 (0.4)
Lithuania	14 (0.4)	14 (0.5)	3 (0.2)	r 3 (0.3)
Malaysia	r 13 (0.8)	r 10 (0.5)	r 9 (0.7)	r 6 (0.5)
Malta	13 (0.1)	5 (0.0)	9 (0.1)	7 (0.0)
Norway	12 (0.4)	6 (0.3)	4 (0.3)	9 (0.8)
Oman	r 14 (0.8)	r 11 (0.7)	r 5 (0.3)	r 9 (0.9)
Palestinian Nat'l Auth.	s 14 (0.8)	s 10 (0.4)	s 6 (0.4)	s 7 (0.4)
Qatar	s 12 (0.0)	s 10 (0.0)	s 7 (0.0)	s 11 (0.0)
Romania	11 (0.5)	14 (0.5)	5 (0.2)	5 (0.2)
Russian Federation	9 (0.2)	15 (0.4)	1 (0.1)	4 (0.2)
Saudi Arabia	x x	x x	x x	x x
Scotland	r 9 (0.3)	r 4 (0.2)	r 7 (0.3)	r 5 (0.3)
Serbia	r 11 (0.3)	r 8 (0.3)	r 3 (0.2)	r 5 (0.4)
Singapore	9 (0.3)	8 (0.3)	7 (0.4)	5 (0.4)
Slovenia	13 (0.4)	5 (0.3)	4 (0.2)	7 (0.5)
Sweden	r 11 (0.3)	r 7 (0.2)	r 4 (0.2)	r 5 (0.6)
Syrian Arab Republic	s 14 (0.8)	s 11 (0.5)	s 6 (0.3)	s 6 (0.3)
Thailand	18 (0.8)	11 (0.5)	8 (0.4)	7 (0.4)
Tunisia	r 18 (1.0)	r 11 (0.9)	r 5 (0.4)	r 5 (0.5)
Turkey	15 (0.8)	9 (0.6)	9 (0.6)	8 (0.4)
Ukraine	20 (0.8)	14 (0.4)	3 (0.1)	6 (0.4)
United States	11 (0.4)	9 (0.3)	7 (0.3)	12 (0.9)
‡ Morocco	s 19 (1.0)	s 13 (0.9)	s 5 (0.4)	s 6 (1.1)
<b>International Avg.</b>	<b>13 (0.1)</b>	<b>10 (0.1)</b>	<b>6 (0.1)</b>	<b>7 (0.1)</b>
<b>Benchmarking Participants</b>				
Basque Country, Spain	9 (0.7)	8 (0.5)	6 (0.4)	6 (1.2)
British Columbia, Canada	r 10 (0.6)	r 9 (0.4)	r 5 (0.5)	r 10 (1.1)
Dubai, UAE	s 10 (0.5)	s 10 (0.4)	s 6 (0.5)	s 9 (0.3)
Massachusetts, US	12 (0.6)	9 (0.5)	6 (0.7)	11 (1.7)
Minnesota, US	11 (0.8)	8 (0.6)	7 (0.5)	12 (1.9)
Ontario, Canada	10 (0.5)	8 (0.4)	7 (0.7)	9 (1.2)
Quebec, Canada	9 (0.6)	8 (0.5)	10 (0.8)	10 (1.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



### How Are Computers Used in Science Classes?

Exhibit 7.10 shows the number of countries with a policy on computer use in their national curriculum, changes in the percentages of students whose teachers reported that computers were available, and the percentages of students being asked to use computers for various activities in about half the science lessons or more. At the fourth grade, 13 of the countries had policies about computer use as part of their curriculum as did three of the benchmarking participants. On average, about half (49%) of students had teachers who reported that computers were available for science class. However, in some countries, including Algeria, Iran, and the Ukraine, computers were available for less than 10 percent of the students, whereas in countries such as Denmark, Japan, New Zealand, Scotland, and Singapore, at least 80 percent of students had access to computers in science class.

The percentage of students with access to computers increased since 2003 in seven countries—Chinese Taipei, Lithuania, the Netherlands, the Russian Federation, Slovenia, Tunisia, the United States—and the province of Quebec. There was a decrease only in England. Despite the relatively high level of availability of computers in science class, fourth-grade teachers reported little usage for instructional purposes. The most common application at the fourth grade was looking up ideas and information, with 12 percent of students using a computer for this in about half of the science lessons, according to their teachers. The highest percentages were in Australia (29%), Denmark (25%), Hong Kong SAR (32%), Kuwait (20%), New Zealand (38%), Qatar (26%), Scotland (34%), as well as the benchmarking participants of Dubai (51%), Massachusetts (27%), and Quebec (30%).

At the eighth grade, 21 countries and 2 benchmarking participants had a policy statement about computer use in their curriculum. Ten countries had increases in computer availability between 2003 and 2007, including Armenia, Botswana, Iran, Lebanon, Malaysia, Norway, Romania, the Russian Federation, Serbia, and Slovenia, together with the provinces of Ontario and Quebec. In 2007, on average internationally, teachers reported availability of computers for 41 percent of the eighth-grade students. As at

fourth grade, computer use in eighth-grade science classes was relatively infrequent. Highest level of use was reported in Armenia, where more than 20 percent of students used the computer in at least half the science lessons for doing scientific procedures or experiments, studying natural phenomena through simulations, practicing skills and procedures, looking up ideas and information, and processing and analyzing data.

Exhibit 7.10 Computer Use in Science Class with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	National Curriculum Contains Policies / Statements About the Use of Computers	Trends in Percentage of Students Whose Teachers Reported That Computers Are Available		Percentage of Students Whose Teachers Reported on Computer Use About Half of the Lessons or More			
		2007 Percent of Students	Difference in Percent from 2003	Doing Scientific Procedures or Experiments	Studying Natural Phenomena Through Simulations	Practicing Skills and Procedures	Looking Up Ideas and Information
Algeria	●	5 (2.1)	∅ ∅	0 (0.0)	0 (0.0)	3 (1.6)	4 (1.8)
Armenia	●	72 (3.5)	--	--	--	--	--
Australia	●	78 (2.8)	-6 (4.1)	2 (1.2)	3 (1.5)	6 (1.9)	29 (3.9)
Austria	○	74 (3.0)	∅ ∅	0 (0.0)	1 (0.8)	3 (0.9)	11 (1.9)
Chinese Taipei	●	53 (4.1)	17 (5.7) ▲	5 (2.1)	5 (2.1)	2 (1.4)	4 (1.8)
Colombia	○	16 (3.0)	∅ ∅	1 (0.8)	2 (1.1)	3 (1.3)	6 (1.8)
Czech Republic	○	54 (3.7)	∅ ∅	1 (0.7)	1 (0.7)	3 (1.6)	4 (1.9)
Denmark	○	r 91 (2.2)	∅ ∅	r 2 (1.4)	r 3 (1.1)	r 11 (3.3)	r 25 (3.9)
El Salvador	○	18 (3.5)	∅ ∅	2 (1.1)	3 (1.5)	4 (1.6)	7 (2.3)
England	●	r 77 (3.7)	-11 (4.7) ▼	7 (2.5)	9 (2.5)	8 (2.6)	17 (3.1)
Georgia	○	15 (3.4)	∅ ∅	0 (0.4)	1 (0.7)	2 (1.4)	0 (0.0)
Germany	●	64 (3.6)	∅ ∅	1 (0.4)	1 (0.8)	2 (1.0)	13 (2.2)
Hong Kong SAR	●	71 (4.1)	7 (6.3)	3 (1.7)	7 (2.4)	10 (2.9)	32 (4.3)
Hungary	○	24 (3.7)	0 (5.4)	0 (0.0)	0 (0.3)	2 (1.2)	2 (1.2)
Iran, Islamic Rep. of	○	2 (0.7)	-2 (1.9)	1 (0.3)	0 (0.0)	0 (0.1)	0 (0.2)
Italy	●	25 (2.6)	6 (3.7)	3 (1.2)	3 (1.3)	3 (1.1)	6 (1.5)
Japan	●	84 (2.9)	-5 (4.0)	0 (0.3)	8 (2.0)	0 (0.0)	4 (1.5)
Kazakhstan	○	38 (5.0)	∅ ∅	0 (0.3)	3 (1.5)	8 (3.2)	9 (3.1)
Kuwait	○	r 39 (4.3)	∅ ∅	r 12 (3.2)	r 9 (2.7)	r 20 (3.2)	r 20 (3.6)
Latvia	○	37 (3.6)	--	1 (0.5)	1 (0.4)	2 (0.7)	12 (2.8)
Lithuania	●	37 (3.8)	29 (4.4) ▲	0 (0.0)	0 (0.0)	2 (1.3)	13 (2.4)
Morocco	○	17 (3.3)	--	1 (0.6)	3 (1.3)	2 (1.1)	6 (2.6)
Netherlands	○	62 (4.7)	24 (6.8) ▲	1 (1.0)	0 (0.2)	0 (0.2)	13 (3.0)
New Zealand	○	r 89 (1.7)	4 (3.1)	3 (0.8)	6 (1.4)	5 (1.3)	38 (2.6)
Norway	●	61 (3.8)	7 (5.7)	1 (0.7)	2 (1.1)	1 (0.0)	3 (1.3)
Qatar	○	r 51 (0.2)	∅ ∅	r 10 (0.1)	r 14 (0.1)	r 24 (0.2)	r 26 (0.2)
Russian Federation	○	16 (2.1)	12 (2.5) ▲	1 (0.7)	2 (0.9)	1 (0.8)	4 (1.2)
Scotland	●	s 89 (2.8)	9 (5.2)	r 4 (1.5)	r 4 (1.6)	r 9 (2.7)	r 34 (3.7)
Singapore	●	80 (2.6)	3 (4.3)	12 (2.2)	8 (1.6)	17 (2.5)	19 (2.5)
Slovak Republic	○	51 (4.0)	∅ ∅	1 (0.8)	1 (0.7)	6 (1.7)	14 (2.7)
Slovenia	○	53 (3.0)	30 (4.9) ▲	1 (0.9)	1 (0.8)	4 (1.1)	10 (2.0)
Sweden	○	77 (2.6)	∅ ∅	2 (1.0)	0 (0.0)	2 (1.1)	8 (1.8)
Tunisia	○	31 (3.7)	16 (5.0) ▲	10 (2.3)	9 (2.2)	11 (2.3)	11 (2.4)
Ukraine	○	8 (2.3)	∅ ∅	0 (0.0)	0 (0.0)	1 (0.9)	1 (0.8)
United States	○	77 (2.6)	9 (3.6) ▲	5 (1.4)	4 (1.2)	8 (1.4)	19 (2.2)
Yemen	○	24 (4.5)	∅ ∅	2 (1.5)	2 (1.2)	9 (3.4)	13 (3.8)
International Avg.		49 (0.6)		3 (0.2)	3 (0.2)	6 (0.3)	12 (0.4)

## Benchmarking Participants

Alberta, Canada	●	78 (3.1)	∅ ∅	6 (1.9)	4 (1.5)	8 (1.7)	16 (2.8)
British Columbia, Canada	●	r 58 (4.4)	∅ ∅	r 4 (2.4)	r 5 (2.7)	r 6 (2.5)	r 16 (2.8)
Dubai, UAE	○	s 70 (2.6)	∅ ∅	s 23 (4.6)	s 20 (4.7)	s 27 (4.4)	s 51 (3.9)
Massachusetts, US	○	73 (4.5)	∅ ∅	4 (2.3)	3 (0.2)	6 (2.8)	27 (4.7)
Minnesota, US	○	56 (6.7)	∅ ∅	2 (1.6)	3 (2.1)	4 (2.3)	4 (2.5)
Ontario, Canada	●	62 (4.2)	0 (6.2)	6 (2.8)	8 (3.8)	7 (2.8)	19 (4.5)
Quebec, Canada	○	72 (4.5)	18 (6.4) ▲	4 (1.6)	5 (1.9)	6 (1.8)	30 (4.4)

● Yes ○ No

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by National Research Coordinators and by teachers.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s"

indicates data are available for at least 50 but less than 70% of the students.

A diamond (∅) indicates the country did not participate in the assessment.

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Exhibit 7.10 Computer Use in Science Class with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	National Curriculum Contains Policies / Statements About the Use of Computers	Trends in Percentage of Students Whose Teachers Reported That Computers Are Available		Percentage of Students Whose Teachers Reported on Computer Use About Half of the Lessons or More					
		2007 Percent of Students	Difference in Percent from 2003	Doing Scientific Procedures or Experiments	Studying Natural Phenomena Through Simulations	Practicing Skills and Procedures	Looking Up Ideas and Information	Processing and Analyzing Data	
Algeria	○	r 37 (3.4)	◇ 0	r 6 (1.7)	r 6 (1.5)	r 8 (1.7)	r 13 (2.2)	r 12 (2.0)	
Armenia	○	s 53 (3.1)	30 (4.1) ▲	r 25 (2.2)	r 26 (2.3)	r 28 (2.8)	r 26 (2.2)	r 28 (2.8)	
Australia	●	r 61 (3.6)	-13 (5.2) ▼	r 4 (1.5)	r 2 (1.0)	r 5 (1.3)	r 10 (2.1)	r 5 (1.7)	
Bahrain	○	s 35 (2.8)	-20 (4.6) ▼	r 3 (0.4)	r 7 (1.1)	r 11 (1.7)	r 11 (2.0)	r 8 (1.1)	
Bosnia and Herzegovina	○	s 21 (2.3)	◇ 0	r 2 (0.5)	r 2 (0.6)	r 3 (0.6)	r 5 (0.8)	r 3 (0.6)	
Botswana	●	r 14 (2.8)	9 (3.5) ▲	r 0 (0.0)	r 1 (0.0)	r 1 (0.0)	r 0 (0.0)	r 1 (0.0)	
Bulgaria	○	s 56 (3.0)	--	r 0 (0.3)	r 1 (0.3)	r 5 (1.5)	r 10 (1.8)	r 4 (1.2)	
Chinese Taipei	●	r 34 (4.0)	-10 (5.6) ▼	r 1 (0.0)	r 2 (1.1)	r 1 (0.0)	r 3 (1.3)	r 3 (1.3)	
Colombia	○	s 22 (3.9)	◇ 0	r 3 (1.3)	r 2 (1.3)	r 5 (1.8)	r 11 (2.8)	r 6 (2.2)	
Cyprus	○	r 19 (1.0)	0 (1.3)	r 1 (0.2)	r 1 (0.2)	r 1 (0.3)	r 3 (0.4)	r 2 (0.3)	
Czech Republic	○	r 77 (2.6)	◇ 0	r 2 (0.6)	r 3 (0.7)	r 7 (1.3)	r 10 (1.4)	r 3 (0.8)	
Egypt	○	--	--	--	--	--	--	--	
El Salvador	○	s 31 (3.5)	◇ 0	r 1 (0.0)	r 2 (1.3)	r 5 (1.8)	r 13 (2.6)	r 6 (1.5)	
England	●	s 66 (3.1)	-4 (5.0)	r 1 (0.3)	r 4 (1.2)	r 3 (1.1)	r 8 (1.7)	r 3 (1.0)	
Georgia	○	s 21 (2.8)	◇ 0	r 1 (0.3)	r 1 (0.4)	r 2 (0.6)	r 4 (1.0)	r 3 (0.7)	
Ghana	○	s 5 (2.1)	-4 (3.6)	r 0 (0.0)	r 2 (1.4)	r 1 (0.0)	r 2 (1.1)	r 2 (1.1)	
Hong Kong SAR	●	s 55 (5.3)	-1 (7.0)	r 13 (3.3)	r 7 (2.6)	r 6 (2.2)	r 12 (3.2)	r 8 (2.6)	
Hungary	●	s 43 (3.2)	2 (4.3)	r 2 (0.9)	r 1 (0.6)	r 3 (0.7)	r 4 (1.0)	r 3 (0.8)	
Indonesia	○	s 22 (4.0)	8 (4.7)	r 0 (0.0)	r 1 (0.5)	r 4 (1.7)	r 2 (1.3)	r 2 (1.1)	
Iran, Islamic Rep. of	○	s 6 (1.7)	5 (1.9) ▲	r 1 (0.8)	r 1 (0.9)	r 2 (1.0)	r 3 (1.2)	r 2 (0.9)	
Israel	●	s 57 (4.2)	6 (5.9)	r 6 (1.9)	r 3 (1.5)	r 8 (2.2)	r 8 (2.4)	r 5 (1.9)	
Italy	●	s 37 (3.0)	2 (4.8)	r 3 (1.0)	r 2 (0.9)	r 3 (1.2)	r 4 (1.4)	r 3 (1.2)	
Japan	●	s 78 (3.2)	-2 (4.7)	r 0 (0.0)	r 3 (1.4)	r 0 (0.0)	r 4 (1.7)	r 1 (0.8)	
Jordan	●	s 18 (3.2)	0 (4.8)	r 3 (1.4)	r 4 (1.5)	r 3 (1.2)	r 9 (2.5)	r 6 (1.8)	
Korea, Rep. of	●	r 77 (3.3)	-9 (4.2) ▼	r 25 (3.4)	r 22 (3.3)	r 13 (2.7)	r 22 (3.6)	r 16 (3.0)	
Kuwait	●	r 36 (4.7)	◇ 0	r 10 (3.0)	r 16 (3.5)	r 17 (3.6)	r 18 (3.7)	r 15 (3.2)	
Lebanon	○	s 32 (3.7)	15 (4.4) ▲	r 6 (2.8)	r 3 (1.2)	r 5 (1.4)	r 12 (3.2)	r 8 (2.8)	
Lithuania	●	s 73 (2.2)	1 (3.5)	r 1 (0.5)	r 3 (0.8)	r 9 (1.2)	r 21 (2.0)	r 9 (1.2)	
Malaysia	●	s 54 (4.4)	39 (5.4) ▲	r 9 (2.4)	r 17 (3.5)	r 10 (2.3)	r 21 (3.3)	r 9 (2.5)	
Malta	●	s 30 (0.2)	◇ 0	r 1 (0.0)	r 1 (0.0)	r 2 (0.1)	r 4 (0.1)	r 1 (0.1)	
Norway	●	s 77 (3.5)	16 (5.2) ▲	r 5 (1.6)	r 0 (0.3)	r 4 (1.8)	r 11 (2.3)	r 4 (1.2)	
Oman	○	s 29 (3.8)	◇ 0	r 3 (1.5)	r 3 (1.3)	r 4 (1.6)	r 7 (2.0)	r 3 (1.5)	
Palestinian Nat'l Auth.	●	s 25 (3.5)	-6 (5.2)	r 1 (0.7)	r 2 (1.1)	r 3 (1.3)	r 6 (1.9)	r 3 (1.5)	
Qatar	○	s 27 (0.1)	◇ 0	r 5 (0.1)	r 5 (0.1)	r 8 (0.1)	r 10 (0.1)	r 10 (0.1)	
Romania	○	s 64 (3.4)	43 (4.3) ▲	r 6 (1.2)	r 5 (1.1)	r 9 (1.4)	r 12 (1.7)	r 8 (1.4)	
Russian Federation	○	s 48 (3.1)	36 (3.6) ▲	r 1 (0.3)	r 2 (0.7)	r 4 (1.0)	r 9 (1.5)	r 3 (0.9)	
Saudi Arabia	○	s 23 (3.8)	--	r 3 (1.4)	r 3 (1.0)	r 8 (2.2)	r 9 (2.6)	r 5 (1.6)	
Scotland	●	s 74 (2.4)	6 (4.3)	r 1 (0.6)	r 2 (0.8)	r 2 (0.6)	r 5 (1.1)	r 1 (0.3)	
Serbia	○	s 26 (2.5)	14 (3.0) ▲	r 0 (0.2)	r 1 (0.4)	r 1 (0.5)	r 3 (0.7)	r 2 (0.5)	
Singapore	●	s 66 (2.3)	-13 (3.2) ▼	r 3 (0.8)	r 3 (0.8)	r 5 (1.3)	r 9 (1.3)	r 3 (0.9)	
Slovenia	○	s 64 (2.7)	14 (3.9) ▲	r 2 (0.8)	r 2 (0.6)	r 3 (0.8)	r 8 (1.5)	r 5 (1.1)	
Sweden	○	s 60 (3.1)	-4 (4.5)	r 1 (0.5)	r 0 (0.0)	r 1 (0.4)	r 8 (1.6)	r 2 (0.7)	
Syrian Arab Republic	○	s 23 (2.9)	◇ 0	r 4 (1.2)	r 4 (1.2)	r 4 (1.6)	r 7 (1.5)	r 7 (1.7)	
Thailand	○	s 38 (4.4)	◇ 0	r 7 (1.9)	r 9 (2.4)	r 9 (2.5)	r 14 (3.1)	r 9 (2.5)	
Tunisia	○	s 14 (2.7)	-22 (5.1) ▼	r 1 (0.9)	r 4 (1.5)	r 3 (1.4)	r 3 (1.4)	r 3 (1.4)	
Turkey	●	s 41 (4.1)	◇ 0	r 6 (2.3)	r 14 (3.1)	r 14 (3.0)	r 19 (3.3)	r 15 (3.2)	
Ukraine	○	s 17 (2.4)	◇ 0	r 0 (0.1)	r 1 (0.4)	r 2 (0.7)	r 3 (0.6)	r 2 (0.5)	
United States	○	r 74 (2.6)	2 (3.9)	r 4 (1.2)	r 5 (1.3)	r 10 (2.0)	r 18 (2.5)	r 9 (1.4)	
‡ Morocco	●	s 15 (3.8)	--	r 1 (0.7)	r 2 (0.9)	r 1 (0.6)	r 4 (1.8)	r 4 (1.5)	
International Avg.		41 (0.5)		4 (0.2)	4 (0.2)	5 (0.2)	9 (0.3)	6 (0.2)	
<b>Benchmarking Participants</b>									
Basque Country, Spain	○	s 66 (3.7)	5 (6.0)	r 2 (1.2)	r 2 (1.2)	r 5 (2.3)	r 11 (3.2)	r 8 (2.8)	
British Columbia, Canada	●	r 59 (3.8)	◇ 0	r 2 (1.4)	r 2 (1.4)	r 2 (1.3)	r 9 (2.7)	r 3 (1.8)	
Dubai, UAE	○	s 37 (2.8)	◇ 0	s 6 (0.8)	s 7 (1.6)	s 14 (2.2)	s 22 (2.3)	s 15 (1.4)	
Massachusetts, US	○	s 59 (7.0)	◇ 0	r 4 (2.6)	r 4 (2.5)	r 7 (3.5)	r 16 (5.7)	r 2 (1.2)	
Minnesota, US	○	s 62 (7.0)	◇ 0	r 1 (1.0)	r 3 (3.0)	r 2 (2.1)	r 9 (4.9)	r 3 (3.1)	
Ontario, Canada	●	s 71 (3.9)	22 (6.0) ▲	r 6 (2.2)	r 4 (1.8)	r 5 (2.0)	r 10 (2.8)	r 6 (2.0)	
Quebec, Canada	○	r 60 (5.0)	19 (7.2) ▲	r 1 (0.8)	r 2 (1.5)	r 3 (1.6)	r 12 (3.7)	r 7 (3.1)	

● Yes ○ No ▲ 2007 percent significantly higher ▼ 2007 percent significantly lower

Background data provided by National Research Coordinators and by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (◇) indicates the country did not participate in the assessment.

### What is the Role of Homework?

Exhibit 7.11 presents teachers' reports about their emphasis on homework. For the Index of Teachers' Emphasis on Science Homework (ESH), students in the high category had teachers who reported giving relatively long homework assignments (more than 30 minutes) on a relatively frequent basis (in about half the lessons or more). Students in the low category had teachers who gave short assignments (less than 30 minutes) relatively infrequently (in about half the lessons or less). The medium level includes all other possible combinations of responses. At the fourth grade, on average internationally, homework was not very prevalent even though there was variation from country to country. Only nine countries and one benchmarking participant had a policy about assigning science homework. Also, there were not many changes between 2003 and 2007, except in Singapore where fewer students were in the low category and more were in the high category, and Chinese Taipei, where the pattern was reversed. In 2007, internationally on average, almost two-thirds of the students (65%) were in the low category and only 7 percent were in the high category. Only 14 countries had more than a few percent of their fourth-grade students at the high level of the index, and these students had lower average science achievement than students at the other two levels, perhaps because in these countries teachers mainly assigned homework as a remedial exercise to the weaker students.

At the eighth grade, teachers placed more emphasis on science homework than they did at the fourth grade, but there was still substantial variation. Sixteen countries reported having a policy about assigning science homework. Countries with most students in the high category included Italy (42%), Colombia (39%), and Ghana (35%). Eighteen countries and four benchmarking participants had more than half their students in the low category. Only two countries were assigning more homework in 2007 than in 2003—Tunisia and Australia—whereas less homework was assigned in

nine countries—the Russian Federation, Armenia, England, Malaysia, Egypt, Jordan, Lithuania, Slovenia, and Bahrain. There was a curvilinear relationship between teachers assigning science homework and science achievement, with students in the medium category having higher average achievement, across countries, than students in the high or low category.

For students at the eighth grade, Exhibit 7.12 presents teachers' reports about how they used homework in their science instruction. Internationally on average, the teachers reported always or almost always monitoring whether the homework was completed for 78 percent of the students. Sixty-three percent of the students, on average, had teachers who reported correcting students' assignments and giving them feedback. Among less frequent uses, teachers reported using homework to contribute to grades or marks for 38 percent of the students, use homework as a basis for class discussion for 27 percent, and have the students correct their own homework in class for 24 percent.

For students at the eighth grade, Exhibit 7.13 shows trends in how frequently teachers assign four different types of science homework. Assigning problem or question sets and reading from a textbook were the most common form of homework, with 38 percent and 35 percent of students, respectively, having teachers who always use that type when they assign homework. Short writing assignments (23%) or work on small investigations (10%) were less common.

**Exhibit 7.11 Index of Teachers' Emphasis on Science Homework (ESH) with Trends**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Have Policy to Assign Science Homework	High ESH			Medium ESH			Low ESH		
		2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Italy	○	30 (3.0)	533 (5.0)	6 (4.3)	34 (3.0)	531 (4.9)	1 (4.2)	36 (3.1)	542 (4.5)	-7 (4.8)
Singapore	○	25 (2.6)	576 (8.9)	12 (3.9) ▲	30 (2.5)	600 (7.4)	5 (4.1)	45 (2.5)	585 (6.1)	-17 (4.9) ▼
Kazakhstan	○	24 (3.8)	534 (7.8)	0 0	75 (3.9)	533 (7.0)	0 0	1 (1.0)	~ ~	0 0
Colombia	○	23 (3.7)	390 (12.4)	0 0	49 (4.6)	397 (8.9)	0 0	28 (4.4)	417 (14.8)	0 0
Algeria	●	19 (3.1)	357 (8.3)	0 0	38 (4.9)	341 (14.3)	0 0	43 (4.7)	364 (9.0)	0 0
Armenia	○	17 (3.6)	487 (17.5)	--	32 (3.3)	482 (10.1)	--	50 (4.3)	488 (9.1)	--
Russian Federation	○	16 (3.3)	527 (14.0)	0 (4.5)	79 (3.4)	552 (5.5)	-1 (4.8)	5 (1.3)	510 (10.1)	2 (1.8)
Tunisia	○	15 (3.0)	322 (15.8)	4 (4.1)	30 (3.9)	319 (11.9)	0 (5.6)	55 (4.0)	311 (9.7)	-4 (6.1)
Georgia	●	13 (3.1)	443 (9.9)	0 0	49 (5.1)	415 (6.9)	0 0	38 (4.6)	410 (6.0)	0 0
El Salvador	○	11 (2.8)	406 (9.6)	0 0	56 (4.4)	384 (6.5)	0 0	33 (4.4)	391 (7.3)	0 0
Iran, Islamic Rep. of	●	11 (2.5)	418 (13.0)	-2 (4.0)	27 (3.5)	453 (8.5)	-4 (5.9)	62 (3.7)	431 (5.9)	5 (6.2)
Morocco	●	9 (2.6)	303 (33.9)	--	25 (3.6)	283 (16.9)	--	66 (4.3)	304 (7.9)	--
Yemen	●	8 (2.9)	206 (26.0)	0 0	55 (4.6)	197 (10.5)	0 0	36 (4.4)	194 (12.5)	0 0
Ukraine	●	7 (2.2)	482 (11.6)	0 0	89 (2.5)	473 (3.2)	0 0	3 (1.4)	489 (8.5)	0 0
Latvia	-	3 (1.4)	548 (18.4)	--	56 (3.9)	545 (3.0)	--	40 (4.1)	541 (3.8)	--
Slovenia	○	3 (1.1)	526 (18.1)	-1 (2.0)	11 (1.8)	522 (5.6)	0 (3.3)	87 (2.0)	518 (2.0)	0 (3.8)
Kuwait	-	r 2 (1.5)	~ ~	0 0	15 (3.2)	373 (14.9)	0 0	83 (3.0)	340 (6.2)	0 0
Hungary	○	2 (0.9)	~ ~	1 (1.1)	59 (4.1)	542 (4.7)	-4 (6.1)	39 (4.2)	529 (7.0)	3 (6.1)
United States	○	r 2 (0.9)	~ ~	1 (1.1)	14 (2.2)	547 (5.5)	1 (3.0)	84 (2.3)	538 (3.2)	-2 (3.2)
Qatar	●	r 2 (0.0)	~ ~	0 0	36 (0.2)	294 (3.3)	0 0	63 (0.2)	281 (3.1)	0 0
England	○	r 2 (1.3)	~ ~	-1 (1.9)	10 (2.5)	538 (8.0)	-2 (4.5)	88 (2.6)	540 (3.1)	3 (4.8)
Slovak Republic	●	2 (0.9)	~ ~	0 0	16 (2.9)	521 (9.8)	0 0	82 (2.9)	528 (5.0)	0 0
Lithuania	●	2 (1.0)	~ ~	0 (1.3)	21 (2.6)	519 (4.1)	3 (3.5)	77 (2.7)	513 (2.6)	-4 (3.7)
Netherlands	○	r 1 (0.9)	~ ~	1 (1.0)	10 (2.9)	518 (9.5)	2 (4.1)	89 (3.0)	523 (3.1)	-3 (4.2)
Czech Republic	○	1 (1.0)	~ ~	0 0	3 (1.3)	522 (16.9)	0 0	96 (1.6)	514 (3.1)	0 0
Chinese Taipei	○	1 (0.8)	~ ~	-7 (2.6) ▼	16 (3.1)	556 (4.4)	-3 (4.5)	83 (3.0)	556 (2.3)	9 (4.5) ▲
Norway	○	1 (0.7)	~ ~	-2 (1.6)	5 (1.9)	483 (6.6)	2 (2.4)	94 (2.0)	476 (3.6)	0 (2.8)
Sweden	○	0 (0.3)	~ ~	0 0	9 (2.4)	535 (8.6)	0 0	90 (2.4)	524 (2.9)	0 0
New Zealand	○	r 0 (0.3)	~ ~	-1 (0.7)	5 (1.3)	516 (12.0)	1 (1.6)	95 (1.3)	505 (2.7)	0 (1.7)
Scotland	○	s 0 (0.0)	~ ~	0 (0.0)	4 (2.0)	472 (11.2)	1 (2.7)	95 (2.1)	502 (2.5)	-1 (2.8)
Germany	○	0 (0.0)	~ ~	0 0	13 (2.2)	525 (5.2)	0 0	87 (2.2)	528 (2.6)	0 0
Hong Kong SAR	○	r 0 (0.4)	~ ~	-1 (1.0)	8 (2.5)	552 (16.9)	-27 (5.2) ▼	92 (2.5)	554 (3.7)	27 (5.3) ▲
Denmark	○	r 0 (0.3)	~ ~	0 0	2 (0.7)	~ ~	0 0	98 (0.8)	518 (3.1)	0 0
Australia	○	r 0 (0.0)	~ ~	0 (0.4)	2 (1.2)	~ ~	-3 (1.8)	98 (1.2)	527 (4.1)	3 (1.9)
Austria	○	0 (0.0)	~ ~	0 0	1 (0.4)	~ ~	0 0	99 (0.4)	525 (2.8)	0 0
Japan	○	0 (0.0)	~ ~	0 (0.0)	8 (2.1)	559 (3.5)	-1 (3.2)	92 (2.1)	547 (2.2)	1 (3.2)
International Avg.		7 (0.3)	441 (4.0)		28 (0.5)	473 (1.6)		65 (0.5)	473 (1.0)	
<b>Benchmarking Participants</b>										
Dubai, UAE	●	s 2 (1.7)	~ ~	0 0	53 (4.8)	450 (9.0)	0 0	45 (4.9)	445 (8.8)	0 0
British Columbia, Canada	○	r 1 (1.1)	~ ~	0 0	8 (2.1)	538 (12.3)	0 0	91 (2.4)	536 (3.3)	0 0
Ontario, Canada	○	0 (0.4)	~ ~	-2 (1.9)	9 (2.3)	537 (15.3)	-3 (4.2)	91 (2.3)	534 (4.1)	5 (4.6)
Quebec, Canada	○	r 0 (0.0)	~ ~	-2 (1.2)	5 (1.8)	503 (11.3)	-3 (3.1)	95 (1.8)	520 (2.9)	5 (3.3)
Alberta, Canada	○	0 (0.0)	~ ~	0 0	4 (1.4)	553 (9.8)	0 0	96 (1.4)	542 (4.1)	0 0
Massachusetts, US	○	0 (0.0)	~ ~	0 0	7 (3.6)	585 (19.4)	0 0	93 (3.6)	571 (4.4)	0 0
Minnesota, US	○	r 0 (0.0)	~ ~	0 0	3 (2.5)	564 (7.1)	0 0	97 (2.5)	557 (5.8)	0 0

● Yes

○ No

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by National Research Coordinators and by teachers.

Index based on teachers' responses to two questions about how often they usually assign science homework and how many minutes of science homework they usually assign.

High level indicates the assignment of more than 30 minutes of homework about half of the lessons or more. Low level indicates no assignment or the assignment of less than 30 minutes of homework about half of the lessons or less. Medium level includes all other possible combinations of responses.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.



**Exhibit 7.11 Index of Teachers' Emphasis on Science Homework (ESH) with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Have Policy to Assign Science Homework	High ESH			Medium ESH			Low ESH		
		2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Italy	○	42 (2.8)	495 (4.5)	-1 (4.9)	36 (3.3)	494 (4.9)	1 (5.0)	21 (2.8)	496 (5.8)	0 (4.1)
Colombia	○	39 (4.6)	418 (6.1)	0	27 (4.4)	413 (6.1)	0	33 (5.0)	416 (8.1)	0
Ghana	●	35 (3.8)	300 (9.6)	6 (5.9)	46 (4.0)	309 (9.6)	5 (6.3)	19 (3.3)	293 (15.1)	-10 (4.8)
Thailand	○	28 (3.5)	458 (8.3)	0	33 (4.1)	489 (9.9)	0	39 (4.2)	464 (6.9)	0
Iran, Islamic Rep. of	●	28 (3.1)	444 (7.2)	1 (4.9)	33 (3.6)	462 (4.9)	7 (5.1)	39 (3.7)	467 (7.5)	-8 (5.8)
Singapore	○	27 (1.9)	588 (8.1)	-2 (3.2)	29 (2.3)	580 (8.7)	-3 (3.4)	44 (2.6)	546 (7.2)	5 (3.4)
Indonesia	○	24 (3.4)	434 (7.6)	-3 (4.7)	47 (3.8)	444 (4.5)	5 (4.9)	30 (3.4)	427 (7.8)	-2 (4.5)
Ukraine	●	24 (2.2)	484 (5.1)	0	74 (2.2)	486 (3.6)	0	2 (0.6)	~ ~	0
Turkey	●	23 (3.6)	450 (9.0)	0	32 (3.8)	460 (7.1)	0	44 (3.8)	451 (6.0)	0
Georgia	●	23 (3.2)	409 (9.1)	0	54 (3.3)	425 (4.2)	0	23 (2.1)	424 (6.7)	0
Lebanon	○	23 (3.5)	397 (10.0)	-4 (4.7)	43 (3.6)	424 (7.5)	-11 (5.3)	34 (3.8)	412 (13.5)	15 (4.9)
Norway	○	23 (3.3)	482 (4.6)	8 (4.4)	46 (3.7)	491 (3.1)	-5 (5.9)	31 (4.1)	484 (4.2)	-4 (6.0)
Chinese Taipei	○	23 (3.8)	570 (7.0)	-1 (5.2)	31 (4.0)	572 (6.4)	2 (5.5)	47 (4.4)	550 (5.1)	-1 (6.2)
Syrian Arab Republic	●	22 (3.0)	460 (5.1)	0	44 (3.8)	452 (4.7)	0	34 (3.2)	444 (4.3)	0
Russian Federation	●	22 (1.8)	525 (6.3)	-6 (2.7)	76 (1.8)	531 (3.9)	7 (2.9)	2 (0.5)	~ ~	-1 (1.0)
Armenia	○	19 (1.7)	488 (6.5)	-7 (2.7)	56 (2.8)	491 (6.5)	4 (4.1)	25 (2.3)	482 (6.7)	3 (3.2)
England	○	18 (2.4)	570 (7.1)	-11 (4.8)	22 (2.7)	557 (7.4)	2 (4.0)	60 (3.1)	528 (6.3)	9 (5.1)
Malta	●	16 (0.2)	491 (2.6)	0	33 (0.2)	460 (1.8)	0	51 (0.3)	433 (1.8)	0
El Salvador	○	16 (3.2)	406 (8.6)	0	43 (4.0)	380 (4.9)	0	40 (4.0)	388 (5.4)	0
Malaysia	○	15 (2.7)	482 (15.6)	-24 (4.8)	50 (4.3)	477 (7.8)	16 (5.8)	35 (4.0)	457 (11.3)	8 (5.5)
Botswana	○	15 (3.0)	343 (6.6)	-2 (3.8)	40 (4.7)	359 (5.3)	1 (6.5)	46 (4.8)	354 (5.5)	2 (6.7)
Hong Kong SAR	○	14 (3.3)	543 (13.1)	2 (4.5)	38 (4.7)	531 (9.5)	-2 (6.4)	48 (5.0)	525 (6.6)	0 (7.0)
Egypt	○	14 (3.0)	410 (9.9)	-14 (4.4)	58 (4.0)	404 (5.2)	5 (5.8)	28 (3.4)	414 (7.7)	9 (5.0)
Tunisia	●	14 (3.1)	444 (7.6)	7 (3.7)	24 (4.0)	439 (4.5)	5 (5.5)	62 (4.6)	445 (3.1)	-12 (6.0)
Algeria	●	12 (2.3)	404 (4.5)	0	42 (3.6)	409 (2.5)	0	46 (3.6)	409 (2.5)	0
Jordan	●	11 (2.3)	470 (15.0)	-9 (4.2)	45 (4.0)	489 (5.0)	10 (5.8)	45 (3.9)	478 (7.1)	-1 (5.9)
Israel	●	11 (2.3)	451 (12.2)	-7 (3.8)	55 (3.9)	469 (6.9)	6 (5.4)	34 (3.5)	476 (8.3)	2 (5.0)
Palestinian Nat'l Auth.	○	10 (2.7)	384 (10.4)	-4 (4.1)	49 (4.4)	403 (5.0)	-6 (6.1)	41 (4.4)	406 (6.5)	11 (6.0)
United States	○	9 (1.6)	497 (8.8)	1 (2.1)	29 (2.4)	519 (5.9)	-5 (3.7)	62 (2.4)	523 (3.6)	4 (3.9)
Australia	○	9 (2.5)	546 (12.9)	7 (2.7)	18 (2.2)	541 (7.2)	-14 (4.2)	73 (3.2)	510 (4.9)	7 (4.8)
Sweden	○	8 (1.6)	510 (10.1)	-2 (2.8)	26 (2.9)	513 (4.4)	-8 (4.0)	66 (3.0)	508 (2.9)	10 (4.1)
Cyprus	●	7 (0.6)	452 (4.5)	1 (1.0)	80 (0.8)	451 (2.1)	4 (1.4)	13 (0.7)	446 (3.8)	-5 (1.0)
Romania	○	7 (1.4)	442 (15.4)	-2 (2.1)	28 (2.0)	463 (5.4)	-3 (2.7)	65 (2.4)	463 (4.2)	5 (3.1)
Kuwait	-	7 (2.3)	399 (19.1)	0	32 (4.6)	416 (8.0)	0	61 (4.9)	417 (4.6)	0
Qatar	○	7 (0.1)	341 (4.3)	0	39 (0.2)	335 (2.5)	0	54 (0.2)	297 (2.2)	0
Bulgaria	○	5 (1.5)	452 (25.5)	--	33 (2.6)	469 (10.0)	--	62 (2.9)	470 (6.5)	--
Serbia	○	4 (1.0)	476 (10.7)	-3 (1.6)	15 (1.8)	473 (5.7)	0 (2.5)	80 (1.8)	469 (3.3)	3 (2.7)
Hungary	○	4 (1.1)	546 (8.7)	2 (1.3)	53 (2.1)	541 (3.6)	8 (3.1)	43 (2.1)	535 (3.7)	-9 (3.2)
Lithuania	●	4 (0.9)	502 (7.8)	-5 (1.5)	53 (2.2)	522 (3.0)	-4 (3.2)	43 (2.1)	516 (2.9)	9 (3.4)
Korea, Rep. of	●	4 (1.6)	552 (13.2)	1 (2.0)	20 (3.2)	548 (3.6)	-7 (4.7)	76 (3.5)	554 (2.3)	6 (5.0)
Bosnia and Herzegovina	○	4 (0.8)	462 (8.1)	0	23 (1.9)	459 (4.8)	0	73 (2.0)	468 (2.9)	0
Japan	○	2 (1.1)	~ ~	0 (1.7)	22 (3.2)	552 (4.9)	4 (4.5)	76 (3.3)	555 (2.8)	-4 (4.6)
Oman	○	2 (1.0)	~ ~	0	55 (4.2)	424 (4.6)	0	43 (4.3)	422 (5.2)	0
Slovenia	○	1 (0.5)	~ ~	-3 (1.1)	20 (2.0)	543 (3.3)	0 (2.6)	79 (2.1)	536 (2.4)	3 (2.8)
Scotland	○	1 (0.4)	~ ~	-2 (1.2)	13 (1.5)	521 (9.3)	-1 (2.9)	86 (1.6)	492 (3.9)	2 (3.1)
Bahrain	○	1 (0.1)	~ ~	-4 (0.7)	42 (3.1)	464 (4.1)	-29 (3.9)	57 (3.1)	467 (3.7)	33 (3.9)
Czech Republic	○	0 (0.2)	~ ~	0	8 (1.2)	536 (5.3)	0	92 (1.2)	538 (2.0)	0
Saudi Arabia	○	x x	x x	--	x x	x x	--	x x	x x	--
‡ Morocco	●	16 (3.1)	409 (7.1)	--	41 (5.6)	399 (4.8)	--	43 (6.1)	409 (6.7)	--
<b>International Avg.</b>		<b>14 (0.4)</b>	<b>462 (1.6)</b>		<b>39 (0.5)</b>	<b>471 (0.8)</b>		<b>47 (0.5)</b>	<b>462 (0.9)</b>	

**Benchmarking Participants**

Dubai, UAE	○	s	11 (1.5)	473 (13.4)	0	60 (2.6)	502 (3.9)	0	29 (2.7)	478 (7.2)	0
British Columbia, Canada	○	r	9 (2.3)	523 (17.1)	0	39 (4.3)	529 (5.2)	0	52 (3.5)	527 (3.6)	0
Massachusetts, US	○		8 (3.9)	555 (13.6)	0	55 (6.3)	569 (8.6)	0	36 (5.9)	530 (9.8)	0
Ontario, Canada	○		7 (2.2)	544 (13.9)	-4 (3.6)	30 (4.8)	526 (6.3)	-4 (6.7)	63 (4.7)	527 (3.9)	8 (6.8)
Basque Country, Spain	○		6 (2.1)	499 (16.1)	-2 (3.5)	46 (4.2)	499 (4.4)	-1 (6.6)	49 (4.2)	498 (3.8)	2 (6.5)
Minnesota, US	○		3 (1.9)	540 (7.3)	0	33 (6.0)	541 (10.8)	0	64 (5.5)	537 (5.6)	0
Quebec, Canada	○	r	3 (1.6)	488 (7.4)	-2 (2.3)	14 (3.5)	536 (7.8)	-12 (5.5)	83 (3.4)	508 (4.2)	14 (5.7)

● Yes ○ No

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by National Research Coordinators and by teachers.

Index based on teachers' responses to two questions about how often they usually assign science homework and how many minutes of science homework they usually assign.

High level indicates the assignment of more than 30 minutes of homework about half of the lessons or more. Low level indicates no assignment or the assignment of less than 30 minutes of homework about half of the lessons or less. Medium level includes all other possible combinations of responses.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement. An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

A diamond (◊) indicates the country did not participate in the assessment.



Exhibit 7.12 Use of Science Homework

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students Whose Teachers Always or Almost Always									
	Monitor Whether or Not the Homework Was Completed	Correct Assignments and Then Give Feedback to Students	Have Students Correct Their Own Homework in Class	Use the Homework as a Basis for Class Discussion	Use the Homework to Contribute Towards Students' Grades/Marks					
Algeria	r	82 (2.4)	r	71 (2.4)	r	41 (3.3)	r	37 (3.2)	r	59 (3.4)
Armenia		52 (3.2)		37 (2.3)		27 (1.9)		25 (2.7)		24 (1.9)
Australia		62 (3.5)		62 (3.3)		16 (2.4)		15 (2.3)		26 (3.1)
Bahrain		79 (2.4)		76 (2.0)		11 (1.7)		46 (2.5)		59 (2.4)
Bosnia and Herzegovina		67 (2.2)		55 (2.7)		19 (1.8)		21 (1.9)		19 (2.0)
Botswana		98 (1.3)		89 (2.8)		27 (4.0)		26 (3.8)		13 (3.2)
Bulgaria		83 (2.1)		51 (3.1)		33 (3.2)		23 (2.5)		16 (2.1)
Chinese Taipei		61 (3.8)		49 (4.1)		47 (4.2)		48 (4.3)		51 (4.1)
Colombia		80 (3.7)		82 (3.2)		11 (2.7)		39 (5.0)		62 (4.5)
Cyprus	r	86 (0.7)	r	81 (0.9)	r	14 (0.7)	r	32 (1.0)	r	55 (1.1)
Czech Republic		74 (2.0)		46 (2.3)		16 (1.6)		17 (1.5)		17 (1.7)
Egypt		89 (2.7)		86 (2.7)		7 (2.1)		47 (4.4)		66 (3.5)
El Salvador		94 (1.9)		82 (3.3)		22 (3.3)		42 (4.3)		61 (4.6)
England		85 (2.2)		60 (2.9)		7 (1.4)		11 (1.7)		26 (2.2)
Georgia		86 (1.7)		59 (3.2)		52 (3.6)		16 (2.3)		57 (3.3)
Ghana		94 (2.0)		93 (2.2)		35 (4.1)		42 (4.0)		64 (4.0)
Hong Kong SAR		72 (4.2)		56 (4.7)		20 (3.9)		15 (3.5)		24 (4.1)
Hungary		87 (1.3)		43 (2.6)		48 (2.4)		11 (1.8)		12 (1.8)
Indonesia		91 (1.9)		90 (2.2)		21 (2.7)		22 (3.3)		56 (3.8)
Iran, Islamic Rep. of		59 (4.1)		46 (3.7)		21 (3.2)		16 (2.8)		39 (3.9)
Israel		79 (3.1)	r	54 (3.5)	r	42 (3.9)		34 (3.9)		57 (3.8)
Italy		68 (3.3)		48 (3.1)		38 (3.7)		53 (3.2)		23 (2.5)
Japan		50 (4.2)		17 (3.1)		20 (3.3)		4 (1.4)		23 (3.7)
Jordan		89 (2.7)		72 (3.8)		22 (3.3)		48 (4.2)		40 (4.5)
Korea, Rep. of		74 (3.4)		25 (3.3)		22 (3.1)		6 (1.4)		44 (4.0)
Kuwait	r	74 (4.2)	r	79 (4.0)	r	14 (3.5)	r	22 (4.0)	r	49 (4.8)
Lebanon		78 (2.8)		75 (3.3)		60 (3.8)		40 (3.5)		21 (3.5)
Lithuania		69 (2.0)		50 (2.2)		17 (1.6)		11 (1.4)		16 (1.6)
Malaysia		76 (3.7)		76 (3.5)		27 (4.1)		35 (3.8)		15 (3.2)
Malta		90 (0.2)		75 (0.3)		13 (0.2)		15 (0.2)		59 (0.3)
Norway		40 (3.4)		13 (2.6)		6 (1.9)		21 (3.0)		24 (3.2)
Oman		89 (2.9)		88 (2.5)		9 (2.8)		29 (4.1)		44 (3.9)
Palestinian Nat'l Auth.		85 (2.9)		72 (4.0)		24 (3.9)		44 (4.1)		44 (4.5)
Qatar		90 (0.1)		85 (0.1)		8 (0.1)	r	28 (0.1)	r	60 (0.2)
Romania		76 (1.9)		60 (2.8)		32 (2.3)		24 (2.0)		21 (1.7)
Russian Federation		93 (0.8)		70 (1.8)		27 (2.0)		14 (1.4)		44 (2.0)
Saudi Arabia		97 (1.6)		92 (2.5)		32 (4.0)		30 (3.8)		59 (4.3)
Scotland	r	94 (1.1)	r	77 (2.7)	r	5 (1.5)	r	13 (1.4)	r	11 (1.8)
Serbia		67 (2.1)		57 (2.3)		23 (2.0)		23 (1.9)		20 (1.7)
Singapore		80 (2.2)		69 (2.2)		30 (2.4)		32 (2.2)		20 (2.0)
Slovenia		74 (2.2)		26 (2.2)		23 (2.2)		28 (2.6)		6 (1.3)
Sweden		55 (3.3)		37 (3.0)		2 (0.7)		23 (2.1)		19 (2.3)
Syrian Arab Republic		88 (2.0)		87 (2.3)		30 (3.2)		51 (3.5)		68 (3.3)
Thailand		84 (2.7)		74 (3.5)		17 (3.3)		26 (3.7)		24 (3.5)
Tunisia		76 (3.6)		68 (4.2)		35 (4.3)		42 (4.0)		37 (4.3)
Turkey		54 (4.0)		47 (3.9)		22 (3.5)		16 (2.9)		41 (4.6)
Ukraine		88 (1.7)		70 (2.6)		20 (1.8)		12 (1.6)		50 (2.5)
United States		84 (2.1)		56 (3.3)		21 (2.5)		35 (3.0)		69 (2.6)
‡ Morocco	r	81 (2.5)	r	62 (4.0)	r	35 (3.8)	r	31 (4.0)	r	45 (5.0)
International Avg.		78 (0.4)		63 (0.4)		24 (0.4)		27 (0.4)		38 (0.5)
<b>Benchmarking Participants</b>										
Basque Country, Spain		77 (3.4)		69 (3.6)		78 (3.7)		19 (3.5)		75 (4.3)
British Columbia, Canada	r	80 (3.6)	r	49 (4.7)	r	23 (3.8)	r	31 (3.9)	r	60 (3.7)
Dubai, UAE	s	92 (3.2)	s	82 (2.7)	s	21 (1.9)	s	29 (3.1)	s	43 (3.8)
Massachusetts, US		90 (4.6)		50 (8.9)		27 (4.8)		33 (5.0)		79 (6.5)
Minnesota, US		78 (6.1)		56 (8.3)		15 (4.4)		42 (6.9)		80 (6.5)
Ontario, Canada		61 (4.9)		52 (4.9)		29 (4.4)		46 (4.9)		20 (4.0)
Quebec, Canada		48 (4.8)		50 (5.0)		25 (4.7)		19 (4.3)		8 (2.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 7.13 Types of Science Homework with Trends

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Types of Homework Assigned by Their Teachers									
	Doing Problem/Question Sets				Reading from a Textbook or Supplementary Materials					
	Always or Almost Always		Sometimes		Always or Almost Always		Sometimes			
	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003		
Algeria	r	39 (2.9)	0	58 (3.1)	0	r	59 (3.4)	0	36 (3.6)	0
Armenia	r	42 (3.1)	-19 (3.8)	29 (2.4)	-7 (3.2)	r	33 (2.5)	-19 (3.9)	40 (3.2)	-4 (4.2)
Australia	r	18 (2.6)	-6 (4.6)	63 (3.8)	-1 (5.7)	r	9 (2.0)	3 (2.7)	47 (3.7)	-7 (5.1)
Bahrain		32 (2.9)	-5 (4.7)	61 (2.9)	3 (5.1)		38 (2.8)	7 (4.2)	46 (2.9)	-11 (4.7)
Bosnia and Herzegovina		13 (1.5)	0	66 (2.3)	0		31 (2.4)	0	50 (2.5)	0
Botswana		30 (4.3)	-2 (6.2)	67 (4.4)	3 (6.4)		47 (4.2)	6 (6.2)	52 (4.3)	-3 (6.1)
Bulgaria	r	40 (2.3)	8 (3.3)	51 (2.4)	-6 (3.6)	r	41 (3.2)	24 (3.9)	47 (3.1)	-25 (4.0)
Chinese Taipei		59 (4.5)	-3 (6.1)	34 (4.3)	3 (6.0)		26 (3.9)	7 (5.0)	57 (4.4)	-5 (6.0)
Colombia		29 (3.9)	0	57 (5.1)	0		40 (4.6)	0	51 (5.4)	0
Cyprus	r	46 (1.2)	-4 (2.0)	46 (1.2)	8 (1.7)	r	49 (1.0)	-19 (1.5)	42 (1.0)	15 (1.5)
Czech Republic		11 (1.6)	0	56 (2.3)	0		9 (1.5)	0	54 (2.3)	0
Egypt		51 (4.3)	0 (6.0)	46 (4.3)	-1 (6.0)		43 (4.5)	-14 (5.6)	51 (4.6)	13 (5.6)
El Salvador		29 (3.7)	0	65 (4.1)	0		32 (4.2)	0	61 (4.4)	0
England	s	30 (2.8)	1 (5.3)	64 (3.2)	-7 (5.4)	s	1 (0.4)	0 (0.9)	32 (2.6)	-13 (5.5)
Georgia		47 (2.8)	0	38 (3.3)	0		63 (2.9)	0	35 (2.8)	0
Ghana		52 (4.5)	11 (6.2)	45 (4.3)	-12 (6.3)		41 (4.5)	2 (6.7)	55 (4.6)	4 (6.9)
Hong Kong SAR		28 (4.4)	0 (6.2)	68 (4.5)	3 (6.3)		29 (4.5)	-4 (6.2)	62 (5.0)	5 (6.5)
Hungary		54 (2.6)	6 (3.5)	38 (2.5)	-5 (3.4)		50 (2.6)	16 (3.5)	42 (2.4)	-15 (3.5)
Indonesia		60 (4.3)	-2 (5.5)	38 (4.2)	1 (5.5)		67 (4.0)	-7 (4.8)	30 (4.1)	7 (4.9)
Iran, Islamic Rep. of		21 (3.3)	-12 (5.0)	68 (3.7)	22 (5.4)		60 (3.8)	15 (5.4)	30 (3.3)	-2 (4.6)
Israel	r	37 (4.1)	-2 (5.6)	55 (4.3)	5 (5.9)	r	19 (2.9)	-4 (4.6)	71 (3.2)	4 (4.8)
Italy		25 (3.0)	-1 (4.4)	64 (3.2)	0 (4.7)		79 (2.5)	5 (3.8)	14 (2.2)	-3 (3.4)
Japan		11 (2.7)	-2 (3.8)	53 (4.0)	2 (5.6)		3 (1.4)	0 (2.2)	15 (2.9)	-11 (4.8)
Jordan		63 (4.4)	6 (5.8)	29 (4.0)	-12 (5.5)		36 (4.0)	-4 (6.1)	50 (4.0)	0 (6.1)
Korea, Rep. of	s	13 (2.7)	-3 (4.0)	64 (3.8)	1 (5.2)	s	16 (3.3)	3 (4.3)	42 (4.1)	-11 (5.8)
Kuwait	r	28 (4.3)	0	59 (5.4)	0	r	20 (3.7)	0	52 (4.8)	0
Lebanon		58 (4.1)	-7 (5.6)	36 (4.5)	5 (5.8)		17 (2.7)	-4 (4.3)	64 (3.9)	2 (5.5)
Lithuania		31 (1.7)	-8 (2.9)	56 (2.0)	3 (3.2)		39 (1.9)	3 (3.0)	52 (1.8)	-6 (2.9)
Malaysia		40 (4.0)	11 (5.5)	57 (4.0)	1 (5.8)		46 (4.0)	-14 (5.7)	49 (4.0)	15 (5.6)
Malta		41 (0.3)	0	50 (0.3)	0		12 (0.2)	0	55 (0.3)	0
Norway		46 (3.4)	3 (5.9)	48 (3.6)	-2 (5.7)		43 (3.5)	4 (5.5)	46 (3.4)	-5 (5.6)
Oman		32 (4.0)	0	67 (4.0)	0		33 (4.5)	0	59 (4.6)	0
Palestinian Nat'l Auth.		65 (3.9)	13 (5.7)	33 (4.0)	-14 (5.8)		21 (3.3)	-31 (5.5)	62 (3.9)	17 (6.0)
Qatar	r	31 (0.2)	0	64 (0.2)	0	r	37 (0.2)	0	50 (0.2)	0
Romania		30 (1.9)	-6 (3.0)	55 (2.1)	3 (3.2)		39 (2.5)	14 (3.2)	45 (2.5)	-17 (3.1)
Russian Federation		72 (1.8)	1 (2.5)	27 (1.8)	0 (2.4)		80 (1.7)	7 (2.7)	20 (1.7)	-5 (2.6)
Saudi Arabia		53 (4.5)	--	45 (4.5)	--		--	--	--	--
Scotland	s	45 (2.9)	-5 (4.2)	52 (2.9)	5 (4.2)	s	3 (0.8)	-2 (1.7)	34 (2.4)	-1 (4.5)
Serbia		12 (1.4)	0 (2.0)	54 (2.5)	2 (3.7)		30 (2.1)	-1 (3.1)	48 (2.2)	7 (3.2)
Singapore		45 (2.4)	-8 (3.6)	50 (2.4)	7 (3.6)		20 (2.3)	-5 (3.3)	56 (2.0)	-3 (3.4)
Slovenia		36 (2.8)	1 (3.6)	48 (2.7)	-5 (3.9)		7 (1.3)	-7 (2.1)	40 (2.7)	-25 (3.8)
Sweden		15 (2.0)	1 (3.1)	61 (2.9)	-10 (4.3)		27 (2.4)	1 (3.8)	53 (2.9)	-3 (4.6)
Syrian Arab Republic		73 (2.7)	0	20 (2.5)	0		26 (3.4)	0	50 (3.7)	0
Thailand		49 (4.4)	0	48 (4.4)	0		36 (4.1)	0	61 (4.3)	0
Tunisia		21 (3.4)	0 (5.1)	69 (4.0)	6 (5.7)		33 (4.3)	21 (5.1)	52 (4.6)	-7 (6.2)
Turkey		30 (3.5)	0	61 (3.3)	0		50 (4.1)	0	37 (4.0)	0
Ukraine		52 (1.5)	0	41 (1.8)	0		86 (1.3)	0	12 (1.2)	0
United States	r	16 (2.1)	-1 (3.0)	64 (2.7)	-3 (4.0)	r	20 (2.6)	1 (3.6)	53 (3.6)	-2 (4.8)
‡ Morocco	r	40 (4.1)	--	54 (5.1)	--	r	46 (4.4)	--	47 (4.1)	--
International Avg.		38 (0.5)		52 (0.5)			35 (0.5)		46 (0.5)	

**Benchmarking Participants**

Basque Country, Spain		52 (4.8)	11 (6.8)	40 (4.4)	-11 (6.6)		28 (4.3)	21 (5.1)	48 (5.0)	-9 (7.2)
British Columbia, Canada	r	22 (3.6)	0	68 (3.9)	0	r	12 (2.0)	0	68 (3.2)	0
Dubai, UAE	s	43 (4.4)	0	56 (4.4)	0	s	36 (2.4)	0	54 (1.9)	0
Massachusetts, US		9 (3.9)	0	83 (5.2)	0		13 (3.6)	0	68 (4.7)	0
Minnesota, US		14 (3.6)	0	74 (5.1)	0		19 (5.0)	0	47 (7.9)	0
Ontario, Canada		23 (3.2)	0 (4.8)	54 (4.7)	-15 (6.3)		15 (3.3)	0 (4.2)	44 (4.8)	-8 (6.9)
Quebec, Canada	r	24 (4.2)	-23 (6.3)	45 (5.2)	0 (6.9)	r	11 (2.7)	2 (3.4)	43 (5.2)	-1 (6.9)

▲ 2007 percent significantly higher      ▼ 2007 percent significantly lower

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

Exhibit 7.13 Types of Science Homework with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Types of Homework Assigned by Their Teachers									
	Writing Definitions or Other Short Writing Assignments					Working on Small Investigations or Gathering Data				
	Always or Almost Always		Sometimes			Always or Almost Always		Sometimes		
	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003		
Algeria	r	42 (3.5)	0 0	47 (3.8)	0 0	r	16 (2.6)	0 0	76 (3.1)	0 0
Armenia	r	31 (2.1)	-26 (3.3) ▼	43 (2.7)	5 (3.6)	r	10 (1.4)	0 (2.2)	71 (2.4)	-5 (3.4)
Australia	r	6 (1.9)	1 (2.8)	58 (3.6)	-9 (5.3)	r	7 (2.0)	1 (2.9)	62 (3.8)	0 (5.6)
Bahrain		38 (2.5)	-17 (4.8) ▼	47 (2.5)	10 (4.8) ●		16 (2.0)	-8 (3.8) ▼	63 (2.0)	2 (4.0)
Bosnia and Herzegovina		15 (1.8)	0 0	53 (2.4)	0 0		6 (0.9)	0 0	66 (2.0)	0 0
Botswana		28 (4.0)	-3 (5.5)	70 (4.1)	7 (6.1)		4 (1.7)	1 (2.4)	80 (3.1)	13 (5.3) ▲
Bulgaria	r	10 (1.8)	6 (2.0) ●	46 (2.6)	-9 (4.0) ▼	r	2 (0.7)	0 (0.9)	61 (3.0)	-1 (4.2)
Chinese Taipei		5 (2.0)	-3 (3.2)	39 (3.5)	-18 (5.5) ▼		1 (1.0)	-1 (1.6)	34 (4.1)	-14 (5.9) ▼
Colombia		17 (3.7)	0 0	57 (4.8)	0 0		25 (3.3)	0 0	55 (4.8)	0 0
Cyprus	r	9 (0.4)	-8 (1.4) ▼	75 (0.9)	7 (1.7) ●	r	7 (0.5)	4 (0.7) ●	69 (1.1)	29 (1.6) ▲
Czech Republic		1 (0.4)	0 0	32 (2.5)	0 0		1 (0.3)	0 0	59 (2.3)	0 0
Egypt		50 (4.2)	27 (5.6) ●	44 (4.0)	-21 (5.8) ▼		17 (3.1)	-3 (4.5)	67 (3.9)	-4 (5.5)
El Salvador		41 (4.0)	0 0	56 (4.1)	0 0		33 (3.9)	0 0	62 (4.2)	0 0
England	s	2 (0.7)	0 (0.9)	68 (2.6)	-3 (4.0)	s	2 (0.9)	0 (1.4)	56 (2.9)	-5 (5.1)
Georgia		43 (3.4)	0 0	51 (3.6)	0 0		4 (1.1)	0 0	83 (1.9)	0 0
Ghana		58 (4.0)	-1 (5.6)	41 (4.0)	3 (5.3)		8 (2.2)	0 (3.3)	77 (3.4)	6 (5.4)
Hong Kong SAR		20 (3.9)	-6 (5.7)	59 (4.6)	-3 (6.1)		2 (1.2)	-3 (2.3)	73 (4.5)	1 (6.1)
Hungary		19 (1.9)	4 (2.5)	48 (2.6)	-3 (3.6)		6 (0.9)	2 (1.2)	80 (1.7)	0 (2.6)
Indonesia		38 (4.3)	5 (5.4)	58 (4.0)	-1 (5.4)		5 (1.7)	0 (2.3)	79 (3.3)	5 (4.4)
Iran, Islamic Rep. of		28 (3.4)	13 (4.3) ●	47 (3.8)	6 (4.8)		25 (3.4)	6 (4.7)	64 (3.6)	6 (5.2)
Israel	r	22 (3.1)	4 (4.4)	57 (4.2)	-7 (5.5)	r	12 (2.7)	1 (3.8)	72 (3.4)	0 (4.8)
Italy		17 (2.4)	-1 (3.7)	56 (3.3)	-4 (5.1)		2 (1.0)	0 (1.5)	66 (2.9)	2 (4.3)
Japan		0 (0.0)	-2 (1.1)	10 (2.6)	-7 (3.9)		1 (0.9)	1 (0.9)	22 (3.4)	-7 (5.1)
Jordan		48 (3.8)	14 (5.6) ●	32 (3.6)	-28 (5.7) ▼		24 (3.6)	7 (4.8)	58 (4.6)	-9 (6.3)
Korea, Rep. of	s	7 (1.9)	0 (2.6)	39 (4.0)	-5 (5.5)	s	1 (0.8)	-1 (1.1)	60 (4.0)	-5 (5.4)
Kuwait	r	36 (4.6)	0 0	44 (5.1)	0 0	r	13 (3.5)	0 0	67 (5.2)	0 0
Lebanon		28 (3.9)	6 (5.1)	46 (3.7)	-12 (5.0) ▼		13 (2.3)	4 (3.2)	64 (3.6)	-5 (5.2)
Lithuania		13 (1.5)	-1 (2.1)	53 (2.0)	-1 (2.9)		2 (0.4)	-1 (1.2)	77 (1.7)	-6 (2.3) ▼
Malaysia		19 (2.9)	-20 (5.2) ▼	65 (3.7)	12 (5.5) ●		7 (2.1)	-2 (3.3)	74 (3.1)	5 (4.9)
Malta		7 (0.1)	0 0	51 (0.3)	0 0		4 (0.1)	0 0	50 (0.3)	0 0
Norway		10 (2.1)	1 (3.4)	58 (3.7)	-5 (5.7)		2 (0.9)	0 (1.4)	72 (3.4)	0 (4.7)
Oman		40 (3.6)	0 0	49 (4.0)	0 0		12 (3.2)	0 0	79 (3.5)	0 0
Palestinian Nat'l Auth.		52 (4.3)	6 (6.1)	40 (4.4)	-11 (6.2)		21 (3.4)	-4 (5.3)	68 (4.1)	3 (6.0)
Qatar	r	47 (0.2)	0 0	45 (0.2)	0 0	r	29 (0.2)	0 0	58 (0.2)	0 0
Romania		11 (1.8)	2 (2.2)	37 (2.4)	-14 (3.3) ▼		6 (1.1)	-2 (1.6)	70 (2.1)	2 (3.0)
Russian Federation		28 (1.7)	0 (2.6)	65 (1.7)	5 (3.2)		4 (1.0)	1 (1.1)	86 (1.6)	4 (2.4)
Saudi Arabia		--	--	--	--		--	--	--	--
Scotland	s	3 (0.9)	-1 (1.6)	51 (2.7)	2 (4.2)	s	1 (0.5)	1 (0.6)	48 (3.0)	4 (4.4)
Serbia		10 (1.3)	3 (1.8)	41 (2.1)	1 (3.2)		5 (1.1)	0 (1.6)	61 (2.1)	5 (3.2)
Singapore		10 (1.4)	-5 (2.3) ▼	54 (2.4)	-5 (3.6)		3 (0.7)	-3 (1.4)	59 (2.6)	3 (3.6)
Slovenia		0 (0.3)	-3 (1.3) ▼	28 (2.5)	-14 (3.7) ▼		3 (0.9)	1 (1.3)	69 (2.6)	-1 (3.9)
Sweden	r	2 (0.7)	-1 (1.3)	45 (2.9)	-5 (4.4)		1 (0.7)	-1 (1.1)	46 (3.3)	-6 (4.6)
Syrian Arab Republic		54 (4.0)	0 0	32 (3.5)	0 0		4 (1.5)	0 0	64 (3.5)	0 0
Thailand		28 (3.7)	0 0	62 (4.2)	0 0		23 (3.6)	0 0	67 (3.8)	0 0
Tunisia	r	10 (2.5)	0 (3.4)	58 (4.2)	6 (5.7)		21 (3.3)	-5 (5.0)	74 (3.5)	6 (5.4)
Turkey		17 (3.3)	0 0	58 (3.6)	0 0		40 (4.3)	0 0	47 (4.6)	0 0
Ukraine		31 (2.4)	0 0	63 (2.3)	0 0		2 (0.7)	0 0	84 (1.7)	0 0
United States	r	13 (2.2)	-2 (3.1)	55 (3.0)	-8 (4.2)	r	8 (1.5)	-4 (2.6)	65 (2.4)	-2 (3.8)
‡ Morocco	r	19 (3.0)	--	60 (5.0)	--		15 (2.9)	--	77 (3.8)	--
International Avg.		23 (0.4)		50 (0.5)			10 (0.3)		65 (0.5)	
<b>Benchmarking Participants</b>										
Basque Country, Spain		18 (3.9)	-1 (5.5)	59 (4.7)	-5 (6.9)		1 (0.0)	-1 (1.5)	60 (5.3)	-17 (6.9) ▼
British Columbia, Canada	r	8 (2.1)	0 0	71 (4.0)	0 0	r	8 (2.8)	0 0	61 (4.6)	0 0
Dubai, UAE	s	45 (1.8)	0 0	44 (2.3)	0 0	s	18 (2.0)	0 0	73 (2.3)	0 0
Massachusetts, US		14 (4.4)	0 0	67 (6.3)	0 0		3 (2.5)	0 0	82 (5.3)	0 0
Minnesota, US		10 (3.6)	0 0	61 (5.0)	0 0		4 (3.2)	0 0	71 (7.3)	0 0
Ontario, Canada		7 (1.8)	-1 (3.3)	56 (5.1)	-13 (6.9)		7 (1.7)	1 (2.6)	61 (4.9)	-17 (6.0) ▼
Quebec, Canada	r	2 (1.1)	-4 (2.5)	42 (4.5)	-3 (6.8)	r	6 (1.2)	2 (2.2)	63 (4.5)	15 (6.6) ●

● 2007 percent significantly higher

▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



### What Types of Assessments Are Used in Science Classes?

This section describes assessment practices in science classes at the eighth grade. As shown in Exhibit 7.14, teachers reported giving the most emphasis to classroom tests as a way of monitoring students' progress in science. Teachers used classroom tests to some extent for nearly all of the students. Internationally on average, teachers reported giving major emphasis to classroom tests for 62 percent of the students and some emphasis for another 33 percent. Teachers also reported using their professional judgment to some extent for most students. Internationally on average, teachers reported giving major emphasis to their own judgment for 45 percent of the students, some emphasis for another 42 percent. Typically, only moderate emphasis was given to national or regional achievement tests, with little or no emphasis on this source of information for 37 percent of students.

Information about trends in the frequency of science testing at the eighth grade is presented in Exhibit 7.15. According to teachers' reports, 76 percent of eighth-grade students were given science tests at least monthly, on average internationally. About one-third (34%) were given a science test or examination every 2 weeks (or more frequently) and another 42 percent were tested about once a month. However, this varied considerably by country. Whereas the majority of students were given a science test at least every two weeks in 16 countries and 3 benchmarking entities, there also were several countries where the majority of students were given science tests or examinations no more often than a few times a year, including Bosnia and Herzegovina (75%), Japan (52%), Malta (69%), Serbia (79%), Slovenia (96%), and Sweden (66%). Countries with increases since 2003 in testing at least every two weeks included Armenia, Jordan, Malaysia, the Palestinian National Authority, and the Russian Federation. Countries with increases in testing a few times a year or less often included Bahrain, Egypt, Singapore, and Tunisia, as well as the province of Quebec.

Exhibit 7.16 provides information about the item formats eighth-grade students are most likely to see in their science tests. In general, about half constructed-response and half multiple-choice were reported to be the

Exhibit 7.14 Emphasis on Sources to Monitor Students' Progress in Science

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Their Teachers' Emphasis on Various Sources to Monitor Students' Progress											
	Teacher's Own Professional Judgement			Classroom Tests			National or Regional Achievement Tests					
	Major Emphasis	Some Emphasis	Little or No Emphasis	Major Emphasis	Some Emphasis	Little or No Emphasis	Major Emphasis	Some Emphasis	Little or No Emphasis			
Algeria	r	61 (3.8)	28 (3.6)	12 (2.6)	r	77 (3.1)	20 (2.9)	3 (1.0)	r	40 (3.7)	22 (3.2)	37 (3.5)
Armenia		32 (2.8)	27 (1.9)	41 (2.8)		24 (2.2)	35 (2.3)	40 (2.8)		14 (1.9)	36 (2.3)	50 (2.4)
Australia		28 (3.5)	50 (3.3)	21 (2.9)		64 (3.4)	30 (3.1)	6 (1.6)		5 (1.6)	18 (2.9)	77 (3.3)
Bahrain		58 (2.1)	34 (2.0)	8 (1.0)		72 (2.6)	27 (2.6)	1 (0.0)		37 (2.1)	36 (2.2)	26 (2.2)
Bosnia and Herzegovina		55 (2.4)	38 (2.2)	7 (1.2)		49 (2.4)	45 (2.5)	5 (1.1)		18 (1.7)	42 (2.6)	39 (2.5)
Botswana		50 (4.8)	41 (4.8)	9 (2.5)		78 (4.0)	20 (3.7)	2 (1.3)		47 (4.5)	34 (4.5)	19 (3.8)
Bulgaria		74 (3.2)	25 (3.1)	2 (0.6)		60 (3.0)	36 (3.0)	3 (0.8)		38 (3.0)	45 (2.8)	17 (2.1)
Chinese Taipei		22 (3.8)	57 (4.3)	21 (3.3)		33 (3.7)	60 (3.7)	6 (1.9)		11 (2.7)	27 (3.7)	62 (4.2)
Colombia		47 (5.2)	40 (5.6)	13 (3.2)		73 (4.2)	25 (4.2)	3 (1.3)		39 (5.6)	44 (5.0)	17 (3.6)
Cyprus	r	35 (0.9)	56 (1.1)	8 (0.7)	r	44 (1.1)	51 (1.1)	5 (0.3)	r	7 (0.6)	25 (0.9)	67 (0.9)
Czech Republic		29 (2.2)	61 (2.5)	10 (1.4)		37 (2.5)	59 (2.6)	4 (1.0)		2 (0.6)	21 (2.2)	78 (2.3)
Egypt		57 (4.0)	37 (4.2)	6 (2.1)		74 (3.6)	20 (3.1)	6 (2.4)		40 (4.2)	38 (4.1)	22 (3.1)
El Salvador		49 (3.9)	49 (3.8)	2 (1.3)		55 (4.2)	38 (4.0)	6 (2.4)		28 (3.6)	43 (4.3)	29 (4.3)
England		49 (2.9)	46 (2.9)	5 (1.6)		61 (3.2)	35 (2.9)	4 (1.2)		52 (2.6)	38 (2.5)	10 (1.3)
Georgia	r	54 (3.5)	42 (3.1)	4 (1.1)		54 (3.1)	43 (2.9)	3 (0.8)	r	28 (3.3)	60 (3.8)	12 (1.9)
Ghana		55 (4.3)	37 (4.1)	8 (2.4)		84 (3.2)	16 (3.2)	0 (0.0)		37 (4.2)	30 (4.0)	34 (3.4)
Hong Kong SAR		22 (3.7)	51 (5.1)	27 (4.8)		54 (4.8)	33 (4.3)	13 (3.0)		6 (2.0)	15 (3.2)	79 (3.5)
Hungary		60 (2.4)	31 (2.1)	9 (1.4)		83 (1.9)	17 (1.9)	0 (0.3)		21 (1.9)	42 (2.4)	37 (2.5)
Indonesia		40 (4.2)	50 (4.3)	10 (2.7)		54 (3.9)	44 (3.8)	3 (1.4)		46 (4.0)	38 (3.9)	15 (3.0)
Iran, Islamic Rep. of		37 (3.4)	48 (3.7)	14 (2.4)		57 (4.4)	39 (4.2)	4 (1.6)		37 (3.7)	44 (3.7)	20 (2.9)
Israel		37 (3.8)	54 (3.6)	9 (2.2)		73 (3.7)	26 (3.7)	1 (0.7)	r	7 (1.7)	52 (4.0)	41 (3.9)
Italy		57 (3.6)	39 (3.7)	3 (1.3)		68 (3.2)	29 (3.0)	3 (1.2)		7 (1.7)	44 (2.8)	49 (3.1)
Japan		5 (1.8)	36 (3.9)	59 (4.0)		48 (4.0)	48 (4.1)	4 (1.7)		5 (1.7)	13 (2.8)	83 (3.1)
Jordan		59 (4.6)	33 (4.3)	8 (2.5)		70 (3.9)	25 (3.4)	5 (1.9)		49 (4.3)	39 (4.2)	12 (3.0)
Korea, Rep. of		22 (3.7)	65 (4.0)	13 (2.7)		58 (3.7)	38 (3.7)	4 (1.1)		17 (2.8)	55 (3.7)	28 (3.0)
Kuwait	r	62 (4.6)	31 (4.4)	7 (2.4)	r	66 (4.6)	29 (4.3)	5 (1.9)	r	27 (4.2)	39 (5.0)	34 (5.1)
Lebanon	s	51 (4.4)	36 (4.1)	13 (2.5)	s	65 (4.3)	29 (4.0)	6 (1.8)	s	21 (4.1)	40 (4.9)	39 (4.3)
Lithuania		30 (2.2)	55 (2.3)	15 (1.6)		49 (1.7)	47 (1.8)	4 (0.8)		25 (2.2)	49 (2.3)	26 (2.1)
Malaysia		25 (2.9)	50 (4.2)	25 (3.4)		46 (4.4)	47 (4.5)	7 (2.0)		25 (3.6)	42 (4.0)	34 (3.8)
Malta		49 (0.3)	47 (0.3)	5 (0.1)		44 (0.3)	41 (0.3)	15 (0.2)		40 (0.3)	30 (0.3)	30 (0.2)
Norway		65 (3.5)	31 (3.3)	4 (1.7)		73 (2.5)	27 (2.5)	0 (0.0)		4 (1.3)	22 (3.1)	74 (3.5)
Oman		54 (4.1)	31 (4.3)	16 (3.2)		71 (4.1)	27 (4.0)	2 (1.2)		29 (3.9)	34 (4.4)	37 (4.3)
Palestinian Nat'l Auth.		50 (4.4)	41 (4.4)	9 (2.7)		83 (3.2)	16 (3.1)	1 (0.0)		27 (3.8)	37 (4.2)	36 (4.0)
Qatar		46 (0.2)	38 (0.2)	16 (0.1)		69 (0.2)	28 (0.2)	3 (0.0)		27 (0.1)	30 (0.1)	44 (0.1)
Romania		61 (2.3)	32 (2.3)	6 (1.3)		82 (1.7)	16 (1.6)	2 (0.5)		44 (2.5)	25 (2.2)	31 (2.2)
Russian Federation		57 (2.4)	37 (2.2)	6 (1.0)		83 (1.5)	15 (1.5)	2 (0.5)		59 (2.0)	35 (2.0)	6 (1.0)
Saudi Arabia		29 (4.1)	38 (4.1)	33 (3.5)		56 (4.4)	37 (4.4)	7 (2.2)		24 (3.8)	20 (3.2)	56 (4.1)
Scotland	r	39 (2.7)	55 (2.7)	7 (1.4)	r	85 (2.0)	14 (2.0)	1 (0.4)	r	9 (1.7)	16 (2.2)	74 (2.6)
Serbia		56 (2.4)	37 (2.4)	7 (1.3)		34 (2.2)	55 (2.2)	11 (1.5)		9 (1.1)	37 (2.2)	55 (2.2)
Singapore		18 (1.8)	57 (2.4)	25 (2.1)		78 (2.2)	20 (2.0)	2 (0.7)		33 (2.5)	24 (2.2)	43 (2.6)
Slovenia		53 (2.7)	41 (2.7)	5 (1.3)		48 (2.5)	35 (2.5)	17 (1.9)		71 (2.5)	26 (2.4)	3 (0.7)
Sweden		71 (2.6)	28 (2.6)	0 (0.3)		42 (2.8)	54 (2.8)	4 (1.4)		--	--	--
Syrian Arab Republic		46 (3.3)	40 (3.3)	14 (2.2)		86 (2.8)	14 (2.7)	1 (0.6)		32 (3.5)	34 (3.4)	34 (3.2)
Thailand		10 (2.7)	40 (4.3)	50 (4.6)		64 (4.4)	30 (4.1)	6 (1.9)		19 (3.1)	51 (4.2)	30 (4.0)
Tunisia		53 (4.3)	33 (4.1)	14 (2.9)		75 (3.5)	23 (3.4)	3 (1.3)		49 (4.1)	33 (3.8)	18 (2.5)
Turkey		73 (3.9)	22 (3.3)	5 (2.2)		61 (3.9)	37 (4.1)	2 (1.3)		41 (4.1)	41 (4.1)	17 (3.5)
Ukraine		21 (1.9)	71 (2.2)	7 (1.7)		39 (2.9)	59 (2.9)	2 (0.7)		12 (1.8)	62 (2.6)	26 (2.5)
United States		46 (3.2)	42 (3.2)	12 (1.8)		52 (3.0)	45 (3.0)	3 (0.9)		13 (2.3)	39 (3.0)	48 (3.3)
‡ Morocco	r	62 (3.6)	31 (3.6)	7 (2.2)	r	72 (3.0)	27 (3.0)	1 (0.7)	r	33 (3.2)	36 (3.4)	31 (3.7)
International Avg.		45 (0.5)	42 (0.5)	13 (0.3)		62 (0.5)	33 (0.5)	5 (0.2)		27 (0.4)	35 (0.5)	37 (0.4)
<b>Benchmarking Participants</b>												
Basque Country, Spain		53 (4.6)	41 (4.5)	6 (2.0)		82 (3.6)	17 (3.4)	2 (1.3)		3 (1.8)	19 (3.7)	78 (3.9)
British Columbia, Canada	r	35 (4.1)	48 (4.5)	16 (3.6)	r	59 (4.3)	38 (4.5)	3 (1.4)	r	1 (0.7)	13 (3.1)	85 (3.1)
Dubai, UAE	s	52 (4.1)	40 (3.5)	8 (2.7)	s	75 (2.3)	24 (2.2)	1 (0.7)	s	18 (2.6)	37 (2.0)	45 (2.3)
Massachusetts, US		49 (6.7)	42 (7.3)	8 (4.1)		52 (6.1)	45 (5.7)	3 (0.1)		8 (4.1)	42 (7.3)	49 (7.4)
Minnesota, US		32 (6.9)	45 (7.8)	23 (6.9)		45 (5.7)	50 (5.8)	5 (2.3)		8 (5.2)	21 (5.6)	71 (6.4)
Ontario, Canada		37 (5.0)	53 (5.4)	10 (2.4)		53 (5.1)	44 (5.0)	2 (1.4)		3 (1.4)	11 (2.5)	87 (2.8)
Quebec, Canada		55 (4.7)	43 (4.6)	2 (1.1)		55 (4.9)	42 (4.8)	3 (1.4)		14 (3.2)	51 (5.2)	34 (4.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 7.15 Frequency of Teachers Giving Science Tests with Trends

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students Whose Teachers Give a Science Test or Examination						
	Every 2 Weeks or More		About Once a Month		A Few Times a Year or Less		
	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	Percent in 2007	Difference in Percent from 2003	
Algeria	r	15 (2.3)	0 0	53 (3.7)	0 0	32 (3.2)	0 0
Armenia	r	27 (2.0)	15 (2.5) ▲	43 (2.5)	-4 (3.5)	29 (2.3)	-11 (3.4) ▼
Australia	r	10 (1.9)	3 (2.7)	63 (3.3)	-1 (4.9)	27 (3.2)	-1 (4.5)
Bahrain		72 (2.3)	-11 (3.2) ▼	23 (2.4)	6 (3.3)	5 (1.8)	5 (1.8) ▲
Bosnia and Herzegovina		4 (0.9)	0 0	21 (1.6)	0 0	75 (1.7)	0 0
Botswana		14 (2.8)	2 (4.0)	86 (2.8)	-1 (4.1)	0 (0.0)	-1 (0.0)
Bulgaria		11 (2.1)	--	41 (3.0)	--	48 (3.3)	--
Chinese Taipei		98 (1.0)	1 (1.8)	2 (1.0)	-2 (1.7)	0 (0.3)	0 (0.3)
Colombia		86 (3.0)	0 0	13 (2.9)	0 0	1 (0.0)	0 0
Cyprus	r	4 (0.4)	1 (0.7)	51 (1.0)	3 (1.9)	46 (1.0)	-3 (1.9)
Czech Republic		82 (1.7)	0 0	16 (1.7)	0 0	2 (0.6)	0 0
Egypt		57 (4.0)	-32 (4.7) ▼	40 (3.9)	29 (4.6) ▲	4 (1.8)	4 (1.8) ▲
El Salvador		57 (4.2)	0 0	39 (4.0)	0 0	4 (1.8)	0 0
England	s	15 (2.4)	0 (4.4)	51 (3.0)	-7 (5.6)	34 (2.8)	6 (5.2)
Georgia		37 (3.1)	0 0	50 (3.4)	0 0	13 (1.5)	0 0
Ghana		74 (3.5)	0 (5.1)	23 (3.2)	-1 (5.0)	2 (1.7)	1 (2.1)
Hong Kong SAR		18 (3.7)	-2 (4.9)	44 (4.8)	16 (6.2) ▲	38 (4.2)	-14 (5.7) ▼
Hungary		37 (2.5)	-2 (3.7)	56 (2.7)	6 (3.8)	7 (1.5)	-4 (2.2)
Indonesia		45 (4.1)	10 (5.2)	48 (4.0)	-4 (5.4)	7 (2.2)	-6 (3.3)
Iran, Islamic Rep. of		40 (3.6)	-9 (5.5)	47 (4.3)	2 (5.9)	13 (3.0)	6 (3.7)
Israel		15 (2.7)	6 (3.4)	47 (3.6)	20 (4.8) ▲	38 (3.4)	-25 (4.6) ▼
Italy		14 (2.1)	-4 (3.6)	58 (3.5)	6 (5.1)	28 (3.0)	-2 (4.3)
Japan		13 (2.4)	2 (3.6)	34 (3.7)	0 (5.3)	52 (3.9)	-2 (5.7)
Jordan		66 (4.1)	33 (6.0) ▲	31 (3.9)	-20 (6.0) ▼	3 (1.5)	-13 (4.1) ▼
Korea, Rep. of	s	39 (3.6)	-10 (5.6)	44 (4.2)	11 (5.8)	17 (2.6)	0 (4.1)
Kuwait	r	60 (4.8)	0 0	30 (4.6)	0 0	10 (2.8)	0 0
Lebanon		72 (3.5)	--	26 (3.5)	--	1 (0.6)	--
Lithuania		14 (1.6)	-9 (2.5) ▼	74 (2.0)	8 (3.0) ▲	12 (1.5)	1 (2.2)
Malaysia		18 (3.1)	11 (3.7) ▲	39 (4.3)	-5 (5.9)	43 (4.4)	-5 (5.9)
Malta		3 (0.1)	0 0	28 (0.3)	0 0	69 (0.3)	0 0
Norway		1 (0.5)	-2 (1.5)	56 (3.9)	14 (6.2) ▲	44 (3.8)	-12 (6.2) ▼
Oman		34 (4.1)	0 0	61 (4.4)	0 0	6 (2.0)	0 0
Palestinian Nat'l Auth.	r	51 (3.7)	22 (5.7) ▲	46 (3.7)	13 (5.2) ▲	3 (1.3)	-35 (4.7) ▼
Qatar		71 (0.1)	0 0	24 (0.1)	0 0	4 (0.1)	0 0
Romania		45 (3.2)	0 (4.0)	46 (2.9)	-3 (3.8)	9 (1.3)	3 (1.7)
Russian Federation		70 (1.7)	9 (3.0) ▲	25 (1.5)	-6 (2.7) ▼	6 (0.8)	-4 (1.5) ▼
Saudi Arabia		54 (4.6)	--	40 (4.5)	--	6 (1.7)	--
Scotland	s	4 (1.2)	0 (1.6)	50 (3.6)	-9 (5.3)	47 (3.4)	8 (5.2)
Serbia		3 (0.6)	0 (1.0)	19 (2.0)	0 (2.5)	79 (2.2)	0 (2.8)
Singapore		25 (1.7)	0 (2.7)	52 (2.1)	-9 (3.5) ▼	23 (1.9)	9 (2.8) ▲
Slovenia		1 (0.5)	1 (0.5)	3 (1.1)	-4 (1.8) ▼	96 (1.2)	3 (1.9)
Sweden		1 (0.5)	-1 (1.2)	33 (3.3)	-3 (4.6)	66 (3.2)	4 (4.6)
Syrian Arab Republic		47 (3.4)	0 0	34 (3.5)	0 0	19 (3.0)	0 0
Thailand		60 (4.1)	0 0	33 (4.2)	0 0	6 (2.1)	0 0
Tunisia		7 (2.0)	-3 (2.9)	48 (4.6)	-25 (5.7) ▼	45 (4.4)	27 (5.4) ▲
Turkey		17 (3.2)	0 0	79 (3.6)	0 0	4 (1.6)	0 0
Ukraine		9 (1.4)	0 0	79 (2.1)	0 0	11 (1.6)	0 0
United States	r	61 (3.0)	-6 (4.6)	32 (2.7)	5 (4.3)	7 (1.3)	1 (2.0)
‡ Morocco		8 (3.3)	--	81 (4.0)	--	12 (3.3)	--
International Avg.		34 (0.4)		42 (0.5)		24 (0.3)	
<b>Benchmarking Participants</b>							
Basque Country, Spain		19 (3.7)	-14 (6.1) ▼	69 (4.8)	11 (6.8)	12 (3.1)	3 (4.2)
British Columbia, Canada	r	45 (4.5)	0 0	51 (4.5)	0 0	5 (1.8)	0 0
Dubai, UAE	s	53 (4.2)	0 0	45 (4.1)	0 0	2 (0.7)	0 0
Massachusetts, US		57 (7.1)	0 0	31 (5.7)	0 0	12 (4.5)	0 0
Minnesota, US		58 (4.8)	0 0	34 (6.2)	0 0	8 (4.3)	0 0
Ontario, Canada		31 (4.7)	-1 (6.5)	58 (5.2)	5 (7.3)	12 (3.1)	-4 (4.6)
Quebec, Canada	r	33 (4.7)	-24 (7.1) ▼	52 (4.7)	14 (7.0) ▲	15 (3.1)	10 (3.6) ▲

▲ 2007 percent significantly higher ▼ 2007 percent significantly lower

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Exhibit 7.16 Item Formats Used by Teachers in Science Tests or Examinations with Trends

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Only or Mostly Constructed-response			About Half Constructed-response and Half Multiple-choice			Only or Mostly Multiple-choice			
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	
Algeria	r	20 (2.8)	406 (3.5)	0 0	53 (3.4)	409 (2.4)	0 0	27 (3.2)	410 (3.2)	0 0
Armenia	r	11 (1.7)	484 (10.8)	-34 (2.9) ▼	42 (2.6)	485 (4.8)	-6 (3.6)	47 (2.6)	491 (8.4)	40 (2.9) ▲
Australia	r	23 (3.2)	515 (7.5)	1 (4.4)	71 (3.3)	517 (5.2)	-3 (4.7)	6 (1.4)	515 (13.0)	2 (2.3)
Bahrain		5 (1.0)	440 (14.2)	0 (2.0)	82 (2.0)	471 (2.4)	-2 (3.0)	13 (1.8)	459 (7.3)	2 (2.5)
Bosnia and Herzegovina		13 (1.6)	466 (5.0)	0 0	45 (2.7)	466 (3.2)	0 0	42 (2.5)	465 (3.6)	0 0
Botswana		22 (3.6)	355 (7.2)	8 (5.0)	64 (4.1)	355 (4.6)	-9 (6.0)	14 (3.1)	344 (11.5)	2 (4.4)
Bulgaria		11 (1.7)	474 (12.7)	--	69 (3.1)	467 (7.5)	--	20 (2.6)	470 (8.2)	--
Chinese Taipei		8 (2.5)	567 (10.5)	0 (3.5)	49 (4.2)	565 (4.7)	-18 (5.8) ▼	42 (4.2)	557 (6.1)	19 (5.5) ▲
Colombia		11 (2.6)	431 (13.0)	0 0	78 (3.6)	414 (4.4)	0 0	12 (2.8)	415 (10.5)	0 0
Cyprus	r	16 (0.6)	449 (3.1)	4 (0.8) ▲	64 (0.8)	451 (2.2)	4 (1.6) ▲	20 (0.9)	454 (3.4)	-8 (1.6) ▼
Czech Republic		47 (2.6)	536 (2.8)	0 0	45 (2.4)	541 (3.0)	0 0	8 (1.1)	534 (4.2)	0 0
Egypt		6 (1.9)	431 (8.8)	4 (2.2)	81 (3.2)	408 (4.2)	11 (5.3) ▲	13 (2.8)	410 (13.4)	-15 (5.0) ▼
El Salvador		9 (2.5)	395 (9.4)	0 0	88 (2.9)	386 (3.4)	0 0	3 (1.6)	396 (65.3)	0 0
England	s	70 (2.8)	548 (5.4)	-2 (4.9)	29 (2.8)	525 (8.1)	2 (4.8)	2 (0.9)	--	0 (1.5)
Georgia		6 (1.1)	431 (11.4)	0 0	58 (3.0)	419 (5.7)	0 0	36 (2.6)	422 (5.3)	0 0
Ghana		32 (3.8)	305 (10.4)	6 (5.4)	64 (3.9)	299 (6.8)	-6 (5.8)	3 (1.8)	355 (65.0)	-1 (2.6)
Hong Kong SAR		40 (4.9)	538 (7.3)	1 (6.8)	59 (4.9)	524 (7.4)	-1 (6.8)	1 (0.7)	--	0 (0.7)
Hungary		42 (2.4)	543 (3.3)	-5 (3.4)	54 (2.3)	537 (3.9)	4 (3.5)	4 (0.9)	528 (12.3)	1 (1.3)
Indonesia		39 (4.3)	432 (5.9)	3 (5.9)	53 (4.4)	438 (5.4)	-2 (5.9)	8 (2.3)	436 (13.3)	-1 (3.2)
Iran, Islamic Rep. of		20 (3.2)	469 (8.2)	-5 (4.5)	74 (3.7)	457 (4.1)	2 (5.1)	7 (2.1)	437 (7.1)	2 (2.7)
Israel		6 (1.8)	459 (18.7)	-1 (2.6)	86 (3.0)	470 (5.3)	16 (4.5) ▲	8 (2.4)	475 (16.9)	-16 (4.3) ▼
Italy		22 (2.6)	495 (4.9)	-11 (4.8) ▼	71 (2.9)	495 (3.6)	10 (5.1) ▲	7 (1.7)	513 (8.8)	0 (2.5)
Japan		42 (4.6)	560 (3.7)	16 (5.8) ▲	47 (4.3)	550 (4.2)	-20 (6.0) ▼	11 (2.7)	550 (7.3)	4 (3.6)
Jordan		7 (1.8)	449 (18.9)	-23 (4.2) ▼	84 (3.1)	483 (4.8)	16 (4.8) ▲	9 (2.6)	499 (8.5)	7 (2.9) ▲
Korea, Rep. of	r	10 (2.0)	566 (4.4)	0 (3.1)	28 (3.4)	551 (3.9)	8 (4.7)	62 (3.7)	552 (2.3)	-9 (5.1)
Kuwait	r	9 (2.8)	419 (12.9)	0 0	73 (4.7)	414 (4.8)	0 0	19 (3.9)	423 (11.4)	0 0
Lebanon		31 (3.5)	414 (11.1)	12 (5.0) ▲	50 (3.6)	415 (8.3)	-16 (5.5) ▼	19 (3.2)	412 (10.2)	4 (4.3)
Lithuania		30 (2.1)	523 (4.1)	1 (3.0)	66 (2.2)	517 (2.5)	1 (3.1)	4 (0.8)	510 (7.1)	-2 (1.3)
Malaysia		9 (2.5)	472 (12.9)	8 (2.7) ▲	90 (2.5)	471 (6.4)	29 (5.1) ▲	1 (0.7)	--	-36 (4.5) ▼
Malta		47 (0.3)	471 (1.4)	0 0	40 (0.3)	430 (2.4)	0 0	13 (0.3)	452 (2.9)	0 0
Norway		77 (3.2)	488 (2.4)	-10 (4.4) ▼	22 (3.3)	485 (5.4)	9 (4.4) ▲	2 (1.0)	--	0 (1.3)
Oman		7 (2.4)	428 (23.3)	0 0	92 (2.5)	423 (3.1)	0 0	1 (0.5)	--	0 0
Palestinian Nat'l Auth.		9 (2.6)	408 (15.6)	5 (3.1)	78 (3.8)	404 (4.6)	-1 (5.4)	13 (3.0)	401 (12.9)	-4 (4.6)
Qatar		5 (0.1)	333 (4.9)	0 0	82 (0.2)	319 (1.8)	0 0	13 (0.1)	307 (3.9)	0 0
Romania		9 (1.5)	466 (7.7)	-2 (2.1)	76 (1.9)	459 (4.3)	0 (2.9)	15 (1.7)	475 (7.7)	2 (2.3)
Russian Federation		16 (1.6)	528 (5.9)	-19 (3.2) ▼	73 (1.8)	530 (3.9)	15 (3.9) ▲	11 (1.2)	526 (7.6)	4 (1.7) ▲
Saudi Arabia		2 (1.4)	--	--	61 (3.8)	400 (4.0)	--	37 (3.8)	407 (4.6)	--
Scotland	s	56 (3.5)	498 (5.0)	8 (5.7)	41 (3.4)	494 (5.9)	-4 (5.5)	3 (1.2)	499 (15.3)	-3 (2.7)
Serbia		32 (2.6)	471 (4.3)	-9 (3.6) ▼	63 (2.6)	471 (3.7)	18 (3.6) ▲	5 (0.8)	459 (9.4)	-9 (2.0) ▼
Singapore		29 (2.3)	578 (6.8)	-1 (3.3)	68 (2.5)	566 (5.8)	0 (3.4)	3 (1.0)	509 (33.6)	1 (1.1)
Slovenia		27 (2.1)	539 (3.0)	-1 (3.3)	71 (2.2)	537 (2.5)	1 (3.3)	2 (0.6)	--	1 (0.8)
Sweden		94 (1.3)	511 (2.9)	1 (2.3)	6 (1.2)	493 (6.3)	-1 (2.2)	0 (0.4)	--	-1 (0.7)
Syrian Arab Republic		6 (1.7)	439 (14.5)	0 0	74 (3.1)	450 (3.6)	0 0	19 (2.7)	461 (6.5)	0 0
Thailand		28 (3.9)	468 (8.9)	0 0	55 (4.6)	474 (6.9)	0 0	17 (3.2)	464 (14.9)	0 0
Tunisia	r	11 (2.9)	445 (7.4)	-12 (5.0) ▼	67 (4.2)	442 (3.0)	-7 (6.0)	22 (3.5)	452 (4.8)	18 (3.9) ▲
Turkey		16 (3.6)	446 (9.9)	0 0	66 (4.2)	458 (5.1)	0 0	18 (3.5)	448 (10.7)	0 0
Ukraine		27 (2.0)	492 (4.4)	0 0	70 (2.3)	484 (4.0)	0 0	4 (0.8)	479 (8.3)	0 0
United States	r	8 (1.5)	509 (11.6)	-3 (2.6)	70 (2.3)	521 (3.8)	-3 (3.8)	22 (2.1)	517 (7.0)	6 (3.0)
‡ Morocco	r	14 (4.0)	420 (9.7)	--	64 (4.6)	401 (4.2)	--	22 (2.9)	409 (5.9)	--
International Avg.		23 (0.4)	469 (1.4)		62 (0.5)	464 (0.7)		14 (0.3)	459 (2.7)	
<b>Benchmarking Participants</b>										
Basque Country, Spain		40 (4.2)	498 (4.6)	8 (6.6)	37 (4.7)	503 (4.6)	-14 (7.1)	23 (4.4)	492 (6.0)	6 (5.9)
British Columbia, Canada	r	11 (3.1)	527 (8.0)	0 0	74 (4.0)	527 (3.7)	0 0	16 (3.2)	528 (7.3)	0 0
Dubai, UAE	s	27 (3.4)	506 (8.6)	0 0	69 (3.2)	487 (4.2)	0 0	4 (1.4)	451 (20.6)	0 0
Massachusetts, US		6 (3.5)	545 (36.9)	0 0	85 (5.1)	552 (6.0)	0 0	10 (4.1)	572 (15.0)	0 0
Minnesota, US		12 (4.5)	539 (17.1)	0 0	64 (4.9)	535 (6.5)	0 0	24 (4.6)	549 (8.6)	0 0
Ontario, Canada	r	23 (3.8)	526 (5.9)	1 (5.6)	74 (4.2)	531 (3.5)	-2 (5.9)	3 (1.7)	498 (36.4)	1 (2.3)
Quebec, Canada		53 (5.4)	514 (4.7)	--	45 (5.1)	510 (8.0)	--	3 (1.3)	490 (9.9)	--

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.



most common test formats. On average internationally, 62 percent of the students were taught by teachers who reported testing them with about half constructed-response and half multiple-choice items, another 23 percent of the students by teachers who reported using only or mostly constructed-response items, and only 14 percent by teachers who reported using only or mostly multiple-choice items. Between 2003 and 2007 there were increases and decreases in each testing approach. Teachers in seven countries reported using less constructed-response testing and in four countries they reported more. Teachers in nine countries reported increased use of the half and half format, while teachers in three countries reported decreased use. Five countries reported more use of multiple-choice testing and five reported less. The biggest shift was in Armenia, from primarily using constructed-response items to greater reliance on multiple-choice testing.

Exhibit 7.17 presents information about the cognitive demands teachers emphasize in the science tests given to eighth-grade students. Teachers were asked how often they gave students each of four different types of questions: knowing facts and procedures, application of knowledge and understanding, developing hypotheses and designing investigations, and providing explanations or justifications. On average internationally, most eighth-grade students were tested at least sometimes with each type of question, with application questions the most prevalent. Nearly three-fourths (72%) had teachers that gave application questions almost always, and the remaining one fourth (26%) had teachers that gave them sometimes. Almost two-thirds (64%) of students had teachers that almost always gave knowing facts and concepts questions, and 34 percent had teachers that sometimes did. Almost half the students (47%) were almost always given questions requiring explanations or justification, and a further 47 percent were given such questions at least sometimes. Although only 19 percent of the students were almost always asked to develop hypotheses or design investigations in their science tests, another 60 percent were asked to do so at least sometimes.

Exhibit 7.17 Types of Questions on Science Tests

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Types of Questions on Science Tests Given by Their Teachers											
	Questions Based on Knowing Facts and Concepts			Questions Based on the Application of Knowledge and Understanding			Questions Involving Developing Hypotheses and Designing Scientific Investigations					
	Always or Almost Always	Sometimes	Never or Almost Never	Always or Almost Always	Sometimes	Never or Almost Never	Always or Almost Always	Sometimes	Never or Almost Never			
Algeria	r	54 (3.8)	46 (3.8)	0 (0.5)	r	67 (3.3)	32 (3.2)	1 (0.7)	r	42 (3.7)	49 (4.0)	9 (2.0)
Armenia		26 (2.2)	51 (2.6)	23 (2.1)		46 (2.8)	16 (2.1)	38 (2.7)		16 (2.0)	64 (2.2)	19 (2.0)
Australia		66 (3.3)	33 (3.3)	1 (0.3)		68 (2.9)	31 (2.9)	0 (0.2)		22 (2.5)	62 (3.7)	17 (2.8)
Bahrain		72 (2.6)	25 (2.8)	3 (1.2)		81 (2.3)	17 (2.1)	3 (1.2)		29 (2.7)	58 (2.6)	13 (1.6)
Bosnia and Herzegovina		62 (2.4)	36 (2.3)	2 (0.7)		79 (2.0)	19 (1.9)	2 (0.7)		12 (1.6)	67 (2.0)	21 (1.8)
Botswana		71 (3.7)	29 (3.7)	0 (0.0)		73 (3.9)	26 (3.8)	1 (0.0)		17 (3.1)	68 (3.8)	15 (3.0)
Bulgaria		87 (1.9)	13 (1.9)	0 (0.0)		75 (2.5)	24 (2.4)	1 (0.5)		7 (1.4)	56 (2.8)	38 (2.8)
Chinese Taipei		76 (3.8)	24 (3.8)	0 (0.3)		74 (4.0)	26 (4.0)	0 (0.3)		15 (2.9)	56 (4.2)	29 (3.9)
Colombia		56 (5.5)	42 (5.4)	2 (1.1)		79 (3.8)	20 (3.7)	1 (0.0)		31 (4.8)	58 (4.9)	11 (3.0)
Cyprus	r	59 (1.0)	40 (1.0)	1 (0.2)		75 (0.9)	24 (0.9)	1 (0.3)	r	18 (0.8)	57 (1.0)	24 (0.9)
Czech Republic		46 (2.7)	52 (2.7)	1 (0.5)		75 (1.9)	25 (1.9)	0 (0.2)		4 (0.8)	58 (2.3)	38 (2.4)
Egypt		49 (4.3)	49 (4.4)	2 (1.5)		73 (3.8)	26 (3.7)	1 (0.9)		34 (3.8)	57 (4.0)	9 (2.9)
El Salvador		58 (4.3)	39 (4.3)	3 (1.6)		75 (3.9)	25 (3.9)	0 (0.0)		28 (3.9)	55 (4.3)	17 (3.3)
England		60 (2.8)	40 (2.8)	0 (0.2)		63 (2.9)	37 (2.9)	0 (0.3)		25 (2.7)	66 (2.8)	9 (1.4)
Georgia		61 (2.9)	38 (2.9)	1 (0.4)		78 (3.6)	21 (3.5)	1 (0.3)		4 (0.9)	69 (2.9)	28 (2.9)
Ghana		70 (3.9)	30 (3.9)	0 (0.0)		68 (4.6)	31 (4.5)	1 (0.8)		25 (3.6)	67 (4.1)	9 (2.2)
Hong Kong SAR		72 (4.4)	28 (4.4)	0 (0.0)		73 (4.5)	27 (4.5)	0 (0.0)		13 (3.2)	66 (4.2)	21 (3.8)
Hungary		76 (2.0)	24 (2.0)	1 (0.4)		85 (1.5)	15 (1.5)	0 (0.1)		2 (0.8)	47 (2.3)	51 (2.2)
Indonesia		76 (3.1)	23 (3.3)	1 (0.6)		73 (3.4)	27 (3.3)	1 (0.6)		15 (2.9)	65 (3.6)	21 (2.9)
Iran, Islamic Rep. of		65 (3.6)	33 (3.4)	2 (1.3)		63 (4.0)	34 (3.8)	2 (1.3)		17 (3.0)	63 (3.2)	20 (2.7)
Israel		74 (3.8)	26 (3.8)	0 (0.0)		75 (3.3)	25 (3.3)	0 (0.0)		31 (3.3)	56 (4.0)	14 (3.0)
Italy		80 (2.4)	14 (2.4)	6 (1.5)		69 (3.1)	24 (2.9)	6 (1.6)		24 (2.8)	53 (3.2)	23 (2.9)
Japan		77 (3.7)	21 (3.6)	2 (1.1)		73 (3.9)	26 (3.9)	1 (0.8)		19 (2.8)	39 (3.8)	42 (4.0)
Jordan		60 (4.5)	37 (4.3)	3 (1.7)		72 (4.0)	26 (3.8)	1 (0.0)		19 (3.3)	52 (4.3)	29 (4.2)
Korea, Rep. of		80 (3.2)	20 (3.2)	0 (0.0)		80 (3.3)	19 (3.3)	1 (0.6)		20 (2.6)	63 (3.3)	16 (2.7)
Kuwait	r	59 (4.2)	40 (4.5)	1 (1.4)	r	65 (4.1)	34 (4.6)	1 (1.3)	r	38 (4.5)	56 (4.9)	6 (2.1)
Lebanon		73 (3.5)	26 (3.5)	1 (0.6)		82 (2.9)	17 (2.7)	1 (0.0)		50 (3.7)	46 (3.7)	4 (1.3)
Lithuania		47 (2.2)	50 (2.2)	3 (0.8)		85 (1.5)	15 (1.5)	0 (0.3)		4 (0.8)	59 (2.3)	37 (2.2)
Malaysia		70 (3.8)	29 (3.8)	1 (0.0)		--	--	--		16 (2.8)	75 (3.5)	9 (2.2)
Malta		54 (0.3)	34 (0.3)	12 (0.2)		58 (0.3)	33 (0.3)	9 (0.2)		8 (0.2)	47 (0.3)	45 (0.3)
Norway		64 (3.4)	36 (3.4)	0 (0.0)		42 (3.4)	57 (3.4)	2 (0.9)		5 (1.7)	53 (4.0)	42 (3.6)
Oman		50 (3.8)	49 (4.0)	1 (0.9)		72 (3.5)	28 (3.5)	0 (0.0)		9 (2.7)	62 (4.5)	29 (4.3)
Palestinian Nat'l Auth.		76 (3.8)	24 (3.8)	0 (0.0)		77 (3.5)	23 (3.5)	0 (0.0)		24 (3.5)	68 (3.8)	8 (2.4)
Qatar	r	60 (0.2)	39 (0.2)	1 (0.0)		63 (0.2)	34 (0.2)	3 (0.1)	r	23 (0.1)	66 (0.2)	12 (0.1)
Romania		74 (1.8)	25 (1.9)	1 (0.4)		85 (1.7)	15 (1.7)	0 (0.2)		24 (1.9)	65 (2.2)	11 (1.4)
Russian Federation		76 (1.9)	23 (1.9)	1 (0.4)		85 (1.2)	14 (1.2)	1 (0.2)		2 (0.6)	71 (2.3)	27 (2.4)
Saudi Arabia		63 (3.9)	37 (3.9)	0 (0.4)		73 (3.8)	26 (3.8)	0 (0.0)		17 (2.7)	70 (3.9)	13 (3.2)
Scotland	r	80 (1.6)	19 (1.7)	0 (0.2)	r	73 (2.1)	26 (2.1)	1 (0.5)	r	22 (2.1)	62 (2.4)	16 (1.8)
Serbia		82 (1.5)	14 (1.4)	4 (0.8)		22 (2.1)	63 (2.5)	15 (1.6)		23 (1.9)	60 (2.2)	17 (1.5)
Singapore		60 (2.4)	39 (2.4)	1 (0.1)		61 (2.5)	39 (2.5)	0 (0.0)		6 (1.1)	51 (2.6)	43 (2.5)
Slovenia		67 (2.3)	31 (2.4)	2 (0.8)		80 (1.9)	19 (1.8)	1 (0.6)		11 (1.7)	66 (2.6)	23 (2.3)
Sweden		77 (2.6)	22 (2.4)	2 (0.9)		86 (1.9)	13 (1.8)	0 (0.0)		18 (2.3)	51 (2.6)	31 (2.9)
Syrian Arab Republic		58 (3.9)	40 (3.8)	1 (0.8)		65 (3.5)	31 (3.4)	4 (1.3)	r	17 (3.3)	56 (3.8)	27 (4.0)
Thailand		47 (4.7)	50 (4.6)	3 (1.6)		51 (4.5)	48 (4.4)	1 (1.0)		21 (3.4)	70 (3.7)	9 (2.4)
Tunisia		67 (3.8)	32 (3.9)	1 (0.8)		76 (3.9)	22 (3.7)	2 (1.1)		15 (2.5)	54 (4.3)	31 (3.9)
Turkey		41 (4.5)	55 (4.7)	4 (1.7)		86 (2.8)	13 (2.7)	1 (0.0)		16 (2.7)	53 (4.2)	30 (3.7)
Ukraine		62 (2.1)	38 (2.1)	0 (0.0)		92 (1.3)	8 (1.3)	0 (0.0)		6 (1.3)	79 (2.1)	16 (1.8)
United States		67 (2.8)	32 (2.8)	1 (0.6)		71 (2.5)	28 (2.4)	1 (0.4)		20 (2.3)	58 (3.2)	22 (2.9)
‡ Morocco	r	50 (4.5)	47 (4.7)	3 (1.5)	r	79 (3.3)	19 (3.2)	1 (1.1)	r	30 (3.2)	62 (3.3)	9 (1.8)
International Avg.		64 (0.5)	34 (0.5)	2 (0.1)		72 (0.4)	26 (0.4)	2 (0.1)		19 (0.4)	60 (0.5)	22 (0.4)
<b>Benchmarking Participants</b>												
Basque Country, Spain		77 (4.1)	22 (4.3)	1 (1.2)		68 (4.8)	29 (4.9)	3 (1.5)		8 (2.9)	37 (4.5)	55 (4.8)
British Columbia, Canada	r	65 (4.1)	35 (4.1)	0 (0.4)	r	67 (4.2)	33 (4.2)	0 (0.0)	r	12 (2.8)	67 (4.0)	21 (3.4)
Dubai, UAE	s	67 (4.3)	31 (4.4)	1 (0.9)	s	84 (3.3)	16 (3.3)	1 (0.0)	s	25 (2.2)	62 (2.3)	14 (1.3)
Massachusetts, US		66 (7.5)	32 (7.4)	1 (1.3)		72 (7.0)	27 (6.9)	1 (1.3)		16 (4.8)	55 (7.0)	30 (6.6)
Minnesota, US		54 (8.7)	43 (9.3)	2 (1.8)		55 (7.5)	44 (7.6)	1 (0.5)		8 (3.3)	62 (5.5)	31 (6.1)
Ontario, Canada		76 (4.0)	24 (4.0)	0 (0.1)		74 (4.6)	25 (4.5)	1 (0.6)		18 (3.7)	59 (4.6)	23 (3.7)
Quebec, Canada		55 (5.7)	43 (5.6)	2 (1.2)		60 (4.8)	40 (4.8)	0 (0.2)		24 (4.7)	61 (5.0)	15 (4.0)

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit 7.17 Types of Questions on Science Tests (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students by Types of Questions on Science Tests Given by Their Teachers			
	Questions Requiring Explanations or Justifications			
	Always or Almost Always	Sometimes	Never or Almost Never	
Algeria	r	39 (3.1)	58 (3.1)	3 (1.2)
Armenia		21 (1.9)	57 (2.2)	22 (2.0)
Australia		48 (3.1)	50 (3.1)	2 (0.3)
Bahrain		59 (2.9)	32 (3.0)	9 (2.1)
Bosnia and Herzegovina		34 (1.9)	61 (2.1)	5 (0.9)
Botswana		59 (4.2)	40 (4.1)	2 (1.3)
Bulgaria		59 (3.6)	36 (3.4)	4 (1.2)
Chinese Taipei		16 (2.8)	61 (3.8)	23 (3.3)
Colombia		54 (5.4)	42 (5.0)	4 (1.7)
Cyprus	r	66 (1.3)	32 (1.2)	2 (0.3)
Czech Republic		41 (2.1)	56 (2.1)	2 (0.6)
Egypt		67 (3.7)	31 (3.7)	2 (1.0)
El Salvador		50 (4.5)	43 (4.2)	7 (2.4)
England		44 (2.9)	55 (2.9)	1 (0.5)
Georgia		57 (3.3)	41 (3.1)	2 (0.6)
Ghana		51 (4.7)	46 (4.8)	3 (1.4)
Hong Kong SAR		31 (4.4)	67 (4.6)	2 (1.4)
Hungary		58 (2.4)	40 (2.3)	2 (0.6)
Indonesia		28 (3.0)	59 (3.5)	13 (2.5)
Iran, Islamic Rep. of		40 (4.1)	55 (4.0)	5 (1.8)
Israel		61 (3.6)	37 (3.7)	2 (0.8)
Italy		46 (2.7)	45 (2.8)	9 (2.1)
Japan		52 (4.3)	42 (4.0)	6 (1.8)
Jordan		34 (4.1)	59 (4.1)	7 (2.1)
Korea, Rep. of		16 (2.9)	62 (3.8)	22 (2.9)
Kuwait	r	55 (4.8)	40 (4.8)	5 (1.7)
Lebanon		75 (3.1)	25 (3.2)	0 (0.2)
Lithuania		56 (2.1)	42 (2.1)	2 (0.6)
Malaysia		24 (3.5)	73 (3.5)	4 (1.6)
Malta		33 (0.3)	53 (0.3)	14 (0.2)
Norway		47 (3.4)	51 (3.4)	2 (1.1)
Oman		70 (4.0)	29 (3.9)	1 (1.0)
Palestinian Nat'l Auth.		67 (4.2)	30 (4.3)	3 (1.4)
Qatar	r	39 (0.2)	53 (0.2)	8 (0.1)
Romania		63 (2.8)	35 (2.7)	2 (0.6)
Russian Federation		57 (2.3)	42 (2.3)	1 (0.5)
Saudi Arabia		40 (4.7)	53 (4.6)	7 (2.4)
Scotland	r	45 (2.4)	54 (2.4)	1 (0.6)
Serbia		39 (2.5)	53 (2.8)	9 (1.2)
Singapore		44 (2.4)	52 (2.5)	4 (1.1)
Slovenia		37 (2.6)	56 (2.6)	7 (1.3)
Sweden		50 (2.8)	42 (3.0)	7 (1.6)
Syrian Arab Republic		57 (3.5)	38 (3.5)	5 (1.3)
Thailand		53 (4.5)	44 (4.4)	2 (1.2)
Tunisia		48 (4.1)	50 (4.0)	2 (1.2)
Turkey		32 (3.8)	46 (4.2)	22 (3.7)
Ukraine		87 (1.1)	13 (1.1)	0 (0.0)
United States		40 (3.0)	53 (2.9)	7 (1.4)
‡ Morocco	r	40 (3.4)	56 (3.3)	3 (1.1)
<b>International Avg.</b>		<b>47 (0.5)</b>	<b>47 (0.5)</b>	<b>6 (0.2)</b>
<b>Benchmarking Participants</b>				
Basque Country, Spain		50 (4.7)	47 (4.9)	4 (1.7)
British Columbia, Canada	r	46 (3.9)	53 (4.0)	1 (0.8)
Dubai, UAE	s	47 (3.3)	47 (4.1)	6 (2.1)
Massachusetts, US		59 (6.6)	36 (5.8)	4 (3.4)
Minnesota, US		32 (7.6)	56 (6.4)	12 (5.3)
Ontario, Canada		65 (4.4)	34 (4.2)	1 (1.3)
Quebec, Canada		54 (4.6)	45 (4.7)	1 (0.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007





# Chapter 8



## *School Contexts for Science Learning and Instruction*

Chapter 8 presents information about school contexts for science learning and instruction among TIMSS 2007 countries and benchmarking participants, including characteristics of the student population, the role of the school principal, encouragement of parental involvement, school resources to support science learning, the climate of the school, and school safety.

### **What Are the Characteristics of the Schools' Student Population?**

To provide information about the student populations in schools, TIMSS asked school principals about the percentage of students in their schools from economically disadvantaged homes, the percentage of students having the language of the TIMSS test as their native language, and the incidence of school attendance problems.

Exhibit 8.1 presents principals' reports about the economic background of students in their schools. At fourth grade, according to school principals, about one-third of students (34%), on average across countries, attended schools with few (10% or less) economically disadvantaged students, 26 percent attended schools with between 11 and 25 percent disadvantaged students, 17 percent attended schools with 26 to 50 percent economically disadvantaged students, and 23 percent attended schools where the majority were economically disadvantaged students. There was considerable variation across countries, however. In eight countries, Austria, Chinese Taipei, Japan, Kazakhstan, Kuwait, the Netherlands, Singapore, and the Ukraine, the

majority of students (52 to 64%) attended schools with few disadvantaged students, whereas at the other extreme, more than half the students in Algeria, Colombia, El Salvador, Iran, Morocco, and Yemen attended schools where the majority of students came from disadvantaged homes. The percentage of students in schools with few disadvantaged students increased since 2003 in Armenia, Latvia, Lithuania, and the Russian Federation, and decreased in Chinese Taipei.

At fourth grade, there was a positive association between attending school with fewer students from economically disadvantaged homes and science achievement. Average achievement was highest among students attending schools with few disadvantaged students (495 points, on average) and lowest among those attending schools where the majority of students were from disadvantaged homes (445 points)—a 50 point gap.

At eighth grade, 22 percent of students, on average across countries, attended schools with few economically disadvantaged students, although in Chinese Taipei, Japan, Kuwait, Malta, Singapore, the Ukraine, and the Basque Country of Spain, more than half the students were in such schools. The percentage of students in these schools increased since 2003 in Armenia, Lithuania, Malaysia, and the Russian Federation, and decreased in Bahrain, Japan, Korea, Singapore, the United States, and the benchmarking participant, Quebec. In contrast to the situation of schools with few disadvantaged students, 33 percent of students, on average, attended schools where the majority of students were from disadvantaged homes. Countries where more than half the students attended majority-disadvantaged schools included Algeria, Colombia, Egypt, El Salvador, Ghana, Indonesia, Lebanon, Morocco, the Palestinian Authority, Thailand, Tunisia, and Turkey. Average science achievement was highest among students attending schools with few disadvantaged students (489 points, on average), and lowest among students in schools with a majority of disadvantaged students (444 points).

Schools with large percentages of students not having the language of instruction, as their native language face additional challenges. As shown in Exhibit 8.2, most students attend school where most of their schoolmates

are native speakers of the language of the test. On average across countries at the fourth grade, 73 percent of students attended schools where almost all the students (more than 90%) had the language of the test as their native language. Almost all of the students (at least 90%) in a number of countries—Armenia, Colombia, the Czech Republic, El Salvador, Georgia, Hong Kong SAR, Hungary, Japan, Kuwait, Lithuania, and Yemen—attended such schools. The countries with nearly half or more of students in schools where less than half the students were native speakers of the language of the test included Iran (46%), and, most notably, Singapore (75%) and the benchmarking participant Dubai (77%). In Singapore, students were tested in English because they learn English as their first language in school. However, their mother-tongue language often would be Mandarin, Malay, or Tamil. The benchmarking participant Dubai in the United Arab Emirates tested in both English and Arabic.

At the eighth grade, and similar to the fourth grade, almost three-quarters of students, on average, attended schools where almost all students had the language of the test as their native language. Seventeen countries had 90 percent or more of students in this category, including Hungary, Japan, and Korea, with 100 percent of students in such schools. In contrast, countries with more than half their students in schools where the language of the test was the native language of less than half the students included Botswana, Ghana, Lebanon, Malta, Singapore, and the benchmarking participant Dubai. Botswana, Ghana, Malta, and Singapore tested in English. Lebanon tested in French and English, and the benchmarking participant Dubai tested in English and Arabic.

At both fourth and eighth grades, average science achievement was highest among students attending schools with more than 90% of students having the language of the test as their native language and lowest among students attending schools with less than half the students who were native speakers of the language of the test (480 vs. 455 points, on average at fourth grade and 476 vs. 450 points at eighth grade).

**Exhibit 8.1 Principals' Reports on the Percentages of Students in Their Schools Coming from Economically Disadvantaged Homes with Trends**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Schools with Few (0–10%) Economically Disadvantaged Students			Schools with 11–25% Economically Disadvantaged Students			Schools with 26–50% Economically Disadvantaged Students		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	4 (1.8)	345 (18.5)	∅ ∅	14 (2.8)	371 (18.0)	∅ ∅	24 (3.6)	363 (8.3)	∅ ∅
Armenia	r 17 (3.0)	473 (10.3)	14 (3.4) ▲	32 (4.2)	486 (11.1)	11 (5.5) ▲	25 (4.0)	496 (12.3)	–3 (5.7)
Australia	34 (4.5)	544 (4.9)	0 (6.3)	30 (3.0)	528 (7.6)	1 (5.0)	22 (4.4)	521 (7.5)	1 (5.7)
Austria	54 (3.6)	533 (3.6)	∅ ∅	29 (3.4)	529 (3.6)	∅ ∅	11 (2.4)	514 (8.9)	∅ ∅
Chinese Taipei	63 (3.9)	565 (2.6)	–17 (5.2) ▼	27 (3.6)	542 (3.6)	12 (4.7) ●	7 (2.3)	546 (8.1)	4 (2.7)
Colombia	5 (2.2)	432 (30.4)	∅ ∅	6 (2.1)	435 (11.5)	∅ ∅	8 (2.3)	439 (20.0)	∅ ∅
Czech Republic	19 (3.9)	525 (7.2)	∅ ∅	41 (4.8)	523 (4.2)	∅ ∅	27 (3.6)	499 (5.8)	∅ ∅
Denmark	r 49 (5.5)	530 (3.9)	∅ ∅	36 (4.8)	512 (4.6)	∅ ∅	8 (2.8)	488 (10.1)	∅ ∅
El Salvador	7 (1.6)	442 (23.3)	∅ ∅	11 (2.2)	404 (15.7)	∅ ∅	13 (2.9)	379 (7.3)	∅ ∅
England	r 38 (4.0)	564 (4.7)	0 (5.9)	31 (3.5)	544 (4.3)	6 (5.7)	15 (3.3)	520 (6.6)	4 (4.5)
Georgia	12 (2.7)	429 (11.7)	∅ ∅	26 (4.2)	422 (4.6)	∅ ∅	25 (3.8)	410 (10.3)	∅ ∅
Germany	29 (3.2)	543 (3.1)	∅ ∅	38 (3.1)	540 (3.2)	∅ ∅	19 (2.2)	526 (4.2)	∅ ∅
Hong Kong SAR	26 (4.1)	553 (5.7)	3 (6.0)	23 (4.3)	556 (8.5)	–3 (5.5)	30 (4.5)	559 (6.2)	5 (6.7)
Hungary	12 (2.8)	569 (12.4)	–3 (4.4)	29 (3.9)	552 (6.2)	5 (5.7)	28 (3.7)	544 (5.7)	–3 (5.4)
Iran, Islamic Rep. of	15 (2.7)	492 (10.9)	–2 (4.4)	15 (3.0)	475 (10.5)	4 (4.4)	18 (2.7)	424 (7.9)	–5 (5.1)
Italy	38 (3.7)	541 (4.5)	–7 (5.5)	37 (3.4)	542 (4.5)	0 (5.1)	14 (2.5)	524 (8.8)	4 (3.5)
Japan	64 (3.8)	551 (2.1)	–10 (5.4)	24 (3.5)	542 (4.2)	3 (5.0)	10 (2.4)	539 (3.7)	6 (2.8) ●
Kazakhstan	52 (4.2)	528 (7.3)	∅ ∅	26 (4.6)	531 (10.4)	∅ ∅	18 (4.4)	542 (12.8)	∅ ∅
Kuwait	60 (4.3)	348 (7.0)	∅ ∅	20 (3.3)	345 (13.1)	∅ ∅	16 (3.2)	347 (15.9)	∅ ∅
Latvia	38 (3.4)	555 (3.6)	13 (5.5) ●	38 (4.1)	535 (2.7)	–2 (7.0)	16 (3.1)	543 (5.9)	–4 (5.7)
Lithuania	37 (3.2)	530 (3.3)	11 (5.0) ▲	37 (3.9)	509 (3.3)	4 (6.0)	22 (3.0)	502 (5.1)	–9 (4.8)
Morocco	r 7 (2.9)	421 (20.3)	4 (3.2)	4 (1.7)	317 (32.8)	0 (2.3)	13 (2.8)	290 (16.4)	–5 (4.5)
Netherlands	r 61 (4.0)	531 (3.0)	–2 (5.6)	16 (3.5)	516 (4.3)	–1 (5.0)	15 (3.8)	504 (5.8)	7 (4.5)
New Zealand	44 (2.6)	534 (3.1)	0 (4.1)	20 (2.6)	515 (4.8)	–3 (4.4)	13 (1.6)	487 (8.3)	1 (2.8)
Norway	--	--	--	--	--	--	--	--	--
Qatar	41 (0.2)	306 (3.3)	∅ ∅	28 (0.2)	298 (3.3)	∅ ∅	13 (0.1)	287 (5.3)	∅ ∅
Russian Federation	28 (3.6)	567 (7.4)	10 (4.4) ●	33 (3.0)	552 (7.4)	1 (4.7)	20 (2.6)	535 (9.6)	–6 (4.0)
Scotland	r 44 (4.3)	517 (3.2)	8 (6.2)	26 (4.4)	499 (5.3)	–5 (6.4)	16 (3.8)	484 (4.7)	–2 (5.7)
Singapore	60 (0.0)	600 (5.6)	–4 (3.7)	30 (0.0)	570 (6.8)	4 (3.2)	9 (0.0)	546 (12.7)	3 (1.7)
Slovak Republic	41 (3.7)	543 (3.9)	∅ ∅	34 (3.8)	529 (5.6)	∅ ∅	13 (2.7)	493 (20.8)	∅ ∅
Slovenia	22 (3.6)	529 (5.7)	–2 (5.3)	43 (4.7)	520 (3.2)	0 (6.6)	25 (3.7)	513 (3.5)	2 (5.5)
Sweden	r 49 (4.5)	537 (2.9)	∅ ∅	30 (4.3)	520 (5.8)	∅ ∅	15 (4.0)	504 (7.9)	∅ ∅
Tunisia	20 (3.5)	354 (15.5)	0 (4.7)	14 (2.9)	344 (17.0)	–2 (4.1)	23 (3.9)	333 (10.5)	7 (4.9)
Ukraine	64 (4.2)	483 (3.4)	∅ ∅	25 (3.6)	457 (7.0)	∅ ∅	6 (2.1)	454 (14.5)	∅ ∅
United States	19 (2.2)	581 (6.3)	0 (3.6)	21 (2.5)	564 (3.4)	–2 (3.6)	18 (2.9)	545 (4.6)	–2 (4.1)
Yemen	5 (1.9)	236 (27.6)	∅ ∅	10 (2.2)	210 (20.2)	∅ ∅	22 (3.7)	199 (16.7)	∅ ∅
International Avg.	34 (0.6)	495 (1.9)		26 (0.6)	481 (1.7)		17 (0.5)	468 (1.7)	
<b>Benchmarking Participants</b>									
Alberta, Canada	45 (4.5)	559 (4.9)	∅ ∅	32 (4.4)	537 (4.4)	∅ ∅	13 (3.2)	534 (6.3)	∅ ∅
British Columbia, Canada	46 (4.7)	545 (5.4)	∅ ∅	34 (4.0)	536 (4.5)	∅ ∅	15 (3.2)	522 (5.8)	∅ ∅
Dubai, UAE	s 45 (0.4)	479 (3.4)	∅ ∅	21 (0.2)	457 (8.2)	∅ ∅	16 (0.2)	415 (5.3)	∅ ∅
Massachusetts, US	46 (7.2)	589 (4.5)	∅ ∅	23 (7.5)	579 (6.0)	∅ ∅	14 (5.0)	564 (7.1)	∅ ∅
Minnesota, US	14 (6.5)	585 (4.2)	∅ ∅	36 (8.5)	571 (10.3)	∅ ∅	29 (8.5)	548 (6.9)	∅ ∅
Ontario, Canada	42 (5.1)	550 (4.9)	–7 (7.5)	29 (4.7)	534 (3.9)	9 (6.2)	10 (2.9)	516 (12.3)	–5 (4.8)
Quebec, Canada	47 (4.9)	522 (3.6)	7 (6.6)	26 (3.8)	519 (5.5)	–3 (5.3)	14 (2.9)	513 (8.4)	1 (4.3)

- ▲ 2007 percent significantly higher  
 ▼ 2007 percent significantly lower

Background data provided by schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (∅) indicates the country did not participate in the assessment.



**Exhibit 8.1 Principals' Reports on the Percentages of Students in Their Schools Coming from Economically Disadvantaged Homes with Trends (Continued)**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Schools with More than 50% Economically Disadvantaged Students		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	58 (4.5)	342 (10.3)	0 0
Armenia	r 25 (3.6)	479 (12.6)	-22 (5.8) ▼
Australia	14 (3.1)	486 (10.5)	-2 (5.1)
Austria	6 (1.8)	470 (15.4)	0 0
Chinese Taipei	3 (1.7)	535 (10.6)	2 (1.9)
Colombia	82 (3.2)	389 (6.2)	0 0
Czech Republic	13 (3.2)	504 (7.6)	0 0
Denmark	r 7 (2.7)	482 (15.2)	0 0
El Salvador	70 (3.2)	384 (4.5)	0 0
England	r 16 (3.0)	499 (4.1)	-9 (5.2)
Georgia	36 (4.4)	418 (8.0)	0 0
Germany	14 (2.4)	463 (7.4)	0 0
Hong Kong SAR	21 (3.7)	540 (6.2)	-4 (5.7)
Hungary	31 (3.8)	500 (5.8)	2 (5.3)
Iran, Islamic Rep. of	52 (3.7)	411 (6.7)	2 (6.0)
Italy	11 (2.4)	508 (14.8)	3 (2.8)
Japan	1 (1.0)	~ ~	1 (1.0)
Kazakhstan	3 (1.3)	571 (12.4)	0 0
Kuwait	4 (1.8)	330 (34.9)	0 0
Latvia	9 (2.0)	521 (8.4)	-7 (4.7)
Lithuania	5 (1.5)	491 (11.5)	-6 (3.3)
Morocco	r 76 (3.6)	274 (7.0)	1 (5.3)
Netherlands	r 7 (2.1)	468 (11.3)	-3 (2.9)
New Zealand	23 (1.7)	444 (5.7)	2 (3.1)
Norway	--	--	--
Qatar	18 (0.1)	289 (4.0)	0 0
Russian Federation	19 (2.3)	530 (11.4)	-4 (4.3)
Scotland	r 14 (2.7)	456 (7.7)	-1 (4.4)
Singapore	1 (0.0)	~ ~	-3 (1.6) ▼
Slovak Republic	12 (2.1)	480 (17.8)	0 0
Slovenia	10 (2.7)	504 (5.3)	-1 (3.8)
Sweden	r 6 (2.4)	467 (10.5)	0 0
Tunisia	43 (3.9)	284 (8.8)	-5 (5.3)
Ukraine	4 (1.8)	470 (14.7)	0 0
United States	42 (2.8)	504 (4.0)	5 (3.8)
Yemen	63 (4.3)	190 (8.9)	0 0
<b>International Avg.</b>	<b>23 (0.5)</b>	<b>445 (2.0)</b>	
<b>Benchmarking Participants</b>			
Alberta, Canada	10 (2.7)	486 (11.7)	0 0
British Columbia, Canada	6 (2.0)	504 (9.9)	0 0
Dubai, UAE	s 19 (0.4)	434 (15.6)	0 0
Massachusetts, US	17 (4.4)	519 (7.8)	0 0
Minnesota, US	21 (7.0)	505 (15.1)	0 0
Ontario, Canada	19 (4.1)	505 (13.9)	2 (5.8)
Quebec, Canada	12 (3.1)	484 (3.8)	-4 (4.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

- 2007 percent significantly higher
- ▼ 2007 percent significantly lower



**Exhibit 8.1 Principals' Reports on the Percentages of Students in Their Schools Coming from Economically Disadvantaged Homes with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

Country	Schools with Few (0–10%) Economically Disadvantaged Students			Schools with 11–25% Economically Disadvantaged Students			Schools with 26–50% Economically Disadvantaged Students		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	6 (1.9)	405 (5.9)	◊ ◊	22 (3.4)	407 (4.5)	◊ ◊	20 (3.2)	409 (5.1)	◊ ◊
Armenia	r 17 (3.3)	488 (11.3)	14 (3.6) ▲	31 (4.3)	480 (8.8)	10 (5.6)	26 (4.2)	497 (10.6)	–3 (6.0)
Australia	31 (3.3)	549 (8.4)	–1 (5.6)	33 (4.0)	509 (5.1)	–2 (5.8)	23 (4.3)	504 (6.7)	0 (5.4)
Bahrain	11 (0.2)	499 (5.9)	–5 (0.2) ▼	33 (0.3)	480 (2.8)	13 (0.3) ▲	31 (0.2)	460 (2.9)	–2 (0.3) ▼
Bosnia and Herzegovina	8 (2.2)	468 (11.6)	◊ ◊	18 (3.4)	465 (6.7)	◊ ◊	28 (4.1)	468 (6.3)	◊ ◊
Botswana	9 (2.2)	404 (15.2)	–7 (4.2)	22 (3.9)	380 (7.3)	1 (5.3)	21 (4.2)	342 (7.3)	–4 (5.7)
Bulgaria	19 (3.3)	502 (11.9)	– –	27 (3.9)	477 (7.9)	– –	20 (4.0)	460 (13.0)	– –
Chinese Taipei	59 (4.1)	571 (3.9)	–8 (5.4)	29 (3.8)	549 (6.3)	4 (5.2)	5 (1.9)	555 (9.6)	0 (2.6)
Colombia	6 (1.8)	419 (26.5)	◊ ◊	7 (3.0)	444 (10.2)	◊ ◊	14 (3.4)	428 (7.6)	◊ ◊
Cyprus	37 (0.2)	450 (2.8)	–1 (0.3)	32 (0.2)	454 (3.4)	–3 (0.4) ▼	22 (0.2)	446 (4.6)	7 (0.3) ▲
Czech Republic	24 (4.2)	552 (7.3)	◊ ◊	39 (4.7)	544 (4.9)	◊ ◊	27 (4.3)	530 (5.6)	◊ ◊
Egypt	10 (2.0)	430 (15.9)	–1 (3.2)	11 (2.7)	419 (11.6)	–13 (4.6) ▼	24 (3.4)	411 (6.2)	1 (4.9)
El Salvador	6 (1.5)	432 (10.0)	◊ ◊	8 (2.5)	387 (18.5)	◊ ◊	16 (3.2)	380 (7.3)	◊ ◊
England	s 38 (3.5)	570 (8.0)	5 (6.3)	27 (4.0)	522 (7.7)	–6 (7.2)	23 (3.8)	526 (10.9)	1 (7.3)
Georgia	11 (2.9)	431 (7.5)	◊ ◊	22 (4.3)	438 (10.3)	◊ ◊	30 (5.0)	409 (9.2)	◊ ◊
Ghana	8 (2.4)	336 (22.2)	4 (2.8)	7 (2.1)	304 (21.3)	–1 (3.3)	15 (2.9)	315 (18.3)	–3 (4.5)
Hong Kong SAR	12 (2.6)	566 (9.3)	–2 (4.3)	24 (3.6)	554 (8.6)	–3 (5.4)	24 (3.8)	516 (10.1)	0 (5.5)
Hungary	13 (2.9)	570 (8.9)	–2 (4.2)	26 (4.1)	548 (6.1)	3 (5.3)	31 (4.3)	534 (5.5)	–4 (6.1)
Indonesia	6 (1.9)	455 (24.6)	2 (2.7)	16 (2.8)	463 (11.9)	–1 (4.4)	22 (4.2)	450 (10.3)	–3 (5.4)
Iran, Islamic Rep. of	11 (2.4)	511 (9.5)	–4 (3.5)	16 (3.3)	460 (9.6)	4 (4.0)	23 (3.5)	468 (7.8)	–2 (4.9)
Israel	14 (2.8)	509 (10.1)	–1 (4.2)	25 (3.4)	493 (9.1)	–10 (5.1) ▼	32 (4.0)	461 (8.5)	6 (5.8)
Italy	40 (4.2)	510 (4.7)	–5 (5.4)	32 (4.0)	501 (4.7)	–1 (5.5)	19 (3.4)	481 (5.6)	7 (4.2)
Japan	57 (4.0)	562 (2.2)	–15 (5.4) ▼	33 (3.9)	550 (4.0)	10 (5.1) ▲	7 (2.4)	520 (11.1)	3 (2.9)
Jordan	11 (2.5)	504 (13.0)	–3 (4.0)	19 (3.5)	502 (8.8)	–3 (5.5)	28 (3.6)	477 (8.7)	4 (5.0)
Korea, Rep. of	24 (3.3)	569 (3.4)	–10 (4.9) ▼	34 (3.7)	553 (3.3)	–6 (5.5)	26 (3.5)	543 (3.6)	10 (4.6) ▲
Kuwait	r 52 (4.7)	423 (5.5)	◊ ◊	21 (3.6)	414 (8.1)	◊ ◊	17 (3.7)	417 (7.9)	◊ ◊
Lebanon	14 (3.0)	455 (15.5)	6 (4.0)	16 (3.2)	441 (12.9)	–1 (4.5)	15 (3.4)	413 (12.0)	0 (4.3)
Lithuania	r 33 (3.6)	540 (4.7)	13 (5.4) ▲	40 (3.6)	511 (3.5)	–1 (6.1)	22 (3.5)	503 (6.3)	–8 (5.6)
Malaysia	17 (3.5)	488 (11.7)	10 (4.2) ▲	25 (3.6)	482 (11.1)	13 (4.5) ▲	20 (3.1)	479 (14.6)	3 (4.6)
Malta	56 (0.2)	497 (1.6)	◊ ◊	20 (0.2)	434 (3.3)	◊ ◊	19 (0.2)	421 (3.0)	◊ ◊
Norway	– –	– –	– –	– –	– –	– –	– –	– –	– –
Oman	12 (2.7)	426 (14.6)	◊ ◊	30 (3.8)	412 (7.8)	◊ ◊	28 (3.7)	431 (7.4)	◊ ◊
Palestinian Nat'l Auth.	6 (1.9)	429 (25.5)	–1 (2.8)	20 (3.4)	426 (8.7)	9 (4.3) ▲	20 (3.2)	409 (9.4)	–9 (4.9)
Qatar	r 31 (0.2)	349 (2.7)	◊ ◊	41 (0.2)	281 (2.6)	◊ ◊	24 (0.1)	340 (2.8)	◊ ◊
Romania	14 (3.0)	492 (8.6)	2 (4.2)	16 (3.1)	484 (9.8)	–2 (4.5)	22 (3.9)	464 (8.0)	1 (4.9)
Russian Federation	30 (3.4)	544 (5.0)	11 (4.5) ▲	36 (3.5)	533 (5.6)	–1 (4.7)	22 (3.2)	518 (8.0)	–2 (4.2)
Saudi Arabia	27 (3.9)	416 (4.8)	– –	31 (4.2)	402 (5.6)	– –	25 (4.1)	394 (8.7)	– –
Scotland	s 36 (3.7)	520 (6.6)	8 (6.0)	38 (4.1)	487 (6.3)	–5 (7.0)	17 (3.6)	478 (10.3)	–6 (5.9)
Serbia	5 (1.9)	514 (8.2)	–5 (2.9)	22 (3.2)	481 (7.9)	–6 (5.1)	28 (4.2)	464 (6.9)	5 (5.8)
Singapore	52 (0.0)	593 (6.2)	–5 (0.0) ▼	30 (0.0)	544 (8.4)	3 (0.0) ▲	9 (0.0)	519 (17.4)	–1 (0.0)
Slovenia	22 (3.4)	546 (6.0)	–1 (5.2)	41 (4.5)	537 (3.5)	–1 (6.4)	25 (3.8)	537 (5.2)	2 (5.6)
Sweden	r 43 (4.7)	516 (4.5)	–3 (6.2)	41 (4.6)	504 (3.9)	9 (6.1)	11 (3.0)	507 (9.3)	–8 (4.8)
Syrian Arab Republic	12 (2.9)	451 (8.0)	◊ ◊	15 (2.7)	465 (8.9)	◊ ◊	25 (3.8)	465 (5.0)	◊ ◊
Thailand	5 (1.9)	507 (18.2)	◊ ◊	15 (2.8)	527 (14.7)	◊ ◊	20 (3.1)	481 (9.6)	◊ ◊
Tunisia	9 (2.6)	459 (6.8)	0 (3.7)	18 (3.1)	450 (5.0)	3 (4.1)	21 (3.5)	454 (4.6)	5 (4.6)
Turkey	6 (1.9)	520 (22.0)	◊ ◊	10 (2.5)	511 (10.9)	◊ ◊	18 (3.4)	470 (10.4)	◊ ◊
Ukraine	60 (4.1)	491 (4.2)	◊ ◊	28 (3.5)	479 (7.9)	◊ ◊	7 (2.1)	462 (7.9)	◊ ◊
United States	r 16 (2.5)	566 (3.6)	–11 (3.8) ▼	23 (2.8)	549 (4.8)	–1 (4.1)	26 (3.4)	521 (4.9)	1 (4.6)
‡ Morocco	0 (0.0)	~ ~	– –	6 (1.4)	437 (17.0)	– –	15 (4.6)	403 (9.7)	– –
International Avg.	22 (0.4)	489 (1.7)		24 (0.5)	472 (1.3)		21 (0.5)	461 (1.3)	

**Benchmarking Participants**

Basque Country, Spain	63 (5.3)	506 (3.6)	–1 (7.2)	15 (4.0)	494 (6.3)	–5 (5.5)	15 (3.9)	489 (6.9)	6 (5.0)
British Columbia, Canada	40 (4.4)	538 (5.1)	◊ ◊	33 (4.5)	521 (3.9)	◊ ◊	23 (4.0)	513 (7.3)	◊ ◊
Dubai, UAE	s 43 (0.9)	506 (5.8)	◊ ◊	19 (0.5)	478 (6.1)	◊ ◊	13 (0.4)	464 (10.6)	◊ ◊
Massachusetts, US	32 (3.5)	588 (6.8)	◊ ◊	37 (5.0)	564 (4.9)	◊ ◊	12 (5.1)	526 (22.4)	◊ ◊
Minnesota, US	15 (5.9)	566 (13.1)	◊ ◊	38 (7.9)	542 (7.3)	◊ ◊	29 (8.0)	531 (6.4)	◊ ◊
Ontario, Canada	42 (4.2)	537 (5.3)	1 (6.3)	36 (4.6)	520 (4.8)	7 (6.4)	17 (3.4)	529 (8.1)	4 (4.9)
Quebec, Canada	28 (3.7)	536 (5.7)	–15 (6.0) ▼	33 (3.8)	500 (6.2)	2 (6.2)	24 (3.9)	497 (6.0)	9 (4.9)

Background data provided by schools.

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (◊) indicates the country did not participate in the assessment.


**TIMSS & PIRLS**  
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**Exhibit 8.1 Principals' Reports on the Percentages of Students in Their Schools Coming from Economically Disadvantaged Homes with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>** Grade

Country	Schools with More than 50% Economically Disadvantaged Students		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	52 (4.2)	409 (2.2)	0 0
Armenia	r 27 (3.9)	488 (9.4)	-20 (6.2) ▼
Australia	13 (2.6)	465 (12.0)	3 (3.5)
Bahrain	24 (0.2)	445 (2.3)	-7 (0.3) ▼
Bosnia and Herzegovina	46 (4.6)	462 (4.1)	0 0
Botswana	47 (4.6)	331 (3.7)	10 (6.5)
Bulgaria	34 (3.9)	449 (12.0)	--
Chinese Taipei	7 (2.8)	535 (20.5)	4 (3.2)
Colombia	73 (3.8)	406 (4.7)	0 0
Cyprus	9 (0.2)	460 (8.7)	-3 (0.3) ▼
Czech Republic	11 (2.6)	512 (5.2)	0 0
Egypt	55 (4.0)	398 (4.8)	13 (5.6) ▲
El Salvador	70 (3.7)	385 (3.7)	0 0
England	s 12 (2.6)	512 (14.0)	-1 (5.0)
Georgia	37 (5.3)	419 (6.7)	0 0
Ghana	71 (3.8)	296 (7.1)	0 (5.7)
Hong Kong SAR	40 (4.2)	507 (8.4)	5 (6.2)
Hungary	30 (3.8)	518 (6.2)	3 (5.4)
Indonesia	56 (3.9)	416 (5.2)	2 (5.7)
Iran, Islamic Rep. of	50 (3.8)	439 (4.1)	2 (5.6)
Israel	30 (3.8)	437 (10.1)	5 (5.0)
Italy	9 (2.2)	429 (10.9)	-1 (3.1)
Japan	2 (1.0)	~ ~	2 (1.0)
Jordan	42 (4.2)	470 (7.1)	2 (6.2)
Korea, Rep. of	16 (2.7)	545 (4.9)	6 (3.7)
Kuwait	r 11 (2.8)	399 (17.3)	0 0
Lebanon	56 (4.6)	385 (9.5)	-5 (6.1)
Lithuania	r 5 (1.9)	498 (13.7)	-3 (3.1)
Malaysia	38 (3.9)	451 (8.8)	-26 (5.6) ▼
Malta	6 (0.1)	307 (5.7)	0 0
Norway	--	--	--
Oman	30 (3.7)	422 (5.3)	0 0
Palestinian Nat'l Auth.	55 (4.0)	392 (4.8)	0 (5.5)
Qatar	r 4 (0.1)	345 (6.3)	0 0
Romania	49 (4.2)	444 (6.0)	-2 (6.0)
Russian Federation	12 (3.2)	505 (10.7)	-8 (4.3)
Saudi Arabia	18 (3.4)	391 (7.8)	--
Scotland	s 9 (2.2)	461 (10.0)	3 (3.5)
Serbia	45 (4.7)	462 (5.1)	6 (6.4)
Singapore	9 (0.0)	534 (14.7)	4 (0.0) ▲
Slovenia	11 (3.1)	528 (6.7)	0 (4.1)
Sweden	r 5 (1.8)	481 (10.9)	2 (2.1)
Syrian Arab Republic	48 (4.5)	440 (4.8)	0 0
Thailand	59 (3.6)	448 (5.6)	0 0
Tunisia	52 (4.0)	436 (2.8)	-7 (5.8)
Turkey	66 (3.9)	434 (4.1)	0 0
Ukraine	6 (1.8)	477 (21.7)	0 0
United States	r 35 (2.8)	480 (5.0)	11 (4.0) ▲
‡ Morocco	78 (4.8)	392 (3.6)	--
<b>International Avg.</b>	<b>33 (0.5)</b>	<b>444 (1.3)</b>	
<b>Benchmarking Participants</b>			
Basque Country, Spain	7 (2.1)	458 (15.7)	0 (3.2)
British Columbia, Canada	4 (1.9)	544 (30.7)	0 0
Dubai, UAE	s 24 (0.6)	465 (6.4)	0 0
Massachusetts, US	19 (3.3)	495 (17.2)	0 0
Minnesota, US	18 (5.6)	501 (15.5)	0 0
Ontario, Canada	5 (2.2)	497 (12.1)	-11 (4.0) ▼
Quebec, Canada	15 (3.2)	475 (9.7)	4 (4.1)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

- ▲ 2007 percent significantly higher  
 ▼ 2007 percent significantly lower

**Exhibit 8.2 Principals' Reports on the Percentages of Students Having the Language of the Test as Their Native Language with Trends**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	Schools with More than 90% of Students Having the Language of the Test as Native Language			Schools with 50–90% of Students Having the Language of the Test as Native Language			Schools with Less than 50% of Students Having the Language of the Test as Native Language		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	77 (4.5)	361 (5.5)	∅ ∅	12 (2.3)	347 (12.2)	∅ ∅	12 (4.4)	322 (43.2)	∅ ∅
Armenia	r 96 (1.3)	485 (5.9)	–1 (1.8)	3 (0.9)	449 (17.8)	2 (1.3)	1 (0.8)	~ ~	–1 (1.3)
Australia	62 (4.1)	527 (3.8)	–1 (6.0)	23 (4.2)	535 (7.1)	–5 (5.9)	15 (3.3)	514 (10.3)	6 (4.0)
Austria	44 (3.0)	534 (3.2)	∅ ∅	41 (3.6)	529 (3.1)	∅ ∅	15 (2.7)	493 (9.2)	∅ ∅
Chinese Taipei	39 (4.2)	560 (3.2)	5 (5.7)	34 (3.9)	559 (3.8)	–6 (5.3)	27 (3.9)	550 (3.5)	0 (5.1)
Colombia	96 (1.9)	403 (6.0)	∅ ∅	3 (1.8)	356 (27.7)	∅ ∅	1 (0.8)	~ ~	∅ ∅
Czech Republic	97 (1.4)	514 (3.1)	∅ ∅	2 (1.3)	~ ~	∅ ∅	1 (0.0)	~ ~	∅ ∅
Denmark	71 (4.3)	523 (3.0)	∅ ∅	25 (3.9)	509 (6.7)	∅ ∅	5 (1.9)	484 (17.9)	∅ ∅
El Salvador	98 (1.1)	390 (3.5)	∅ ∅	1 (0.9)	~ ~	∅ ∅	1 (0.6)	~ ~	∅ ∅
England	r 68 (3.9)	548 (3.6)	–6 (6.0)	17 (3.4)	531 (7.7)	4 (4.5)	15 (2.9)	524 (8.5)	2 (4.9)
Georgia	90 (2.5)	417 (4.7)	∅ ∅	10 (2.5)	420 (14.1)	∅ ∅	0 (0.0)	~ ~	∅ ∅
Germany	44 (2.9)	543 (3.0)	∅ ∅	45 (3.0)	530 (3.1)	∅ ∅	11 (1.8)	468 (8.2)	∅ ∅
Hong Kong SAR	96 (1.6)	554 (3.8)	–1 (2.6)	3 (1.3)	566 (12.2)	0 (2.4)	1 (0.0)	~ ~	1 (0.0)
Hungary	99 (0.8)	537 (3.3)	1 (1.3)	0 (0.0)	~ ~	–2 (1.1)	1 (0.0)	~ ~	1 (0.0)
Iran, Islamic Rep. of	43 (4.0)	468 (7.2)	–4 (6.7)	10 (2.5)	462 (9.8)	–4 (4.1)	46 (3.6)	400 (5.3)	8 (6.1)
Italy	66 (3.2)	535 (3.5)	–14 (4.4) ▼	33 (3.1)	540 (5.0)	17 (4.1) ▲	1 (0.8)	~ ~	–3 (1.8)
Japan	99 (0.7)	548 (2.0)	1 (1.4)	1 (0.0)	~ ~	1 (0.0)	0 (0.0)	~ ~	–2 (1.1)
Kazakhstan	53 (5.0)	521 (7.6)	∅ ∅	34 (4.9)	550 (7.3)	∅ ∅	12 (2.4)	534 (9.9)	∅ ∅
Kuwait	92 (2.1)	351 (4.7)	∅ ∅	7 (2.0)	318 (20.4)	∅ ∅	1 (0.0)	~ ~	∅ ∅
Latvia	72 (4.0)	546 (2.4)	–3 (6.1)	24 (3.9)	542 (4.2)	3 (6.0)	4 (1.5)	512 (18.8)	0 (2.2)
Lithuania	93 (2.0)	513 (2.4)	2 (3.2)	6 (1.8)	534 (10.4)	0 (2.8)	1 (0.7)	~ ~	–2 (1.9)
Morocco	r 68 (3.4)	297 (8.5)	6 (5.4)	16 (3.0)	317 (20.9)	8 (3.6) ▲	16 (3.0)	259 (15.9)	–13 (5.0) ▼
Netherlands	r 62 (4.1)	534 (3.3)	–4 (5.5)	28 (3.7)	508 (3.5)	7 (5.0)	11 (3.0)	497 (7.5)	–3 (4.0)
New Zealand	65 (3.0)	516 (3.2)	–2 (4.4)	26 (3.1)	491 (7.8)	–1 (4.4)	10 (1.6)	461 (10.3)	3 (2.5)
Norway	80 (3.8)	476 (3.9)	–1 (5.3)	17 (3.7)	477 (8.5)	–1 (5.2)	3 (1.6)	471 (11.3)	2 (1.8)
Qatar	76 (0.1)	295 (2.6)	∅ ∅	14 (0.1)	313 (4.3)	∅ ∅	10 (0.1)	244 (5.1)	∅ ∅
Russian Federation	70 (2.7)	550 (5.5)	–2 (4.7)	19 (2.7)	543 (9.3)	2 (3.8)	11 (1.6)	528 (21.0)	0 (3.0)
Scotland	87 (3.3)	502 (2.6)	–4 (4.4)	11 (3.0)	496 (10.5)	3 (3.9)	2 (1.3)	~ ~	0 (2.0)
Singapore	3 (0.0)	614 (23.6)	– –	22 (0.0)	616 (6.6)	– –	75 (0.0)	577 (5.1)	– –
Slovak Republic	89 (2.7)	535 (3.2)	∅ ∅	5 (1.8)	485 (25.3)	∅ ∅	5 (2.0)	420 (40.8)	∅ ∅
Slovenia	78 (3.7)	521 (2.4)	6 (5.2)	21 (3.6)	512 (3.9)	–6 (5.1)	1 (0.8)	~ ~	0 (1.1)
Sweden	61 (4.4)	531 (3.2)	∅ ∅	31 (4.0)	526 (3.9)	∅ ∅	8 (2.5)	476 (9.1)	∅ ∅
Tunisia	62 (4.1)	318 (8.4)	8 (6.0)	28 (4.1)	319 (11.9)	11 (5.3) ▲	10 (2.6)	296 (22.1)	–19 (4.6) ▼
Ukraine	58 (3.3)	468 (4.3)	∅ ∅	18 (3.1)	474 (6.1)	∅ ∅	23 (3.0)	488 (5.0)	∅ ∅
United States	62 (3.0)	551 (3.3)	–5 (4.3)	26 (2.9)	526 (7.0)	6 (3.9)	12 (2.0)	499 (10.7)	–1 (3.0)
Yemen	93 (2.3)	198 (7.6)	∅ ∅	5 (1.9)	221 (26.8)	∅ ∅	1 (0.1)	~ ~	∅ ∅
International Avg.	73 (0.5)	480 (1.0)		17 (0.5)	472 (2.2)		10 (0.3)	455 (3.6)	
<b>Benchmarking Participants</b>									
Alberta, Canada	62 (4.4)	546 (4.3)	∅ ∅	30 (4.1)	539 (6.3)	∅ ∅	7 (2.2)	524 (8.5)	∅ ∅
British Columbia, Canada	48 (4.8)	545 (3.6)	∅ ∅	31 (4.7)	536 (5.0)	∅ ∅	20 (3.6)	519 (9.0)	∅ ∅
Dubai, UAE	r 13 (0.2)	426 (5.1)	∅ ∅	10 (0.1)	498 (7.6)	∅ ∅	77 (0.2)	462 (4.1)	∅ ∅
Massachusetts, US	71 (4.6)	580 (4.0)	∅ ∅	22 (4.8)	560 (17.2)	∅ ∅	7 (3.8)	516 (7.2)	∅ ∅
Minnesota, US	62 (9.5)	568 (5.2)	∅ ∅	30 (8.7)	538 (13.4)	∅ ∅	8 (5.6)	493 (37.3)	∅ ∅
Ontario, Canada	58 (4.5)	535 (4.7)	6 (6.7)	31 (4.4)	536 (8.8)	–1 (6.4)	11 (2.7)	530 (10.0)	–5 (4.6)
Quebec, Canada	75 (3.6)	522 (2.7)	–10 (4.6) ▼	19 (3.0)	507 (6.3)	8 (4.1)	6 (1.9)	481 (7.9)	2 (2.3)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

A diamond (∅) indicates the country did not participate in the assessment.


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**Exhibit 8.2 Principals' Reports on the Percentages of Students Having the Language of the Test as Their Native Language with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Schools with More than 90% of Students Having the Language of the Test as Native Language			Schools with 50–90% of Students Having the Language of the Test as Native Language			Schools with Less than 50% of Students Having the Language of the Test as Native Language		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Algeria	87 (2.5)	408 (1.8)	0 0	8 (2.1)	415 (6.4)	0 0	5 (1.7)	399 (9.6)	0 0
Armenia	r 97 (0.8)	489 (5.9)	-1 (1.4)	3 (0.8)	451 (19.1)	2 (0.9)	0 (0.0)	~ ~	-2 (1.1)
Australia	68 (3.1)	517 (4.7)	6 (5.8)	25 (3.4)	514 (7.6)	-1 (5.5)	7 (2.4)	486 (30.7)	-6 (4.6)
Bahrain	88 (0.1)	465 (1.6)	7 (0.2)	7 (0.1)	481 (11.1)	-9 (0.2)	5 (0.1)	497 (4.1)	2 (0.1)
Bosnia and Herzegovina	97 (1.5)	464 (2.8)	0 0	3 (1.5)	500 (26.8)	0 0	0 (0.0)	~ ~	0 0
Botswana	r 2 (1.2)	~ ~	0 (1.9)	3 (1.4)	396 (47.7)	2 (1.8)	95 (1.8)	350 (3.3)	-2 (2.6)
Bulgaria	58 (4.6)	482 (7.0)	--	21 (3.9)	469 (15.6)	--	21 (3.7)	443 (11.4)	--
Chinese Taipei	40 (4.3)	564 (4.9)	-3 (6.1)	37 (4.5)	572 (5.5)	3 (6.1)	23 (3.9)	537 (7.3)	0 (5.2)
Colombia	99 (0.9)	418 (3.6)	0 0	1 (0.0)	~ ~	0 0	0 (0.0)	~ ~	0 0
Cyprus	89 (0.1)	451 (2.0)	-10 (0.1)	10 (0.1)	451 (6.9)	10 (0.1)	0 (0.0)	~ ~	-1 (0.1)
Czech Republic	98 (1.0)	539 (2.0)	0 0	2 (1.0)	~ ~	0 0	0 (0.0)	~ ~	0 0
Egypt	96 (1.2)	409 (3.8)	-4 (1.2)	4 (1.2)	404 (15.2)	4 (1.2)	0 (0.0)	~ ~	0 (0.0)
El Salvador	99 (0.6)	388 (3.0)	0 0	1 (0.7)	~ ~	0 0	0 (0.0)	~ ~	0 0
England	s 72 (4.1)	548 (5.9)	-10 (6.2)	22 (3.7)	531 (8.1)	7 (6.3)	6 (1.8)	519 (24.8)	3 (3.0)
Georgia	87 (4.2)	423 (4.7)	0 0	13 (4.2)	405 (14.5)	0 0	0 (0.0)	~ ~	0 0
Ghana	r 1 (1.0)	~ ~	1 (1.0)	1 (0.7)	~ ~	-1 (1.7)	98 (1.2)	302 (5.8)	0 (2.0)
Hong Kong SAR	89 (2.9)	534 (5.1)	-4 (3.7)	9 (2.6)	500 (22.4)	3 (3.4)	2 (1.3)	~ ~	1 (1.4)
Hungary	100 (0.0)	539 (3.1)	1 (0.8)	0 (0.0)	~ ~	-1 (0.8)	0 (0.0)	~ ~	0 (0.0)
Indonesia	31 (4.5)	442 (8.5)	15 (5.3)	34 (4.4)	428 (8.4)	0 (6.1)	35 (4.8)	431 (7.3)	-16 (6.6)
Iran, Islamic Rep. of	49 (3.7)	476 (5.3)	-3 (5.5)	12 (2.6)	471 (10.6)	0 (3.4)	38 (3.4)	434 (4.7)	4 (5.2)
Israel	77 (3.4)	471 (5.3)	1 (4.7)	20 (3.4)	471 (11.2)	-1 (4.7)	3 (1.5)	457 (43.4)	0 (2.0)
Italy	69 (3.0)	493 (3.7)	-8 (4.6)	27 (3.0)	505 (4.1)	10 (4.1)	4 (1.6)	474 (21.5)	-2 (2.6)
Japan	100 (0.0)	554 (1.9)	0 (0.0)	0 (0.0)	~ ~	0 (0.0)	0 (0.0)	~ ~	0 (0.0)
Jordan	99 (0.7)	481 (4.0)	3 (1.4)	1 (0.7)	~ ~	-2 (1.6)	0 (0.0)	~ ~	-1 (0.0)
Korea, Rep. of	100 (0.0)	553 (2.0)	1 (0.8)	0 (0.0)	~ ~	-1 (0.8)	0 (0.0)	~ ~	0 (0.0)
Kuwait	92 (2.2)	419 (3.3)	0 0	7 (2.0)	417 (11.7)	0 0	1 (0.8)	~ ~	0 0
Lebanon	r 12 (2.6)	425 (21.9)	0 (4.2)	5 (2.2)	402 (26.0)	-1 (3.2)	83 (3.3)	414 (7.7)	0 (5.0)
Lithuania	92 (1.8)	518 (2.6)	1 (3.0)	6 (1.8)	526 (7.3)	1 (2.6)	1 (1.1)	~ ~	-2 (1.8)
Malaysia	38 (3.2)	464 (11.2)	-6 (5.3)	34 (3.8)	488 (8.6)	5 (5.3)	28 (3.7)	461 (12.8)	1 (4.8)
Malta	11 (0.2)	483 (5.4)	0 0	5 (0.2)	447 (6.4)	0 0	84 (0.2)	456 (1.3)	0 0
Norway	82 (3.4)	488 (2.5)	-7 (4.2)	16 (3.4)	487 (4.8)	6 (4.2)	1 (0.9)	~ ~	1 (1.1)
Oman	96 (1.7)	422 (3.1)	0 0	4 (1.7)	421 (19.9)	0 0	0 (0.0)	~ ~	0 0
Palestinian Nat'l Auth.	99 (1.1)	404 (3.6)	-1 (1.1)	1 (1.1)	~ ~	1 (1.1)	0 (0.0)	~ ~	0 (0.0)
Qatar	88 (0.1)	328 (1.8)	0 0	5 (0.1)	284 (7.4)	0 0	7 (0.1)	349 (5.7)	0 0
Romania	86 (2.6)	461 (4.0)	-1 (3.6)	7 (1.8)	474 (15.1)	-1 (2.7)	7 (2.5)	465 (16.1)	2 (3.0)
Russian Federation	78 (3.6)	529 (4.1)	5 (5.8)	15 (2.7)	542 (8.8)	-3 (5.7)	7 (2.6)	505 (12.9)	-2 (3.7)
Saudi Arabia	90 (2.3)	403 (2.6)	--	9 (2.3)	408 (8.1)	--	1 (0.5)	~ ~	--
Scotland	s 95 (2.1)	497 (3.7)	3 (3.5)	5 (2.1)	470 (22.2)	-3 (3.5)	0 (0.0)	~ ~	0 (0.0)
Serbia	88 (2.9)	472 (3.3)	-5 (3.5)	10 (2.4)	464 (10.1)	3 (3.1)	2 (1.7)	~ ~	1 (1.8)
Singapore	7 (0.0)	633 (8.6)	--	18 (0.0)	607 (9.4)	--	74 (0.0)	550 (5.5)	--
Slovenia	76 (3.7)	539 (2.7)	7 (5.4)	23 (3.7)	536 (3.9)	-7 (5.3)	0 (0.0)	~ ~	0 (0.8)
Sweden	61 (4.3)	517 (2.9)	-1 (5.9)	33 (4.1)	506 (4.7)	0 (5.7)	6 (1.9)	473 (7.9)	1 (2.7)
Syrian Arab Republic	97 (1.1)	453 (3.0)	0 0	2 (1.1)	~ ~	0 0	1 (0.1)	~ ~	0 0
Thailand	85 (2.7)	476 (5.0)	0 0	6 (1.9)	439 (16.9)	0 0	9 (2.4)	447 (9.1)	0 0
Tunisia	85 (2.9)	445 (2.2)	4 (4.3)	12 (2.7)	446 (6.7)	5 (3.4)	3 (1.4)	431 (7.9)	-9 (2.8)
Turkey	--	--	0 0	--	--	0 0	--	--	0 0
Ukraine	60 (2.9)	484 (4.8)	0 0	17 (2.8)	487 (8.5)	0 0	23 (2.9)	487 (5.8)	0 0
United States	68 (3.0)	531 (3.6)	-9 (4.3)	22 (2.8)	504 (6.8)	6 (3.9)	9 (1.9)	486 (9.7)	4 (2.5)
‡ Morocco	65 (5.0)	399 (4.4)	--	18 (4.9)	417 (11.6)	--	16 (4.9)	398 (14.6)	--
<b>International Avg.</b>	<b>74 (0.4)</b>	<b>476 (0.8)</b>		<b>11 (0.4)</b>	<b>467 (2.4)</b>		<b>15 (0.3)</b>	<b>450 (3.0)</b>	

**Benchmarking Participants**

Basque Country, Spain	39 (4.2)	499 (4.8)	-9 (5.6)	37 (5.2)	496 (4.7)	7 (6.9)	24 (4.3)	495 (5.0)	2 (5.4)
British Columbia, Canada	50 (4.2)	523 (3.5)	0 0	35 (4.1)	540 (5.4)	0 0	15 (3.2)	515 (10.5)	0 0
Dubai, UAE	s 21 (0.5)	431 (7.0)	0 0	11 (0.3)	523 (4.5)	0 0	68 (0.6)	500 (4.8)	0 0
Massachusetts, US	76 (5.3)	571 (5.0)	0 0	16 (5.6)	521 (19.2)	0 0	8 (2.7)	480 (18.3)	0 0
Minnesota, US	79 (7.2)	548 (5.1)	0 0	17 (7.2)	512 (9.7)	0 0	5 (1.1)	462 (26.7)	0 0
Ontario, Canada	62 (4.3)	530 (4.2)	5 (6.6)	26 (3.8)	532 (6.2)	-6 (6.2)	12 (2.9)	518 (7.7)	2 (4.1)
Quebec, Canada	71 (4.1)	510 (3.7)	-4 (5.5)	24 (4.0)	505 (12.1)	4 (5.3)	5 (1.7)	490 (7.3)	0 (2.5)

Background data provided by schools.

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

In many countries, there are schools that have high rates of absenteeism, which can disrupt continuity in the classroom and reduce time for learning. As previously shown in TIMSS, absenteeism is related to lower student achievement. To examine this issue, TIMSS developed an Index of Good Attendance at School (GAS) based on schools' responses to three questions about the seriousness of students' absenteeism, arriving late at school, and skipping class. As shown in Exhibit 8.3, schools at the high level of the index reported that all three behaviors never occur or are not a problem, while schools at the low level indicated that two or more of the behaviors were a serious problem or that one was a serious problem and the other two were minor problems. The medium category includes all other combinations of responses

Exhibit 8.3 presents, for each TIMSS participant at the fourth and eighth grades, the percentage of students at each of the three levels of the Index of Good Attendance at School, together with average science achievement. At the fourth grade, on average across countries, 43 percent of students were at the high level of the index, 50 at the medium level, and 7 percent at the low level. The countries with the highest percentages of students at the high index level (i.e., in schools with few attendance problems) included Chinese Taipei, Slovenia, the Czech Republic, Austria, the Netherlands, and Germany, with more than 60 percent of students at this level. Countries where absenteeism was reported to be more of a problem at the fourth grade included Morocco, Colombia, the United States, Yemen, El Salvador, Kuwait, and Qatar, with less than 30 percent of students at the high index level. Average science achievement was highest among students at the high index level (481 points), next among those at the medium level (474 points), and lowest among those at the low level (433 points).

Attendance problems appear to be more serious at the eighth grade than at the fourth, with an average of 21 percent of students at the high index level compared with 43 percent at fourth grade, and 20 percent at the low level compared with just 7 percent at fourth grade. Countries with the greatest percentages of students (40% or more) in schools with few attendance problems included Lebanon, Chinese Taipei, Oman, Korea, and Malta, while those with less than 10 percent of students in such schools included Norway, Indonesia, Kuwait, Morocco, Lithuania, Ghana, and Sweden. Similar to fourth grade, average science achievement was highest (481 points) among students attending schools with few attendance problems (the high level of the index), next among students at the medium level (465 points), and lowest among students at the low level of the attendance index (451 points), i.e., those attending schools where students arriving late, absenteeism, and skipping class may be serious problems.

Exhibit 8.4 presents trends in the Index of Good Attendance at School (GAS), with changes since 2003 in the percentages of students at the high level of the index for fourth grade and changes since 1999 and 2003 at the eighth grade. At fourth grade, only one country, the Russian Federation, showed an increase in the percentage of students at the high level since 2003, with three countries, Hong Kong SAR, Italy, and Hungary, with a decrease. At eighth grade, six countries showed an increase in the percentage of students at the high level of the attendance index since 1999 or 2003, or both. These were: Chinese Taipei, Korea, Israel, the Russian Federation, Malaysia, and Botswana. Eight countries had a decrease over that period, including Lebanon, Egypt, Singapore, Italy, Iran, Bahrain, Cyprus, and Norway.

## Exhibit 8.3 Index of Good Attendance at School (GAS)

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	High GAS		Medium GAS		Low GAS	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Chinese Taipei	77 (3.9)	558 (2.4)	23 (3.9)	555 (5.1)	0 (0.0)	~ ~
Slovenia	72 (3.7)	518 (2.6)	28 (3.6)	520 (4.4)	1 (0.7)	~ ~
Czech Republic	71 (3.9)	517 (3.1)	28 (3.8)	510 (7.5)	1 (0.8)	~ ~
Austria	71 (3.0)	530 (2.6)	29 (3.0)	515 (5.3)	0 (0.0)	~ ~
Netherlands	r 66 (4.1)	528 (3.2)	33 (4.0)	510 (5.9)	1 (0.0)	~ ~
Germany	63 (3.5)	542 (2.1)	33 (3.5)	508 (5.0)	4 (1.2)	479 (15.7)
Singapore	57 (0.0)	589 (5.7)	42 (0.0)	585 (5.5)	0 (0.0)	~ ~
Sweden	56 (4.4)	531 (3.0)	42 (4.4)	519 (5.0)	1 (0.8)	~ ~
Latvia	53 (4.5)	545 (3.1)	46 (4.4)	541 (3.0)	1 (1.0)	~ ~
Scotland	51 (4.0)	513 (3.2)	45 (4.2)	492 (3.9)	4 (1.8)	440 (13.2)
Norway	51 (4.5)	479 (4.4)	48 (4.5)	472 (4.6)	1 (0.0)	~ ~
Hong Kong SAR	50 (4.5)	553 (4.2)	49 (4.4)	554 (5.2)	1 (0.0)	~ ~
Lithuania	49 (4.0)	510 (3.2)	46 (4.1)	517 (3.8)	4 (1.6)	533 (8.7)
Algeria	49 (4.6)	338 (10.4)	47 (4.5)	363 (8.2)	4 (1.7)	393 (22.8)
Japan	48 (3.6)	547 (2.8)	42 (3.6)	550 (2.8)	10 (2.1)	545 (5.3)
Denmark	47 (5.2)	523 (4.2)	45 (5.1)	515 (3.9)	7 (2.3)	494 (11.9)
Ukraine	46 (4.1)	480 (4.1)	51 (4.2)	468 (4.8)	3 (1.5)	474 (15.0)
Italy	42 (3.7)	537 (4.6)	48 (4.0)	534 (4.9)	9 (2.3)	535 (11.6)
Tunisia	42 (4.3)	314 (10.4)	47 (4.7)	329 (10.2)	11 (2.5)	256 (21.8)
Iran, Islamic Rep. of	39 (4.0)	449 (7.8)	60 (3.9)	427 (5.9)	1 (1.0)	~ ~
Russian Federation	39 (3.6)	551 (6.4)	58 (3.0)	543 (5.6)	3 (2.1)	546 (13.0)
Armenia	37 (3.9)	482 (8.9)	50 (4.0)	490 (9.4)	12 (2.4)	471 (16.2)
New Zealand	37 (3.4)	531 (3.5)	58 (3.5)	493 (3.8)	5 (1.4)	448 (14.5)
England	34 (4.4)	557 (5.3)	61 (4.4)	536 (3.5)	4 (1.8)	499 (11.8)
Kazakhstan	34 (4.4)	545 (7.5)	65 (4.4)	527 (8.0)	1 (0.8)	~ ~
Hungary	33 (4.1)	550 (6.1)	55 (4.7)	537 (5.3)	12 (3.3)	497 (9.2)
Slovak Republic	32 (3.6)	533 (4.7)	54 (4.3)	523 (7.6)	14 (2.7)	520 (10.3)
Australia	31 (4.3)	534 (4.9)	65 (4.1)	527 (4.0)	4 (1.4)	469 (13.2)
Georgia	30 (4.0)	418 (8.2)	62 (4.2)	418 (6.0)	8 (2.7)	422 (13.1)
Morocco	r 29 (4.1)	311 (11.0)	55 (4.4)	287 (7.5)	16 (3.0)	294 (19.8)
Colombia	28 (4.8)	417 (11.6)	40 (5.6)	400 (9.8)	33 (4.8)	390 (9.8)
United States	21 (3.0)	565 (5.5)	71 (3.4)	536 (3.8)	8 (1.8)	504 (8.3)
Yemen	21 (4.2)	172 (15.3)	64 (5.2)	205 (9.2)	15 (3.7)	181 (21.2)
El Salvador	11 (2.7)	416 (24.1)	67 (3.9)	392 (4.7)	22 (3.8)	374 (8.7)
Kuwait	11 (2.8)	341 (18.3)	63 (4.0)	360 (6.5)	26 (3.4)	323 (12.1)
Qatar	9 (0.1)	306 (4.9)	84 (0.1)	290 (2.7)	7 (0.1)	298 (6.1)
International Avg.	43 (0.6)	481 (1.6)	50 (0.7)	474 (1.4)	7 (0.3)	433 (3.0)
<b>Benchmarking Participants</b>						
Dubai, UAE	r 47 (0.4)	468 (3.8)	48 (0.4)	446 (6.2)	6 (0.2)	505 (8.9)
Minnesota, US	46 (8.9)	565 (13.5)	54 (8.9)	543 (6.2)	0 (0.0)	~ ~
Alberta, Canada	42 (4.5)	546 (4.3)	53 (4.4)	542 (5.6)	5 (1.8)	517 (11.2)
Ontario, Canada	42 (5.1)	543 (5.0)	51 (5.2)	537 (6.2)	8 (2.9)	490 (17.7)
Quebec, Canada	37 (4.1)	523 (4.4)	60 (4.1)	514 (3.7)	3 (1.3)	496 (8.1)
Massachusetts, US	37 (8.8)	572 (9.3)	61 (8.9)	573 (5.1)	3 (0.2)	511 (4.7)
British Columbia, Canada	27 (4.3)	552 (6.2)	67 (4.5)	532 (3.5)	6 (2.2)	517 (12.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on principals' responses to three questions about the seriousness of attendance problems in the school: arriving late at school; absenteeism (i.e., unjustified absences); and skipping class. High level indicates that all three behaviors either never occur or are reported not to be a problem. Low level indicates that two or more behaviors are reported to be a serious problem, or two behaviors are reported to be minor problems and the third is reported to be a serious problem. Medium level includes all other possible combinations of responses.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

## Exhibit 8.3 Index of Good Attendance at School (GAS) (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	High GAS		Medium GAS		Low GAS	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Lebanon	52 (5.1)	420 (9.6)	42 (5.2)	410 (11.6)	5 (1.6)	405 (22.3)
Chinese Taipei	52 (4.0)	563 (5.2)	42 (4.0)	561 (4.9)	5 (1.9)	545 (7.1)
Oman	50 (4.3)	424 (5.0)	42 (4.8)	429 (5.9)	9 (2.6)	400 (17.7)
Korea, Rep. of	49 (4.3)	554 (2.8)	42 (4.4)	551 (3.1)	9 (1.8)	553 (7.1)
Malta	43 (0.2)	501 (1.5)	47 (0.2)	425 (2.0)	10 (2.0)	400 (5.3)
Czech Republic	36 (4.2)	554 (4.8)	53 (4.4)	532 (2.9)	11 (2.9)	523 (5.2)
Egypt	34 (4.0)	419 (5.7)	53 (4.1)	403 (6.2)	13 (2.7)	391 (8.1)
Armenia	30 (3.7)	489 (7.1)	56 (4.1)	489 (9.4)	14 (2.6)	481 (8.1)
Hong Kong SAR	30 (4.1)	559 (6.7)	60 (4.7)	522 (6.3)	10 (3.0)	470 (20.6)
Jordan	30 (3.8)	489 (8.7)	52 (4.3)	482 (6.1)	18 (3.3)	465 (12.2)
Singapore	30 (0.0)	609 (7.2)	66 (0.0)	553 (5.9)	4 (0.0)	498 (26.0)
Italy	28 (3.5)	500 (4.5)	56 (4.0)	494 (4.1)	15 (2.7)	491 (8.6)
Slovenia	28 (3.7)	533 (5.7)	54 (4.1)	541 (2.9)	19 (3.2)	535 (5.4)
Bosnia and Herzegovina	28 (3.6)	463 (4.9)	61 (4.2)	468 (3.8)	11 (2.7)	457 (11.8)
Hungary	26 (3.6)	549 (7.6)	55 (4.6)	541 (4.5)	19 (3.7)	520 (6.9)
Iran, Islamic Rep. of	25 (3.3)	469 (6.6)	72 (3.4)	455 (4.7)	3 (1.3)	462 (9.3)
Turkey	25 (3.8)	468 (8.7)	53 (5.1)	456 (6.3)	22 (3.5)	436 (9.1)
Algeria	23 (3.4)	410 (4.1)	56 (4.5)	406 (2.3)	21 (3.9)	415 (3.4)
England	23 (3.1)	583 (10.4)	65 (4.0)	536 (5.6)	12 (2.8)	505 (10.7)
Ukraine	23 (3.5)	493 (6.5)	65 (4.1)	487 (4.2)	12 (3.0)	461 (8.6)
Israel	21 (3.2)	471 (9.1)	55 (4.8)	471 (6.6)	24 (4.0)	468 (9.4)
Palestinian Nat'l Auth.	21 (3.3)	420 (7.8)	65 (4.0)	408 (5.1)	14 (2.5)	366 (11.5)
Romania	18 (2.7)	478 (10.6)	52 (3.8)	468 (6.0)	30 (4.1)	445 (7.0)
Australia	18 (2.8)	559 (9.8)	65 (3.7)	514 (4.6)	16 (2.7)	470 (8.5)
Bulgaria	18 (3.3)	500 (11.5)	43 (4.4)	477 (9.1)	40 (4.6)	452 (10.2)
Syrian Arab Republic	17 (3.6)	443 (8.3)	64 (4.9)	453 (4.1)	19 (3.3)	456 (5.8)
Russian Federation	17 (2.8)	549 (9.1)	63 (3.1)	529 (4.4)	20 (3.0)	513 (6.0)
Malaysia	17 (2.8)	503 (13.9)	68 (3.2)	467 (6.9)	15 (2.8)	451 (14.1)
Bahrain	17 (0.2)	491 (4.0)	64 (0.3)	465 (2.1)	20 (0.2)	451 (4.1)
Serbia	16 (3.6)	480 (6.1)	55 (4.4)	470 (3.8)	29 (3.6)	467 (7.0)
Colombia	15 (3.2)	438 (9.7)	38 (4.8)	421 (4.8)	47 (4.2)	406 (5.8)
United States	15 (2.5)	535 (6.2)	66 (3.6)	527 (4.3)	19 (2.8)	488 (6.8)
Scotland	15 (2.9)	525 (15.4)	78 (3.3)	493 (4.5)	7 (1.8)	471 (19.8)
Saudi Arabia	14 (3.1)	387 (9.9)	65 (3.8)	405 (3.6)	21 (3.1)	412 (6.6)
Thailand	14 (2.7)	484 (12.4)	68 (3.7)	469 (5.8)	18 (3.5)	472 (11.7)
Tunisia	14 (2.9)	446 (5.6)	63 (4.0)	446 (2.7)	23 (3.7)	443 (4.2)
Qatar	13 (0.1)	380 (4.3)	64 (0.2)	295 (2.2)	23 (0.2)	311 (2.8)
Botswana	13 (2.7)	378 (9.9)	61 (3.9)	359 (4.0)	27 (3.5)	329 (6.1)
Japan	11 (2.5)	558 (6.6)	49 (4.5)	563 (3.2)	40 (3.9)	541 (4.3)
El Salvador	11 (2.3)	403 (9.8)	67 (4.1)	388 (4.0)	22 (3.8)	377 (6.8)
Cyprus	11 (0.1)	450 (5.2)	73 (0.2)	452 (2.3)	16 (0.2)	448 (5.3)
Georgia	10 (3.1)	415 (14.5)	69 (4.9)	421 (5.9)	21 (4.2)	423 (8.6)
Norway	8 (2.1)	497 (7.6)	73 (4.0)	487 (2.6)	19 (3.6)	481 (5.0)
Indonesia	7 (2.2)	456 (14.1)	57 (4.8)	433 (5.3)	36 (4.3)	412 (7.7)
Kuwait	7 (2.7)	420 (11.6)	57 (4.8)	415 (4.7)	36 (4.3)	421 (6.7)
Lithuania	6 (2.0)	509 (10.4)	44 (4.3)	521 (4.0)	50 (4.4)	517 (4.0)
Ghana	5 (2.0)	357 (54.4)	71 (4.2)	307 (6.4)	24 (4.0)	280 (13.4)
Sweden	4 (1.6)	541 (15.1)	58 (4.0)	512 (3.3)	38 (3.9)	506 (4.4)
‡ Morocco	7 (2.5)	447 (19.1)	50 (6.5)	396 (5.3)	43 (6.3)	397 (5.5)
International Avg.	21 (0.4)	481 (1.7)	58 (0.6)	465 (0.9)	20 (0.5)	451 (1.5)
<b>Benchmarking Participants</b>						
Basque Country, Spain	28 (4.7)	501 (6.6)	63 (5.3)	501 (3.7)	9 (2.6)	475 (10.7)
Minnesota, US	27 (7.7)	534 (7.1)	71 (7.7)	543 (5.4)	2 (1.2)	~ ~
Dubai, UAE	24 (0.6)	506 (6.3)	65 (0.7)	479 (4.9)	11 (0.3)	510 (3.6)
Ontario, Canada	18 (3.7)	535 (7.0)	72 (4.3)	529 (3.6)	10 (2.9)	517 (14.1)
Quebec, Canada	17 (3.3)	545 (10.1)	59 (4.5)	506 (4.5)	25 (3.8)	487 (6.5)
Massachusetts, US	16 (5.5)	565 (17.5)	75 (6.6)	559 (6.5)	9 (4.5)	509 (20.7)
British Columbia, Canada	13 (3.6)	534 (8.7)	68 (4.4)	534 (3.5)	19 (3.4)	503 (7.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on principals' responses to three questions about the seriousness of attendance problems in the school: arriving late at school; absenteeism (i.e., unjustified absences); and skipping class. High level indicates that all three behaviors either never occur or are reported not to be a problem. Low level indicates that two or more behaviors are reported to be a serious problem, or two behaviors are reported to be minor problems and the third is reported to be a serious problem. Medium level includes all other possible combinations of responses.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

(~) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.



## Exhibit 8.4 High Index of Good Attendance at School (GAS) with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	High GAS	
	2007 Percent of Students	Difference in Percent from 2003
Chinese Taipei	77 (3.9)	-3 (5.2)
Slovenia	72 (3.7)	-9 (5.3)
Netherlands	r 66 (4.1)	-4 (5.8)
Singapore	57 (0.0)	-8 (4.3)
Latvia	53 (4.5)	7 (6.9)
Scotland	51 (4.0)	-2 (6.7)
Norway	51 (4.5)	-1 (6.2)
Hong Kong SAR	50 (4.5)	-14 (6.8) ⬇
Lithuania	49 (4.0)	4 (5.8)
Japan	48 (3.6)	-4 (5.2)
Italy	42 (3.7)	-30 (5.0) ⬇
Tunisia	41 (4.3)	-5 (5.6)
Iran, Islamic Rep. of	39 (4.0)	-6 (6.1)
Russian Federation	39 (3.6)	10 (5.0) ⬆
Armenia	r 37 (3.9)	4 (5.7)
New Zealand	37 (3.4)	2 (4.6)
England	r 34 (4.4)	-4 (6.6)
Hungary	33 (4.1)	-13 (5.8) ⬇
Australia	31 (4.3)	-10 (6.1)
Morocco	r 29 (4.1)	-11 (6.3)
United States	21 (3.0)	0 (4.1)
International Avg.	46 (0.9)	
<b>Benchmarking Participants</b>		
Ontario, Canada	42 (5.1)	6 (6.7)
Quebec, Canada	37 (4.1)	-6 (5.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

2007 percent significantly higher ⬆

2007 percent significantly lower ⬇

For a detailed definition of the GAS index, refer to Exhibit 8.3.  
Trend notes: Data for Tunisia do not include private schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.



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International Study Center  
Lynch School of Education, Boston College

## Exhibit 8.4 High Index of Good Attendance at School (GAS) with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	High GAS		
	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1999
Lebanon	52 (5.1)	-14 (6.6) ▼	0 0
Chinese Taipei	52 (4.0)	1 (5.6)	24 (5.4) ▲
Korea, Rep. of	49 (4.3)	-2 (5.7)	18 (5.7) ▲
Czech Republic	36 (4.2)	0 0	-2 (7.1)
Egypt	34 (4.0)	-12 (5.9) ▼	0 0
Armenia	r 30 (3.7)	10 (5.2)	0 0
Hong Kong SAR	30 (4.1)	3 (5.8)	5 (5.6)
Jordan	30 (3.8)	-5 (5.6)	-10 (5.7)
Singapore	30 (0.0)	-12 (0.0) ▼	-2 (4.1)
Italy	28 (3.5)	-28 (5.0) ▼	-6 (4.7)
Slovenia	28 (3.7)	-3 (5.5)	--
Hungary	26 (3.6)	-4 (5.3)	3 (5.1)
Iran, Islamic Rep. of	25 (3.3)	-12 (5.1) ▼	-15 (5.7) ▼
England	s 23 (3.1)	7 (5.2)	--
Israel	r 21 (3.2)	9 (4.4) ▲	15 (3.9) ▲
Palestinian Nat'l Auth.	21 (3.3)	-9 (4.9)	0 0
Romania	18 (2.7)	-3 (4.6)	4 (4.2)
Australia	18 (2.8)	-8 (5.3)	--
Russian Federation	17 (2.8)	8 (3.8) ▲	7 (3.3) ▲
Malaysia	17 (2.8)	-1 (4.5)	11 (3.7) ▲
Bahrain	17 (0.2)	-9 (0.3) ▼	0 0
Serbia	16 (3.6)	0 (4.8)	0 0
United States	r 15 (2.5)	-3 (3.7)	-4 (3.9)
Scotland	s 15 (2.9)	0 (4.7)	0 0
Thailand	14 (2.7)	0 0	-4 (4.2)
Tunisia	14 (2.9)	-3 (4.3)	-2 (4.3)
Botswana	13 (2.7)	7 (3.3) ▲	0 0
Japan	11 (2.5)	-1 (3.4)	2 (3.3)
Cyprus	r 11 (0.1)	-11 (0.3) ▼	-8 (0.2) ▼
Indonesia	8 (2.7)	-1 (3.6)	-1 (3.7)
Norway	8 (2.1)	-12 (4.6) ▼	0 0
Lithuania	6 (2.0)	0 (2.9)	-6 (3.2)
Ghana	5 (2.0)	-3 (3.1)	0 0
Sweden	4 (1.6)	-3 (2.7)	0 0
<b>International Avg.</b>	<b>22 (0.5)</b>		
<b>Benchmarking Participants</b>			
Basque Country, Spain	28 (4.7)	3 (6.4)	0 0
Ontario, Canada	18 (3.7)	-5 (5.1)	-6 (5.6)
Quebec, Canada	17 (3.3)	0 (4.6)	10 (5.0)
Massachusetts, US	s 16 (5.5)	0 0	2 (7.5)
British Columbia, Canada	13 (3.6)	0 0	3 (5.4)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

2007 percent significantly higher ▲  
 2007 percent significantly lower ▼

For a detailed definition of the GAS index, refer to Exhibit 8.3.

Trend notes: Data are not shown for Bulgaria, Morocco, Saudi Arabia, and Turkey, because comparable data from previous cycles are not available. Data for Indonesia do not include Islamic schools.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.



### What Is the Role of the School Principal?

To provide information about roles and responsibilities of school principals, TIMSS asked principals how they shared their time across the competing demands of school-related activities. More specifically, principals were asked what percentage of their time they devote to administrative duties (hiring, budgeting, scheduling, meetings, etc.), instructional leadership (developing curriculum and pedagogy), supervising and evaluating teachers and other staff, public relations and fundraising, teaching, and other activities. Exhibit 8.5 presents principals' reports of the percentage of their time they spend on these activities, together with changes in the percentages since 2003, for both fourth and eighth grades.

As shown in the exhibit, school principals at both grades reported spending most time, on average across countries, on administrative duties (about 30% of time), instructional leadership (about 20%), and staff supervision and evaluation (about 20%). They reported spending about 10 percent of time on public relations and fundraising, and on teaching, and less than 10 percent on other activities. At fourth grade, there appears to be a growth in the administrative burden, with principals reporting an increase in the percentage of time spent on such duties in 11 countries and one benchmarking entity. Several of these countries showed a corresponding decrease in the percentage of time devoted to instructional leadership. Also, in six countries and one benchmarking entity, principals reported a decrease in the percentage of time spent teaching. Principals in Germany (39%) and Austria (26%) reported the highest percentage of time spent on teaching, and the lowest on teacher supervision and evaluation (7% and 8%, respectively).

At eighth grade, the increase in time spent on administrative duties is even more evident, with increased percentages since 2003 in 18 countries and 3 benchmarking entities, and decreases in just 4 countries. Similar to the fourth grade, several of these countries had a decrease in percentage of time spent on instructional leadership: in total, 9 countries and one benchmarking entity had decreases, and just two countries showed increases. There also were increased percentages of time spent on teacher supervision and evaluation in 11 countries, with decreases in 6 countries.



Exhibit 8.5 Principals' Time Spent on Various School-related Activities with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Percent of Time					
	Administrative Duties (e.g., Hiring, Budgeting, Scheduling, Meetings)		Instructional Leadership (e.g., Developing Curriculum and Pedagogy)		Supervising and Evaluating Teachers and Other Staff	
	2007	Difference from 2003	2007	Difference from 2003	2007	Difference from 2003
Algeria	28 (1.9)	0 0	21 (1.0)	0 0	25 (1.1)	0 0
Armenia	r 25 (1.1)	-3 (1.7)	r 23 (0.8)	3 (1.1) ▲	r 22 (1.0)	-1 (1.6)
Australia	47 (1.2)	2 (2.2)	19 (0.8)	1 (1.2)	13 (0.5)	2 (0.8) ▲
Austria	40 (1.3)	0 0	13 (0.6)	0 0	8 (0.4)	0 0
Chinese Taipei	32 (1.5)	4 (1.8) ▲	25 (0.9)	-3 (1.3) ▼	15 (0.6)	-2 (1.0) ▼
Colombia	32 (1.5)	0 0	28 (1.3)	0 0	16 (0.8)	0 0
Czech Republic	41 (1.2)	0 0	18 (0.7)	0 0	10 (0.5)	0 0
Denmark	45 (1.7)	0 0	15 (0.9)	0 0	17 (0.8)	0 0
El Salvador	28 (1.1)	0 0	23 (0.8)	0 0	18 (0.7)	0 0
England	r 39 (1.3)	-2 (2.2)	r 20 (0.8)	2 (1.4)	r 16 (0.7)	4 (1.0) ▲
Georgia	23 (0.9)	0 0	25 (0.9)	0 0	19 (0.7)	0 0
Germany	28 (1.0)	0 0	13 (0.5)	0 0	7 (0.3)	0 0
Hong Kong SAR	41 (1.4)	3 (1.9)	24 (1.0)	0 (1.3)	18 (0.7)	0 (1.0)
Hungary	30 (1.1)	4 (1.8) ▲	19 (0.6)	-2 (1.0) ▼	17 (0.7)	-1 (1.1)
Iran, Islamic Rep. of	20 (1.1)	2 (1.4)	25 (1.0)	-1 (1.6)	19 (0.7)	0 (0.9)
Italy	38 (1.1)	6 (1.5) ▲	27 (0.8)	-3 (1.1) ▼	16 (0.5)	-1 (0.8)
Japan	28 (1.0)	7 (1.3) ▲	23 (0.9)	-3 (1.2) ▼	22 (0.8)	2 (1.1)
Kazakhstan	21 (0.9)	0 0	23 (0.7)	0 0	26 (1.6)	0 0
Kuwait	s 19 (1.0)	0 0	s 12 (1.0)	0 0	s 42 (1.8)	0 0
Latvia	30 (1.1)	5 (1.7) ▲	22 (0.8)	-1 (1.1)	16 (0.6)	0 (0.9)
Lithuania	32 (1.1)	7 (1.6) ▲	22 (0.7)	-2 (1.1)	17 (0.6)	0 (0.9)
Morocco	r 27 (1.4)	1 (2.4)	r 17 (0.7)	-1 (1.2)	r 25 (1.0)	1 (1.7)
Netherlands	r 29 (1.4)	-2 (2.0)	r 28 (1.0)	3 (1.5) ▲	r 19 (0.8)	2 (1.4)
New Zealand	47 (1.1)	3 (1.8)	22 (0.7)	1 (1.2)	11 (0.5)	1 (0.7)
Norway	48 (1.3)	5 (2.0) ▲	26 (0.8)	1 (1.3)	10 (0.5)	0 (0.8)
Qatar	r 20 (0.0)	0 0	r 16 (0.0)	0 0	r 33 (0.1)	0 0
Russian Federation	21 (0.7)	-1 (1.1)	21 (0.6)	-1 (0.8)	25 (0.7)	4 (1.0) ▲
Scotland	38 (1.5)	5 (2.1) ▲	23 (1.1)	-1 (1.5)	13 (0.7)	-1 (1.1)
Singapore	37 (0.0)	10 (1.2) ▲	21 (0.0)	-2 (1.0) ▼	22 (0.0)	-3 (0.7) ▼
Slovak Republic	33 (1.1)	0 0	15 (0.5)	0 0	17 (0.6)	0 0
Slovenia	39 (1.3)	6 (1.7) ▲	28 (1.0)	-2 (1.4)	15 (0.5)	0 (0.8)
Sweden	41 (1.5)	0 0	25 (0.9)	0 0	23 (0.8)	0 0
Tunisia	26 (1.3)	-2 (1.9)	15 (0.9)	0 (1.2)	26 (1.3)	6 (1.6) ▲
Ukraine	18 (0.9)	0 0	21 (0.7)	0 0	25 (0.9)	0 0
United States	36 (1.3)	6 (1.8) ▲	26 (1.0)	0 (1.3)	23 (0.7)	-1 (1.1)
Yemen	19 (0.9)	0 0	13 (0.8)	0 0	31 (1.4)	0 0
International Avg.	32 (0.2)		21 (0.1)		19 (0.1)	
<b>Benchmarking Participants</b>						
Alberta, Canada	42 (1.6)	0 0	20 (1.0)	0 0	14 (0.7)	0 0
British Columbia, Canada	45 (1.4)	0 0	18 (0.9)	0 0	13 (0.7)	0 0
Dubai, UAE	r 30 (0.1)	0 0	r 25 (0.1)	0 0	r 24 (0.0)	0 0
Massachusetts, US	43 (3.1)	0 0	21 (1.4)	0 0	23 (2.0)	0 0
Minnesota, US	37 (2.4)	0 0	24 (2.0)	0 0	19 (1.5)	0 0
Ontario, Canada	41 (1.9)	4 (2.5)	23 (1.2)	1 (2.0)	16 (1.0)	-1 (1.3)
Quebec, Canada	51 (1.2)	11 (2.1) ▲	21 (0.9)	-3 (1.5)	14 (0.8)	0 (1.0)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Background data provided by schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

**Exhibit 8.5 Principals' Time Spent on Various School-related Activities with Trends (Continued)**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

Country	Percent of Time					
	Public Relations and Fundraising		Teaching		Other	
	2007	Difference from 2003	2007	Difference from 2003	2007	Difference from 2003
Algeria	9 (0.7)	0 0	7 (1.0)	0 0	10 (0.8)	0 0
Armenia	r 12 (0.6)	0 (1.0)	r 10 (0.7)	0 (1.0)	r 7 (0.8)	1 (1.0)
Australia	9 (0.6)	0 (0.9)	6 (0.6)	-1 (1.3)	r 7 (0.9)	-4 (1.5)
Austria	8 (0.4)	0 0	26 (1.9)	0 0	5 (0.5)	0 0
Chinese Taipei	12 (0.7)	3 (0.9) ▲	8 (0.8)	-1 (1.0)	8 (0.7)	0 (1.0)
Colombia	10 (0.8)	0 0	8 (0.8)	0 0	6 (0.6)	0 0
Czech Republic	9 (0.5)	0 0	15 (0.7)	0 0	7 (0.5)	0 0
Denmark	13 (0.6)	0 0	5 (0.7)	0 0	6 (0.9)	0 0
El Salvador	8 (0.5)	0 0	20 (1.1)	0 0	4 (0.3)	0 0
England	r 9 (0.5)	0 (1.3)	r 10 (0.9)	-2 (1.6)	r 7 (0.7)	-1 (1.2)
Georgia	13 (0.6)	0 0	15 (0.9)	0 0	5 (0.4)	0 0
Germany	7 (0.4)	0 0	39 (1.1)	0 0	6 (0.5)	0 0
Hong Kong SAR	8 (0.5)	-1 (0.8)	4 (0.7)	1 (0.9)	6 (0.5)	-2 (0.9)
Hungary	14 (0.7)	-1 (1.0)	14 (0.6)	0 (0.9)	7 (0.7)	0 (0.9)
Iran, Islamic Rep. of	13 (0.6)	0 (0.9)	12 (1.1)	-1 (1.8)	11 (0.6)	1 (0.9)
Italy	15 (0.7)	-1 (0.9)	2 (0.5)	0 (0.6)	2 (0.3)	-1 (0.6)
Japan	12 (0.6)	-3 (0.9) ▼	8 (0.7)	-2 (1.0)	7 (0.6)	-1 (0.8)
Kazakhstan	11 (0.6)	0 0	12 (0.7)	0 0	8 (0.4)	0 0
Kuwait	s 10 (0.7)	0 0	s 8 (1.2)	0 0	s 10 (0.8)	0 0
Latvia	15 (0.8)	1 (1.4)	12 (0.8)	-2 (1.3)	5 (0.6)	-3 (1.2)
Lithuania	11 (0.5)	-1 (0.8)	11 (0.5)	-4 (1.6) ▼	7 (0.6)	-1 (0.9)
Morocco	r 15 (0.7)	1 (1.1)	r 7 (0.6)	-1 (0.9)	r 10 (0.5)	0 (0.9)
Netherlands	r 8 (0.7)	2 (0.8) ▲	r 5 (1.1)	-7 (1.8) ▼	r 12 (0.9)	3 (1.2) ▲
New Zealand	8 (0.4)	-1 (0.7)	7 (0.5)	-4 (0.8)	5 (0.6)	0 (0.8)
Norway	3 (0.4)	-3 (0.8) ▼	7 (1.0)	-3 (1.3) ▼	7 (0.8)	0 (1.0)
Qatar	r 10 (0.0)	0 0	r 11 (0.0)	0 0	r 10 (0.0)	0 0
Russian Federation	12 (0.4)	-1 (0.7) ▼	12 (0.6)	-2 (1.0) ▼	9 (0.5)	0 (0.7)
Scotland	10 (0.5)	-2 (0.9)	11 (1.1)	-1 (2.2)	r 6 (0.8)	-1 (1.1)
Singapore	11 (0.0)	-1 (0.6)	2 (0.0)	-2 (0.3) ▼	7 (0.0)	-2 (0.8) ▼
Slovak Republic	13 (0.5)	0 0	16 (0.8)	0 0	6 (0.4)	0 0
Slovenia	8 (0.4)	-2 (0.7) ▼	4 (0.4)	-1 (0.6)	5 (0.5)	-2 (1.0) ▼
Sweden	1 (0.3)	0 0	2 (0.5)	0 0	s 11 (1.3)	0 0
Tunisia	10 (0.5)	-2 (0.7) ▼	15 (1.0)	-2 (1.9)	9 (0.6)	0 (0.8)
Ukraine	12 (0.7)	0 0	15 (0.7)	0 0	8 (0.6)	0 0
United States	7 (0.3)	-2 (0.5) ▼	4 (0.4)	0 (0.6)	r 5 (0.7)	-2 (1.0) ▼
Yemen	10 (0.6)	0 0	16 (0.9)	0 0	11 (0.6)	0 0
<b>International Avg.</b>	<b>10 (0.1)</b>		<b>11 (0.1)</b>		<b>7 (0.1)</b>	
<b>Benchmarking Participants</b>						
Alberta, Canada	6 (0.4)	0 0	14 (1.3)	0 0	4 (0.6)	0 0
British Columbia, Canada	8 (0.5)	0 0	11 (1.0)	0 0	5 (0.8)	0 0
Dubai, UAE	r 8 (0.0)	0 0	r 4 (0.0)	0 0	s 11 (0.1)	0 0
Massachusetts, US	6 (0.6)	0 0	2 (0.5)	0 0	5 (2.3)	0 0
Minnesota, US	10 (1.6)	0 0	5 (1.1)	0 0	r 6 (1.3)	0 0
Ontario, Canada	9 (0.6)	-1 (1.0)	2 (0.4)	-3 (1.2) ▼	8 (1.6)	0 (2.1)
Quebec, Canada	7 (0.5)	0 (0.7)	2 (0.6)	-2 (1.1)	6 (0.7)	-6 (1.5) ▼

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Exhibit 8.5 Principals' Time Spent on Various School-related Activities with Trends**  
**(Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

Country	Percent of Time					
	Administrative Duties (e.g., Hiring, Budgeting, Scheduling, Meetings)		Instructional Leadership (e.g., Developing Curriculum and Pedagogy)		Supervising and Evaluating Teachers and Other Staff	
	2007	Difference from 2003	2007	Difference from 2003	2007	Difference from 2003
Algeria	30 (1.3)	0 (0)	22 (1.1)	0 (0)	23 (1.0)	0 (0)
Armenia	r 24 (1.2)	-4 (1.8)	24 (0.8)	3 (1.1)	r 23 (1.0)	1 (1.7)
Australia	51 (1.3)	8 (2.1)	16 (0.8)	-2 (1.2)	13 (0.7)	-2 (1.3)
Bahrain	29 (0.1)	8 (0.1)	14 (0.0)	-10 (0.1)	31 (0.1)	2 (0.1)
Bosnia and Herzegovina	22 (1.0)	0 (0)	24 (0.8)	0 (0)	20 (0.8)	0 (0)
Botswana	r 32 (1.4)	1 (2.0)	r 20 (1.0)	-1 (1.4)	r 26 (1.2)	0 (1.7)
Bulgaria	33 (1.4)	-	19 (0.8)	-	22 (1.1)	-
Chinese Taipei	34 (1.4)	6 (1.9)	25 (1.0)	0 (1.4)	17 (0.8)	-2 (1.1)
Colombia	35 (1.3)	0 (0)	28 (0.9)	0 (0)	17 (0.7)	0 (0)
Cyprus	35 (0.1)	-7 (0.1)	17 (0.1)	0 (0.1)	16 (0.0)	2 (0.1)
Czech Republic	42 (1.3)	0 (0)	19 (0.8)	0 (0)	10 (0.5)	0 (0)
Egypt	19 (0.8)	-1 (1.4)	14 (0.8)	-3 (1.0)	32 (1.1)	7 (1.7)
El Salvador	32 (1.1)	0 (0)	23 (0.7)	0 (0)	19 (0.7)	0 (0)
England	s 36 (1.5)	3 (2.9)	s 18 (0.9)	-2 (2.5)	s 17 (0.8)	1 (1.7)
Georgia	23 (1.2)	0 (0)	25 (1.0)	0 (0)	19 (0.7)	0 (0)
Ghana	24 (1.0)	4 (1.4)	16 (0.6)	-1 (0.9)	27 (1.1)	-2 (2.0)
Hong Kong SAR	43 (1.3)	3 (1.8)	20 (0.6)	0 (1.0)	18 (0.7)	-3 (1.1)
Hungary	31 (1.2)	4 (1.9)	20 (0.7)	-1 (1.0)	16 (0.8)	-2 (1.1)
Indonesia	21 (0.9)	0 (1.2)	25 (0.9)	-2 (1.3)	25 (1.2)	4 (1.5)
Iran, Islamic Rep. of	22 (0.9)	4 (1.1)	25 (0.9)	-2 (1.4)	19 (0.6)	-4 (1.1)
Israel	29 (1.2)	5 (1.6)	23 (0.8)	-1 (1.3)	18 (0.6)	-1 (0.9)
Italy	35 (1.1)	6 (1.5)	28 (0.7)	-2 (1.1)	16 (0.6)	-1 (0.8)
Japan	29 (1.1)	6 (1.4)	23 (0.7)	-3 (1.1)	22 (0.7)	2 (1.0)
Jordan	21 (0.9)	-4 (1.4)	17 (0.7)	-5 (1.1)	30 (0.9)	7 (1.3)
Korea, Rep. of	26 (1.2)	5 (1.7)	26 (0.9)	-1 (1.5)	17 (0.8)	3 (1.0)
Kuwait	r 23 (1.1)	0 (0)	r 12 (0.9)	0 (0)	r 38 (1.6)	0 (0)
Lebanon	29 (1.7)	3 (2.2)	24 (0.9)	-1 (1.4)	23 (1.1)	0 (1.5)
Lithuania	31 (1.1)	4 (1.7)	22 (0.7)	-3 (1.1)	17 (0.7)	0 (0.8)
Malaysia	36 (1.1)	2 (1.6)	25 (1.0)	-1 (1.4)	17 (0.6)	0 (0.9)
Malta	45 (0.1)	0 (0)	19 (0.0)	0 (0)	18 (0.0)	0 (0)
Norway	52 (1.3)	9 (2.0)	25 (0.9)	0 (1.3)	10 (0.6)	0 (0.7)
Oman	19 (0.9)	0 (0)	17 (0.7)	0 (0)	33 (1.0)	0 (0)
Palestinian Nat'l Auth.	22 (0.9)	-3 (1.6)	20 (0.7)	2 (0.9)	29 (1.0)	4 (1.4)
Qatar	r 19 (0.0)	0 (0)	r 16 (0.0)	0 (0)	r 32 (0.1)	0 (0)
Romania	23 (1.0)	4 (1.4)	19 (0.8)	-3 (1.2)	20 (0.9)	3 (1.2)
Russian Federation	22 (0.8)	-3 (1.1)	22 (0.6)	1 (0.8)	24 (0.7)	5 (0.9)
Saudi Arabia	21 (1.0)	-	11 (0.7)	-	35 (1.3)	-
Scotland	s 39 (1.6)	6 (2.5)	s 21 (1.0)	-1 (1.7)	s 14 (0.7)	-3 (1.2)
Serbia	24 (1.0)	8 (1.3)	23 (0.9)	-3 (1.3)	19 (0.6)	5 (0.8)
Singapore	38 (0.0)	11 (0.0)	21 (0.0)	0 (0.0)	22 (0.0)	-6 (0.0)
Slovenia	40 (1.3)	7 (1.7)	27 (1.1)	-2 (1.5)	15 (0.5)	0 (0.7)
Sweden	42 (1.4)	3 (2.0)	23 (0.9)	2 (1.2)	21 (0.7)	-1 (1.3)
Syrian Arab Republic	23 (0.9)	0 (0)	13 (0.9)	0 (0)	30 (1.5)	0 (0)
Thailand	34 (1.2)	0 (0)	26 (1.0)	0 (0)	15 (0.7)	0 (0)
Tunisia	34 (1.2)	2 (1.7)	10 (0.7)	-2 (1.0)	33 (1.2)	11 (1.4)
Turkey	27 (1.4)	0 (0)	17 (0.8)	0 (0)	20 (0.9)	0 (0)
Ukraine	19 (0.9)	0 (0)	21 (0.7)	0 (0)	25 (1.0)	0 (0)
United States	r 39 (1.3)	8 (1.7)	r 24 (1.0)	0 (1.2)	r 21 (0.7)	-2 (1.0)
‡ Morocco	34 (2.2)	-	12 (1.1)	-	19 (1.2)	-
International Avg.	30 (0.2)		21 (0.1)		22 (0.1)	

**Benchmarking Participants**

Basque Country, Spain	32 (1.5)	5 (2.1)	23 (0.8)	-3 (1.4)	12 (0.9)	0 (1.1)
British Columbia, Canada	50 (1.6)	0 (0)	19 (0.8)	0 (0)	14 (0.9)	0 (0)
Dubai, UAE	s 29 (0.2)	0 (0)	s 22 (0.1)	0 (0)	s 25 (0.1)	0 (0)
Massachusetts, US	43 (2.3)	0 (0)	22 (1.3)	0 (0)	23 (1.5)	0 (0)
Minnesota, US	50 (3.0)	0 (0)	18 (1.8)	0 (0)	16 (1.8)	0 (0)
Ontario, Canada	42 (1.5)	5 (2.3)	22 (1.3)	2 (1.7)	17 (1.1)	-1 (1.5)
Quebec, Canada	45 (1.7)	7 (2.8)	22 (1.0)	-1 (1.6)	15 (0.7)	0 (1.2)

Background data provided by schools.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

● 2007 percent significantly higher

▼ 2007 percent significantly lower

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (◊) indicates the country did not participate in the assessment.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007


**TIMSS & PIRLS**  
 International Study Center  
 Lynch School of Education, Boston College

**Exhibit 8.5 Principals' Time Spent on Various School-related Activities with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Percent of Time					
	Public Relations and Fundraising		Teaching		Other	
	2007	Difference from 2003	2007	Difference from 2003	2007	Difference from 2003
Algeria	9 (0.5)	∅ ∅	10 (0.9)	∅ ∅	8 (0.4)	∅ ∅
Armenia	r 12 (0.6)	-1 (1.1)	r 10 (0.7)	0 (1.0)	r 7 (0.6)	1 (0.9)
Australia	11 (0.6)	-1 (0.9)	4 (0.6)	0 (0.8)	s 9 (0.9)	0 (1.3)
Bahrain	8 (0.0)	-2 (0.0) ▼	5 (0.0)	1 (0.0) ▲	12 (0.0)	1 (0.0) ▲
Bosnia and Herzegovina	14 (0.6)	∅ ∅	11 (0.5)	∅ ∅	8 (0.6)	∅ ∅
Botswana	r 11 (0.5)	0 (0.7)	r 5 (0.7)	1 (0.9)	r 7 (0.8)	-1 (1.1)
Bulgaria	10 (0.4)	--	9 (0.5)	--	7 (0.6)	--
Chinese Taipei	9 (0.6)	0 (0.8)	8 (1.0)	-4 (1.5) ▼	7 (0.6)	1 (0.7)
Colombia	9 (0.6)	∅ ∅	6 (0.6)	∅ ∅	6 (0.8)	∅ ∅
Cyprus	13 (0.0)	3 (0.1) ▲	8 (0.0)	-1 (0.0) ▼	11 (0.0)	3 (0.1) ▲
Czech Republic	10 (0.6)	∅ ∅	13 (0.6)	∅ ∅	7 (0.6)	∅ ∅
Egypt	12 (0.5)	-2 (0.7) ▼	13 (1.1)	0 (1.4)	10 (0.7)	-1 (0.9)
El Salvador	9 (0.5)	∅ ∅	13 (1.1)	∅ ∅	4 (0.4)	∅ ∅
England	s 11 (0.5)	-2 (1.5)	s 7 (0.6)	-1 (1.9)	s 13 (1.1)	1 (2.4)
Georgia	13 (0.6)	∅ ∅	15 (1.3)	∅ ∅	5 (0.5)	∅ ∅
Ghana	8 (0.4)	0 (0.5)	20 (1.7)	-1 (2.4)	5 (0.3)	0 (0.5)
Hong Kong SAR	10 (0.5)	0 (0.7)	4 (0.8)	1 (1.1)	r 7 (1.1)	0 (1.3)
Hungary	13 (0.8)	-1 (1.0)	14 (0.6)	0 (0.8)	7 (0.6)	0 (0.8)
Indonesia	11 (0.5)	0 (0.7)	11 (0.8)	-1 (1.0)	6 (0.4)	-1 (0.6)
Iran, Islamic Rep. of	15 (0.7)	0 (0.9)	6 (0.6)	0 (0.8)	13 (0.8)	2 (1.0)
Israel	10 (0.6)	0 (0.8)	14 (0.6)	0 (0.8)	7 (0.7)	-4 (1.3) ▼
Italy	15 (0.7)	-2 (1.0)	6 (0.7)	4 (0.7) ▲	0 (0.1)	-4 (0.7) ▼
Japan	12 (0.6)	-2 (0.9) ▼	7 (0.7)	-1 (1.0)	7 (0.6)	-2 (0.8) ▼
Jordan	11 (0.5)	-2 (0.8) ▼	11 (0.9)	3 (1.3) ▲	10 (0.5)	0 (0.7)
Korea, Rep. of	10 (0.5)	1 (0.9)	12 (1.0)	-9 (1.7) ▼	8 (0.5)	1 (0.7)
Kuwait	r 8 (0.6)	∅ ∅	r 7 (1.1)	∅ ∅	r 11 (0.6)	∅ ∅
Lebanon	r 15 (1.0)	1 (1.2)	r 5 (1.0)	-1 (1.4)	r 5 (0.7)	-1 (1.0)
Lithuania	11 (0.5)	0 (0.7)	12 (0.5)	-1 (0.7)	8 (0.8)	0 (1.1)
Malaysia	7 (0.3)	-1 (0.5) ▼	11 (0.7)	1 (1.0)	5 (0.4)	-1 (0.7)
Malta	10 (0.0)	∅ ∅	1 (0.0)	∅ ∅	r 8 (0.0)	∅ ∅
Norway	3 (0.4)	-3 (0.8) ▼	4 (0.6)	-3 (1.0) ▼	6 (0.7)	-3 (1.1) ▼
Oman	11 (0.5)	∅ ∅	7 (0.9)	∅ ∅	13 (0.7)	∅ ∅
Palestinian Nat'l Auth.	11 (0.5)	-2 (0.7) ▼	6 (0.7)	-1 (1.0)	11 (0.6)	0 (0.8)
Qatar	r 9 (0.0)	∅ ∅	r 13 (0.0)	∅ ∅	r 11 (0.0)	∅ ∅
Romania	10 (0.5)	-1 (0.7)	22 (1.7)	-3 (2.3)	6 (0.5)	0 (0.7)
Russian Federation	13 (0.6)	-1 (0.9)	12 (0.5)	-1 (0.8)	8 (0.4)	-1 (0.6)
Saudi Arabia	13 (0.7)	--	9 (1.3)	--	11 (0.9)	--
Scotland	s 11 (0.6)	-1 (1.0)	s 4 (0.7)	0 (0.8)	s 12 (1.3)	-2 (2.2)
Serbia	19 (0.8)	1 (1.3)	6 (0.6)	-11 (1.2) ▼	9 (0.6)	0 (0.8)
Singapore	10 (0.0)	-1 (0.0) ▼	2 (0.0)	-1 (0.0) ▼	6 (0.0)	-3 (0.0) ▼
Slovenia	8 (0.4)	-2 (0.6) ▼	4 (0.4)	0 (0.6)	5 (0.4)	-2 (0.8) ▼
Sweden	1 (0.2)	-1 (0.3) ▼	2 (0.4)	-1 (0.6)	s 15 (1.2)	-5 (2.0) ▼
Syrian Arab Republic	9 (0.5)	∅ ∅	17 (1.0)	∅ ∅	8 (0.5)	∅ ∅
Thailand	10 (0.5)	∅ ∅	10 (1.2)	∅ ∅	5 (0.5)	∅ ∅
Tunisia	9 (0.5)	-8 (0.9) ▼	5 (0.8)	-2 (1.1)	10 (0.5)	0 (0.7)
Turkey	18 (1.0)	∅ ∅	12 (0.6)	∅ ∅	7 (0.7)	∅ ∅
Ukraine	12 (0.5)	∅ ∅	14 (0.5)	∅ ∅	8 (0.5)	∅ ∅
United States	r 7 (0.4)	-2 (0.7) ▼	r 3 (0.4)	-1 (0.7)	s 8 (1.0)	-2 (1.5)
‡ Morocco	15 (1.2)	--	7 (1.8)	--	13 (2.0)	--
<b>International Avg.</b>	<b>11 (0.1)</b>		<b>9 (0.1)</b>		<b>8 (0.1)</b>	
<b>Benchmarking Participants</b>						
Basque Country, Spain	11 (0.8)	-2 (1.2)	16 (1.1)	-1 (1.6)	7 (0.9)	1 (1.1)
British Columbia, Canada	7 (0.5)	∅ ∅	4 (0.7)	∅ ∅	6 (0.9)	∅ ∅
Dubai, UAE	s 8 (0.0)	∅ ∅	s 6 (0.1)	∅ ∅	s 10 (0.1)	∅ ∅
Massachusetts, US	7 (0.7)	∅ ∅	2 (0.6)	∅ ∅	r 5 (1.0)	∅ ∅
Minnesota, US	7 (0.8)	∅ ∅	2 (0.6)	∅ ∅	r 10 (2.6)	∅ ∅
Ontario, Canada	10 (0.8)	-1 (1.0)	3 (0.5)	-2 (1.0) ▼	7 (1.4)	-2 (2.2)
Quebec, Canada	8 (0.6)	2 (0.8) ▲	1 (0.4)	0 (0.5)	10 (1.5)	-8 (2.7) ▼

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

### **Do Schools Encourage Home Involvement?**

Parental support for and involvement in school activities is an essential aspect of school life in many countries, and is often seen as an important way to strengthen the link between home and school, and ultimately foster an enhanced educational experience. Exhibit 8.6 presents information supplied by TIMSS National Research Coordinators on whether there is a national policy on parental involvement in schools. It also shows the percentages of students, according to principals' reports, that their school does ask parents to be involved in school-related activities. Five specific activities are shown: attend special events (such as science fairs, concerts, sporting events), raise funds for the school, volunteer for school projects, programs, and trips, ensure that students complete their homework, and serve on school committees.

As shown in Exhibit 8.6, the majority of TIMSS participants at both grade levels have established policies of encouraging parental involvement in schools. Even where no written policy exists, there sometimes was an informal understanding that parental involvement should be encouraged. Almost universally, schools ask parents to ensure that their child completes his or her homework and to attend special events. At both grades, almost all students (90 percent or more) were in schools where these were the expectations. In almost every country and benchmarking entity also, most students attended schools that expected parents to volunteer for school projects, 84 percent at fourth grade and 75 percent at eighth grade, and serve on school committees, 71 and 67 percent, respectively. There was more variability among participants in expectations for parental involvement in fundraising for schools. For example, at fourth grade, more than 90 percent of students in Australia, England, New Zealand, Scotland, the Ukraine, the United States, and the states of Massachusetts and Minnesota were in schools where parents were asked to raise funds, but 10 percent or less in Japan, Kuwait, Norway, and Sweden. Similar variability was shown at eighth grade.

Exhibit 8.6 Schools' Encouragement of Parental Involvement

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Have Policy to Encourage Parental Involvement in Schools	Percentages of Students Whose Schools Reported That They Ask Parents to Be Involved in the School-related Activity				
		Attend Special Events (e.g., Science Fair, Concert, Sporting Events)	Raise Funds for the School	Volunteer for School Projects, Programs, and Trips	Ensure That Their Child Completes His/Her Homework	Serve on School Committees (e.g., Select School Personnel, Review School Finances)
Algeria	●	82 (3.4)	41 (4.8)	58 (4.3)	88 (2.6)	31 (4.2)
Armenia	○	90 (2.8)	52 (4.1)	85 (3.2)	90 (2.7)	90 (2.6)
Australia	○	100 (0.5)	97 (1.3)	98 (1.0)	96 (1.8)	96 (1.6)
Austria	●	91 (1.8)	56 (3.6)	98 (0.9)	93 (2.0)	100 (0.0)
Chinese Taipei	●	95 (1.9)	38 (4.3)	88 (2.9)	99 (0.7)	92 (2.3)
Colombia	●	91 (3.1)	41 (5.2)	93 (2.4)	99 (1.3)	69 (4.2)
Czech Republic	○	62 (4.3)	41 (4.2)	80 (3.3)	96 (1.6)	61 (4.5)
Denmark	●	88 (3.7)	11 (3.1)	13 (3.0)	100 (0.0)	93 (2.7)
El Salvador	●	86 (3.3)	46 (4.6)	87 (3.2)	97 (1.5)	81 (3.6)
England	○	100 (0.5)	98 (1.5)	93 (2.0)	99 (1.0)	84 (3.1)
Georgia	●	87 (3.4)	61 (4.6)	93 (2.4)	95 (1.8)	82 (3.7)
Germany	●	98 (0.7)	68 (3.0)	99 (0.6)	95 (1.5)	97 (1.0)
Hong Kong SAR	●	94 (2.2)	78 (3.9)	97 (1.5)	95 (1.8)	63 (4.1)
Hungary	○	78 (3.9)	73 (4.0)	92 (2.6)	93 (2.3)	64 (4.4)
Iran, Islamic Rep. of	●	77 (3.2)	69 (3.4)	82 (2.8)	94 (1.8)	70 (3.5)
Italy	●	99 (0.8)	37 (3.8)	51 (4.1)	96 (1.5)	51 (3.9)
Japan	●	98 (1.2)	2 (1.3)	92 (2.3)	87 (2.7)	23 (3.6)
Kazakhstan	●	97 (1.4)	60 (5.4)	83 (4.5)	99 (0.9)	82 (4.1)
Kuwait	●	87 (3.1)	4 (1.7)	70 (4.1)	89 (2.6)	24 (3.5)
Latvia	○	97 (1.5)	48 (4.0)	81 (3.4)	82 (2.9)	71 (3.7)
Lithuania	●	99 (0.8)	74 (3.3)	96 (1.7)	96 (1.6)	88 (2.5)
Morocco	●	89 (2.5)	46 (4.0)	70 (3.5)	96 (1.5)	31 (3.6)
Netherlands	●	r 87 (3.5)	r 33 (3.9)	r 94 (2.9)	r 96 (2.5)	r 90 (3.2)
New Zealand	●	100 (0.0)	96 (1.3)	100 (0.0)	94 (1.5)	94 (1.6)
Norway	●	96 (1.7)	10 (2.7)	97 (1.1)	97 (1.6)	89 (2.4)
Qatar	○	94 (0.1)	26 (0.2)	75 (0.1)	91 (0.1)	25 (0.2)
Russian Federation	○	99 (0.6)	67 (3.1)	96 (1.4)	99 (0.7)	91 (2.5)
Scotland	●	100 (0.0)	100 (0.0)	98 (1.4)	100 (0.0)	95 (1.8)
Singapore	●	99 (0.0)	69 (0.0)	99 (0.0)	99 (0.0)	67 (0.0)
Slovak Republic	●	57 (3.9)	66 (3.4)	83 (3.2)	91 (2.3)	82 (3.2)
Slovenia	●	98 (1.3)	41 (4.3)	73 (4.2)	98 (1.2)	39 (4.2)
Sweden	●	91 (2.1)	3 (1.2)	86 (3.1)	99 (0.6)	65 (3.9)
Tunisia	○	70 (3.9)	62 (4.2)	74 (3.6)	94 (2.1)	44 (3.9)
Ukraine	●	97 (1.3)	95 (1.9)	90 (2.4)	96 (1.8)	89 (2.4)
United States	●	100 (0.3)	94 (1.6)	98 (0.9)	100 (0.4)	89 (2.1)
Yemen	●	65 (4.3)	45 (4.9)	67 (4.4)	93 (2.1)	50 (4.8)
International Avg.		90 (0.4)	54 (0.6)	84 (0.5)	95 (0.3)	71 (0.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Benchmarking Participants

Alberta, Canada	○	96 (1.6)	77 (3.6)	94 (2.0)	99 (1.0)	66 (3.9)
British Columbia, Canada	●	94 (2.3)	88 (3.1)	92 (2.7)	99 (0.9)	75 (4.3)
Dubai, UAE	○	r 96 (0.1)	r 38 (0.4)	r 61 (0.4)	r 100 (0.0)	r 27 (0.3)
Massachusetts, US	●	100 (0.0)	97 (2.2)	100 (0.0)	100 (0.0)	94 (4.0)
Minnesota, US	○	100 (0.0)	93 (3.9)	100 (0.3)	100 (0.3)	84 (7.0)
Ontario, Canada	●	95 (2.2)	88 (3.6)	96 (2.1)	96 (2.5)	69 (5.1)
Quebec, Canada	●	99 (0.9)	88 (2.6)	97 (2.4)	99 (0.8)	75 (3.7)

● Yes ○ No

Background data provided by National Research Coordinators and by schools.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.  
 Note: In some countries, schools are not permitted to ask parents to raise funds or serve on school committees.

## Exhibit 8.6 Schools' Encouragement of Parental Involvement (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Have Policy to Encourage Parental Involvement in Schools	Percentages of Students Whose Schools Reported That They Ask Parents to Be Involved in the School-related Activity				
		Attend Special Events (e.g., Science Fair, Concert, Sporting Events)	Raise Funds for the School	Volunteer for School Projects, Programs, and Trips	Ensure That Their Child Completes His/Her Homework	Serve on School Committees (e.g., Select School Personnel, Review School Finances)
Algeria	●	84 (3.5)	37 (3.8)	56 (4.3)	85 (3.1)	48 (4.0)
Armenia	○	91 (2.5)	53 (4.0)	84 (3.5)	91 (2.7)	90 (2.8)
Australia	○	96 (1.8)	71 (4.0)	77 (3.1)	97 (1.3)	97 (1.2)
Bahrain	●	92 (0.1)	31 (0.2)	64 (0.2)	97 (0.2)	32 (0.3)
Bosnia and Herzegovina	●	84 (2.9)	52 (3.7)	92 (2.3)	92 (2.3)	91 (2.1)
Botswana	○	82 (3.3)	99 (0.7)	76 (3.6)	88 (2.9)	89 (2.3)
Bulgaria	○	95 (1.7)	57 (4.0)	66 (4.4)	81 (3.4)	59 (4.8)
Chinese Taipei	●	90 (2.4)	38 (3.9)	77 (3.7)	98 (1.2)	83 (3.1)
Colombia	●	93 (2.2)	31 (4.5)	90 (2.9)	98 (1.5)	63 (4.4)
Cyprus	●	93 (0.1)	74 (0.2)	51 (0.3)	95 (0.1)	79 (0.2)
Czech Republic	○	58 (3.8)	40 (3.7)	76 (3.9)	95 (1.9)	70 (4.1)
Egypt	○	94 (2.0)	56 (4.2)	81 (3.1)	94 (1.7)	65 (4.1)
El Salvador	●	94 (1.9)	44 (4.6)	89 (2.8)	93 (2.2)	81 (3.4)
England	○	99 (1.1)	67 (4.3)	61 (4.5)	99 (1.0)	71 (4.2)
Georgia	●	89 (2.7)	64 (5.1)	89 (2.8)	99 (0.8)	90 (2.3)
Ghana	●	82 (3.3)	66 (4.2)	62 (4.0)	79 (3.2)	95 (1.8)
Hong Kong SAR	●	92 (2.6)	66 (4.6)	83 (3.6)	91 (2.7)	60 (4.0)
Hungary	○	75 (3.7)	77 (3.0)	91 (2.8)	94 (2.2)	62 (4.5)
Indonesia	●	77 (3.7)	71 (4.0)	54 (4.3)	97 (1.6)	80 (3.4)
Iran, Islamic Rep. of	●	72 (3.4)	70 (3.4)	77 (3.5)	89 (2.3)	63 (3.8)
Israel	●	91 (2.5)	33 (4.2)	83 (3.0)	86 (3.0)	56 (4.4)
Italy	●	96 (1.5)	27 (3.3)	47 (3.8)	96 (1.5)	51 (4.3)
Japan	●	100 (0.0)	13 (3.0)	74 (3.9)	78 (3.6)	29 (3.8)
Jordan	●	96 (1.7)	33 (3.5)	78 (3.6)	95 (1.8)	46 (4.0)
Korea, Rep. of	●	93 (2.2)	11 (2.2)	51 (3.9)	60 (4.0)	92 (2.0)
Kuwait	●	79 (3.2)	9 (2.5)	65 (4.2)	90 (2.4)	28 (4.5)
Lebanon	●	79 (4.0)	46 (4.9)	52 (3.8)	91 (2.8)	73 (4.6)
Lithuania	●	99 (0.7)	74 (3.6)	98 (1.1)	97 (1.3)	85 (2.7)
Malaysia	●	98 (1.2)	85 (3.0)	77 (3.5)	92 (2.5)	57 (3.8)
Malta	●	99 (0.0)	74 (0.2)	58 (0.2)	100 (0.0)	75 (0.2)
Norway	●	90 (2.6)	18 (3.8)	90 (3.0)	92 (2.5)	91 (2.4)
Oman	●	98 (1.1)	24 (3.8)	85 (2.9)	94 (1.8)	21 (3.6)
Palestinian Nat'l Auth.	○	100 (0.0)	38 (3.8)	80 (3.2)	99 (0.9)	19 (3.3)
Qatar	○	91 (0.1)	28 (0.1)	75 (0.1)	94 (0.1)	30 (0.1)
Romania	○	78 (3.6)	49 (4.2)	85 (2.7)	99 (1.0)	68 (4.5)
Russian Federation	○	98 (1.1)	69 (3.9)	95 (1.8)	88 (2.9)	92 (2.0)
Saudi Arabia	●	96 (1.6)	16 (3.3)	44 (4.2)	97 (1.4)	93 (1.9)
Scotland	●	99 (0.9)	79 (4.1)	53 (5.0)	99 (1.0)	85 (3.8)
Serbia	○	77 (4.2)	72 (3.9)	83 (3.2)	97 (1.5)	96 (1.6)
Singapore	●	98 (0.0)	69 (0.0)	96 (0.0)	91 (0.0)	63 (0.0)
Slovenia	●	98 (1.2)	44 (4.4)	70 (4.2)	96 (1.7)	38 (4.1)
Sweden	●	85 (3.1)	10 (2.4)	74 (3.6)	96 (1.5)	68 (4.2)
Syrian Arab Republic	●	91 (2.6)	14 (2.9)	80 (3.4)	98 (1.2)	52 (4.6)
Thailand	●	95 (1.8)	92 (2.1)	78 (3.2)	89 (2.6)	77 (3.3)
Tunisia	○	79 (3.2)	36 (4.1)	60 (3.5)	97 (1.4)	21 (3.7)
Turkey	●	80 (3.2)	81 (3.1)	80 (3.3)	59 (4.5)	62 (4.1)
Ukraine	●	97 (1.5)	91 (2.6)	86 (2.7)	93 (2.3)	90 (2.6)
United States	●	99 (0.8)	82 (2.6)	97 (1.3)	98 (0.9)	89 (2.5)
‡ Morocco	●	95 (1.9)	35 (4.0)	87 (2.3)	69 (4.0)	65 (5.6)
International Avg.		90 (0.3)	51 (0.5)	75 (0.5)	91 (0.3)	67 (0.5)
<b>Benchmarking Participants</b>						
Basque Country, Spain	●	85 (2.6)	34 (5.0)	79 (4.3)	92 (2.6)	95 (2.1)
British Columbia, Canada	●	94 (2.1)	57 (4.4)	78 (3.3)	94 (1.7)	83 (3.6)
Dubai, UAE	○	r 100 (0.0)	r 35 (0.7)	s 66 (0.7)	r 100 (0.0)	r 24 (0.8)
Massachusetts, US	●	99 (1.2)	93 (3.5)	94 (3.8)	98 (2.4)	93 (3.8)
Minnesota, US	○	98 (1.8)	71 (7.0)	99 (0.7)	99 (0.6)	84 (4.9)
Ontario, Canada	●	92 (2.8)	82 (3.9)	91 (2.7)	99 (0.8)	62 (4.9)
Quebec, Canada	●	97 (1.4)	66 (4.8)	59 (4.6)	97 (1.3)	73 (4.3)

● Yes ○ No

Background data provided by National Research Coordinators and by schools.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.

An "s" indicates data are available for at least 50 but less than 70% of the students.

Note: In some countries, schools are not permitted to ask parents to raise funds or serve on school committees.

### What School Resources Are Available to Support School Learning?

To provide information about the level of school resources available to schools for science instruction and in particular about the impact of shortages of important resources, TIMSS created an index based on principals' responses to questions about shortages affecting schools' general capacity to provide instruction, and to provide science instruction in particular. To create the Index of Availability of School Resources for Science Instruction (ASRSI), principals were asked how much shortages or inadequacies in five areas affected their school's general capacity to provide instruction: instructional materials (textbooks, for example); budget for supplies (paper, pencils, etc.); school buildings and grounds; heating/cooling and lighting systems; and instructional space (classrooms, for example). They also responded to six questions about shortages affecting science instruction: science laboratory equipment and supplies; computers for science instruction; computer software for science instruction; calculators for science instruction; library materials relevant to science instruction; and audio-visual resources. Responses were coded on a four-point scale: 1 = *none*, 2 = *a little*, 3 = *some*, and 4 = *a lot*, and averages calculated across the five general questions and the six science instruction questions for each principal. Students were assigned to one of three levels of the Index of Availability of School Resources for Science Instruction on the basis of their school principals' average responses. The high level of the index indicates that both averages were lower than 2, and the low level that both averages were at least 3. The medium level includes all other possible combinations.

Exhibit 8.7 displays the percentage of students at the high, medium, and low levels of the index for each TIMSS participant, at both fourth and eighth grades, together with average science achievement.

At fourth grade, 31 percent of students, internationally, were at the high level of the index, where principals reported that resource shortages essentially were not a problem. A further 59 percent of students were at the medium level and just 10 percent at the low index level. There was considerable variation across countries, however, with the majority of students

in Singapore (83%), Austria (71%), the Czech Republic (64%), Japan (53%), and England (50%), as well as the benchmarking participants Dubai (82%) and Alberta (50%) at the high level, for example, and less than 10 percent in Morocco, the Ukraine, Colombia, Iran, Yemen, Georgia, Tunisia, and Algeria. Average science achievement was highest among students at the high index level (483 points), next at the medium level (477 points), and lowest at the low level of the index (442 points).

At eighth grade, the situation was similar, with 27 percent of students at the high level, 62 percent at the medium level, and 11 percent at the low level. Again there were large differences between countries, with the majority of students at the high index level in Singapore (90%), Hong Kong SAR (71%), the Czech Republic (65%), Slovenia (58%), Australia (57%), Scotland (52%), and in benchmarking participants Dubai (80%), the Basque Country (71%), Quebec (54%), and British Columbia (53%). In contrast, there was less than 10 percent in Kuwait, Saudi Arabia, Turkey, Tunisia, Georgia, Indonesia, the Ukraine, Botswana, Bosnia and Herzegovina, and Morocco. Students at the high level of the index had highest average science achievement (479 points), followed by students at the medium level (463 points) and then by students at the low level (447 points).

For countries that participated in previous cycles of TIMSS, Exhibit 8.8 presents changes in the percentage of students at the high level of the Index of Availability of School Resources for Science Instruction (ASRSI). At fourth grade, changes are shown since 1995 and 2003 for participants in those assessments. TIMSS participants showing an increase since 1995 in percentage of students at the high level included Singapore, the Czech Republic, Japan, England, Hungary (also since 2003), Slovenia, Hong Kong SAR, the United States, New Zealand, Australia, Latvia, and among benchmarking participants, Alberta, Ontario, and Minnesota. No country had a significant decrease. At the eighth grade, Exhibit 8.8 presents changes in percentages from three earlier cycles of TIMSS—1995, 1999, and 2003. Almost all participants showed an increase in 2007 compared to at least one of the previous assessments, and only three countries showed a decrease—

Israel, Italy, and Indonesia. Singapore has a small decrease from 2003, but that was outweighed by a larger increase from 1995 and 1999.

Because of its importance as a resource for science instruction, TIMSS asked schools whether they were equipped with a science laboratory. Exhibit 8.9 summarizes schools' responses, showing for each participant the percentage of students in schools with and without science laboratories, together with average science achievement. It is clear from the exhibit that science laboratories are more common in schools serving eighth grade students than in schools for fourth grade students. On average at the fourth grade, 31 percent of students attended a school with a science laboratory, compared with 76 percent at the eighth grade. There was considerable variation between countries at the fourth grade in the percentage of students in laboratory-equipped schools. More than 90 percent of students were in such schools in Kuwait, Japan, Singapore, Qatar, and the benchmarking participant Dubai, while there were 12 countries and one benchmarking participant with less than 10 percent of students in schools with science laboratories. At eighth grade, there were 23 countries and 4 benchmarking participants with 90 percent or more of students in laboratory-equipped schools, and only three countries with 10 percent or less.

**Exhibit 8.7 Index of Availability of School Resources for Science Instruction (ASRSI)**
**TIMSS2007**  
**Science 4<sup>th</sup> Grade**

Country	High ASRSI		Medium ASRSI		Low ASRSI	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Singapore	83 (0.0)	586 (4.6)	16 (0.0)	597 (9.2)	1 (0.0)	~ ~
Austria	71 (3.3)	526 (3.3)	28 (3.3)	522 (5.9)	0 (0.0)	~ ~
Czech Republic	64 (4.2)	514 (3.9)	36 (4.2)	516 (4.7)	0 (0.0)	~ ~
Japan	53 (4.0)	547 (2.8)	45 (4.2)	548 (2.4)	3 (1.4)	566 (12.8)
England	50 (4.4)	547 (4.6)	49 (4.3)	536 (4.3)	1 (1.1)	~ ~
Germany	48 (3.7)	535 (3.1)	50 (3.7)	523 (3.7)	2 (1.1)	~ ~
Denmark	47 (5.4)	523 (4.2)	52 (5.5)	512 (4.5)	1 (0.0)	~ ~
Hungary	46 (4.4)	531 (6.1)	49 (4.5)	540 (4.9)	5 (1.8)	547 (10.8)
Slovenia	46 (4.0)	516 (3.5)	53 (4.1)	520 (2.5)	1 (0.9)	~ ~
Scotland	44 (4.5)	502 (4.5)	53 (4.5)	499 (3.7)	3 (1.5)	510 (13.2)
Hong Kong SAR	43 (4.6)	556 (4.8)	56 (4.5)	553 (4.9)	1 (0.8)	~ ~
United States	42 (3.6)	550 (4.2)	55 (3.5)	533 (3.9)	3 (1.0)	502 (20.4)
New Zealand	40 (3.1)	501 (5.1)	58 (3.2)	509 (3.2)	2 (1.1)	~ ~
Australia	39 (4.1)	534 (4.7)	61 (4.2)	522 (5.4)	0 (0.4)	~ ~
Chinese Taipei	36 (4.4)	562 (3.9)	59 (4.2)	555 (2.5)	4 (1.8)	543 (9.7)
Russian Federation	36 (4.1)	553 (8.1)	61 (4.1)	545 (4.7)	3 (1.2)	493 (26.8)
Kazakhstan	33 (5.0)	534 (8.0)	59 (4.8)	532 (8.5)	8 (2.2)	532 (10.2)
Sweden	30 (3.8)	535 (3.3)	65 (4.0)	521 (4.0)	4 (1.8)	511 (14.9)
Qatar	29 (0.2)	267 (3.5)	68 (0.2)	302 (2.6)	2 (0.1)	~ ~
Kuwait	27 (3.9)	355 (10.0)	70 (4.2)	345 (6.6)	3 (1.6)	379 (32.4)
Lithuania	25 (3.6)	510 (5.0)	73 (3.7)	516 (2.8)	2 (1.0)	~ ~
Norway	23 (3.6)	481 (5.1)	74 (3.8)	475 (4.2)	3 (1.4)	452 (15.5)
Netherlands	22 (3.8)	524 (5.7)	75 (4.0)	522 (3.7)	3 (1.5)	500 (15.2)
Slovak Republic	21 (3.1)	530 (9.9)	72 (3.4)	525 (5.5)	6 (2.0)	510 (11.8)
Italy	18 (2.9)	541 (6.6)	75 (3.4)	535 (4.0)	6 (2.0)	521 (8.4)
Latvia	14 (3.1)	526 (7.1)	84 (3.3)	545 (2.4)	2 (1.2)	~ ~
El Salvador	13 (1.9)	451 (13.2)	62 (4.2)	384 (4.6)	26 (4.0)	373 (9.5)
Armenia	12 (2.1)	453 (8.4)	76 (3.2)	491 (7.3)	12 (2.6)	473 (14.3)
Morocco	9 (3.3)	371 (32.1)	48 (4.4)	296 (8.7)	43 (3.5)	273 (10.3)
Ukraine	9 (2.4)	478 (6.6)	82 (3.1)	474 (3.4)	8 (2.2)	465 (18.0)
Colombia	9 (3.2)	475 (20.2)	48 (4.8)	416 (7.2)	43 (4.5)	370 (9.7)
Iran, Islamic Rep. of	8 (2.1)	443 (23.7)	75 (3.5)	441 (4.6)	17 (3.1)	407 (10.4)
Yemen	8 (2.0)	207 (15.2)	37 (3.8)	205 (10.1)	55 (4.0)	190 (10.6)
Georgia	7 (2.7)	411 (13.5)	77 (4.1)	418 (4.8)	15 (3.3)	424 (15.2)
Tunisia	6 (2.1)	340 (28.5)	64 (4.2)	324 (7.8)	30 (4.0)	301 (12.0)
Algeria	5 (1.7)	363 (24.0)	74 (4.9)	358 (5.8)	21 (4.7)	329 (24.2)
International Avg.	31 (0.6)	483 (2.1)	59 (0.7)	477 (1.3)	10 (0.4)	442 (3.4)
<b>Benchmarking Participants</b>						
Dubai, UAE	82 (0.2)	467 (3.5)	17 (0.2)	424 (5.5)	1 (0.1)	~ ~
Alberta, Canada	50 (4.7)	541 (4.7)	48 (4.6)	544 (5.4)	2 (1.0)	~ ~
Quebec, Canada	49 (4.6)	517 (4.1)	51 (4.6)	517 (3.9)	0 (0.1)	~ ~
Minnesota, US	38 (6.9)	550 (16.4)	61 (7.2)	554 (6.6)	1 (1.6)	~ ~
British Columbia, Canada	37 (4.8)	541 (4.8)	62 (4.8)	535 (4.0)	1 (0.7)	~ ~
Massachusetts, US	37 (5.5)	575 (10.9)	60 (6.0)	572 (5.6)	3 (2.3)	534 (40.3)
Ontario, Canada	28 (4.2)	544 (6.3)	70 (4.4)	535 (4.9)	2 (1.4)	~ ~

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on principals' average response to five questions about shortages that affect general capacity to provide instruction: instructional materials (e.g., textbook); budget for supplies (e.g., paper, pencils); school buildings and grounds; heating/cooling and lighting systems; and instructional space (e.g., classrooms); and the average response to five questions about shortages that affect science instruction: computers for science instruction; computer software for science instruction; calculators for science instruction; library materials relevant to science instruction; and audio-visual resources for science instruction. Average is computed based on a 4-point scale: 1 = none; 2 = a little; 3 = some;

and 4 = a lot. High level indicates that both shortages are on average lower than 2. Low level indicates that both shortages are on average greater than or equal to 3. Medium level includes all other possible combinations of responses.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.



**Exhibit 8.7 Index of Availability of School Resources for Science Instruction (ASRSI) (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	High ASRSI		Medium ASRSI		Low ASRSI	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Singapore	90 (0.0)	567 (4.9)	10 (0.0)	570 (13.9)	0 (0.0)	~ ~
Hong Kong SAR	71 (3.7)	528 (6.0)	29 (3.7)	526 (9.4)	0 (0.0)	~ ~
Czech Republic	65 (4.0)	538 (2.6)	35 (4.0)	540 (3.7)	0 (0.0)	~ ~
Slovenia	58 (4.2)	538 (2.8)	39 (4.3)	537 (4.2)	2 (1.3)	~ ~
Australia	57 (3.4)	531 (6.1)	41 (3.4)	493 (5.5)	2 (0.8)	~ ~
Scotland	52 (4.5)	496 (5.4)	46 (4.5)	493 (6.1)	3 (1.6)	521 (28.9)
Malta	49 (0.3)	474 (2.0)	50 (0.3)	439 (1.9)	2 (0.1)	~ ~
Sweden	49 (4.1)	508 (3.8)	50 (4.0)	514 (3.6)	1 (1.1)	~ ~
Hungary	48 (4.6)	538 (5.4)	48 (4.6)	542 (4.8)	4 (1.7)	527 (8.6)
United States	45 (3.6)	530 (4.1)	50 (3.5)	513 (4.6)	4 (1.5)	505 (14.9)
Japan	45 (4.1)	559 (4.1)	53 (4.3)	551 (3.1)	2 (1.2)	~ ~
Malaysia	44 (4.2)	479 (8.3)	44 (4.5)	457 (8.4)	12 (2.5)	491 (14.8)
Chinese Taipei	39 (4.0)	561 (6.1)	55 (4.2)	560 (5.1)	5 (2.4)	569 (12.7)
Israel	39 (4.2)	486 (8.4)	57 (4.4)	460 (6.0)	4 (1.2)	456 (10.7)
Lebanon	34 (4.2)	448 (12.2)	59 (4.2)	395 (7.9)	7 (3.2)	365 (36.7)
England	32 (3.6)	542 (8.9)	63 (3.9)	542 (5.7)	5 (1.7)	542 (18.3)
Qatar	31 (0.2)	308 (2.8)	66 (0.1)	322 (1.8)	3 (0.0)	366 (7.5)
Cyprus	28 (0.2)	450 (3.5)	59 (0.2)	453 (2.4)	14 (0.2)	447 (4.9)
Egypt	25 (3.4)	418 (8.6)	70 (3.7)	405 (4.7)	5 (1.8)	398 (22.9)
Korea, Rep. of	25 (3.8)	552 (4.2)	73 (3.8)	553 (2.3)	2 (0.7)	~ ~
Russian Federation	25 (3.0)	546 (7.0)	69 (3.1)	525 (4.5)	6 (1.8)	512 (12.7)
Jordan	24 (3.0)	496 (6.9)	69 (3.6)	476 (5.4)	7 (2.0)	490 (19.3)
Lithuania	23 (3.8)	513 (5.7)	74 (3.7)	520 (3.2)	2 (1.3)	~ ~
Bahrain	23 (0.2)	495 (3.0)	73 (0.2)	460 (2.0)	4 (0.1)	446 (7.1)
Norway	22 (3.8)	497 (4.2)	72 (4.0)	483 (2.6)	6 (1.8)	497 (11.8)
Palestinian Nat'l Auth.	19 (3.0)	416 (7.6)	68 (3.7)	404 (4.4)	12 (2.5)	385 (15.2)
Romania	19 (3.6)	470 (12.6)	74 (4.0)	463 (4.7)	7 (2.3)	442 (20.1)
Italy	19 (3.2)	500 (4.9)	79 (3.3)	493 (3.6)	3 (1.3)	518 (9.1)
Bulgaria	18 (3.5)	482 (13.6)	74 (4.0)	465 (7.2)	8 (2.9)	502 (18.5)
Algeria	17 (2.8)	405 (4.3)	76 (3.4)	408 (2.3)	7 (2.2)	413 (7.9)
Oman	15 (3.2)	432 (6.7)	62 (4.3)	421 (4.9)	23 (3.7)	418 (9.4)
Thailand	15 (2.5)	510 (10.0)	64 (4.0)	463 (5.7)	21 (3.3)	466 (11.1)
Colombia	15 (3.0)	433 (13.7)	52 (4.8)	424 (4.1)	33 (4.3)	396 (6.4)
Serbia	14 (2.9)	499 (8.4)	69 (3.7)	468 (3.8)	17 (2.8)	453 (9.5)
El Salvador	13 (2.8)	429 (9.4)	66 (4.0)	383 (4.1)	21 (3.5)	373 (5.5)
Armenia	13 (2.3)	464 (8.0)	76 (3.0)	493 (7.2)	11 (2.4)	480 (7.1)
Syrian Arab Republic	12 (2.8)	456 (8.5)	83 (3.2)	451 (3.6)	5 (1.8)	445 (16.1)
Ghana	10 (2.6)	253 (18.6)	78 (3.7)	307 (5.9)	12 (2.7)	314 (16.0)
Iran, Islamic Rep. of	10 (2.0)	516 (12.5)	71 (3.2)	454 (3.5)	19 (2.9)	448 (10.2)
Kuwait	9 (2.8)	428 (11.2)	84 (3.5)	415 (3.5)	7 (2.4)	424 (10.8)
Saudi Arabia	8 (2.1)	398 (13.5)	77 (3.8)	405 (3.1)	15 (3.6)	392 (9.6)
Turkey	7 (2.3)	513 (14.0)	63 (4.5)	452 (5.0)	30 (4.0)	444 (7.7)
Tunisia	6 (2.0)	451 (6.3)	74 (3.6)	444 (2.5)	19 (3.2)	444 (5.2)
Georgia	6 (1.8)	440 (13.9)	81 (4.6)	419 (5.4)	14 (4.1)	425 (13.5)
Indonesia	5 (1.7)	472 (14.9)	59 (4.4)	429 (4.7)	36 (4.1)	418 (7.0)
Ukraine	5 (1.9)	479 (21.0)	82 (3.5)	485 (3.9)	13 (3.1)	487 (7.7)
Botswana	4 (1.6)	406 (23.6)	64 (3.7)	352 (4.3)	32 (3.8)	349 (5.4)
Bosnia and Herzegovina	4 (1.6)	505 (17.1)	74 (3.4)	466 (3.4)	23 (3.2)	458 (6.9)
‡ Morocco	4 (1.3)	493 (8.5)	47 (6.1)	398 (4.9)	49 (6.0)	396 (4.9)
<b>International Avg.</b>	<b>27 (0.4)</b>	<b>479 (1.5)</b>	<b>62 (0.5)</b>	<b>463 (0.9)</b>	<b>11 (0.4)</b>	<b>447 (2.3)</b>

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Dubai, UAE	r	80 (0.4)	500 (4.1)	16 (0.3)	438 (5.8)	3 (0.1)	449 (4.6)
Basque Country, Spain		71 (4.5)	498 (4.1)	27 (4.6)	499 (3.6)	2 (1.2)	~ ~
Quebec, Canada		54 (5.0)	519 (5.8)	46 (5.0)	493 (4.4)	0 (0.0)	~ ~
British Columbia, Canada		53 (5.2)	525 (4.1)	45 (5.1)	529 (4.6)	3 (1.4)	543 (31.2)
Massachusetts, US		42 (7.2)	567 (9.7)	52 (8.0)	547 (9.8)	5 (3.7)	543 (8.2)
Ontario, Canada		37 (5.2)	530 (4.3)	58 (4.9)	525 (4.8)	5 (2.4)	554 (17.9)
Minnesota, US		35 (7.6)	542 (9.5)	61 (7.0)	538 (5.3)	4 (3.4)	504 (10.0)

Index based on principals' average response to five questions about shortages that affect general capacity to provide instruction: instructional materials (e.g., textbook); budget for supplies (e.g., paper, pencils); school buildings and grounds; heating/cooling and lighting systems; and instructional space (e.g., classrooms); and the average response to five questions about shortages that affect science instruction: computers for science instruction; computer software for science instruction; calculators for science instruction; library materials relevant to science instruction; and audio-visual resources for science instruction. Average is computed based on a 4-point scale: 1 = none; 2 = a little; 3 = some; and 4 = a lot. High level indicates that both shortages are on average lower than 2. Low

level indicates that both shortages are on average greater than or equal to 3. Medium level includes all other possible combinations of responses.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

**Exhibit 8.8 High Index of Availability of School Resources for Science Instruction (ASRSI) with Trends**
**TIMSS2007**  
 Science **4<sup>th</sup>**  
 Grade

Country	High ASRSI			
	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1995	
Singapore	83 (0.0)	-1 (2.8)	36 (4.1)	▲
Austria	71 (3.3)	◊ ◊	7 (5.5)	
Czech Republic	64 (4.2)	◊ ◊	27 (6.1)	▲
Japan	53 (4.0)	5 (5.5)	28 (5.4)	▲
England	r 50 (4.4)	5 (6.6)	24 (6.3)	▲
Hungary	46 (4.4)	13 (5.9)	▲ 24 (5.7)	▲
Slovenia	r 46 (4.0)	-3 (5.7)	39 (4.8)	▲
Scotland	44 (4.5)	-7 (6.5)	--	
Hong Kong SAR	43 (4.6)	8 (6.4)	22 (6.3)	▲
United States	r 42 (3.6)	6 (5.0)	18 (4.8)	▲
New Zealand	40 (3.1)	-1 (4.5)	19 (4.9)	▲
Australia	39 (4.1)	1 (5.7)	15 (6.2)	▲
Chinese Taipei	36 (4.4)	16 (5.4)	◊ ◊	
Russian Federation	36 (4.1)	32 (4.3)	▲ ◊ ◊	
Lithuania	25 (3.6)	14 (4.2)	▲ ◊ ◊	
Norway	r 23 (3.6)	-4 (5.6)	6 (4.8)	
Netherlands	r 22 (3.8)	-7 (5.8)	-7 (5.9)	
Italy	18 (2.9)	-7 (4.4)	--	
Latvia	r 14 (3.1)	-6 (5.6)	13 (3.1)	▲
Armenia	r 12 (2.1)	6 (3.5)	◊ ◊	
Morocco	r 9 (3.3)	3 (4.3)	◊ ◊	
Iran, Islamic Rep. of	8 (2.1)	-4 (4.0)	4 (2.8)	
Tunisia	5 (2.0)	-2 (3.0)	◊ ◊	
<b>International Avg.</b>	<b>36 (0.8)</b>			
<b>Benchmarking Participants</b>				
Alberta, Canada	50 (4.7)	◊ ◊	42 (6.2)	▲
Quebec, Canada	49 (4.6)	13 (6.4)	▲ 4 (12.0)	
Minnesota, US	r 38 (6.9)	◊ ◊	30 (8.2)	▲
Ontario, Canada	28 (4.2)	3 (6.2)	14 (5.4)	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

2007 percent significantly higher ▲

2007 percent significantly lower ▼

For a detailed definition of the ASRSI index, refer to Exhibit 8.7.

Trend notes: Data are not shown for Kuwait, because comparable data from previous cycles are not available. Data for Tunisia do not include private schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students.

A diamond (◊) indicates the country did not participate in the assessment.



**Exhibit 8.8 High Index of Availability of School Resources for Science Instruction (ASRSI) with Trends (Continued)**
**TIMSS2007**  
 Science **8<sup>th</sup>**  
 Grade

Country	High ASRSI			
	2007 Percent of Students	Difference in Percent from 2003	Difference in Percent from 1999	Difference in Percent from 1995
Singapore	90 (0.0)	-2 (0.0) ▼	34 (3.9) ▲	28 (4.8) ▲
Hong Kong SAR	71 (3.7)	5 (5.2)	52 (4.9) ▲	49 (6.5) ▲
Czech Republic	65 (4.0)	0 ◊	22 (5.9) ▲	35 (6.2) ▲
Slovenia	r 58 (4.2)	10 (5.7)	--	52 (4.9) ▲
Australia	r 57 (3.4)	3 (5.1)	--	16 (6.2) ▲
Scotland	s 52 (4.5)	16 (7.0) ▲	◊ ◊	--
Sweden	49 (4.1)	10 (5.7)	◊ ◊	15 (6.3) ▲
Hungary	48 (4.6)	22 (6.0) ▲	24 (5.8) ▲	27 (5.6) ▲
United States	r 45 (3.6)	-4 (5.2)	11 (4.9) ▲	29 (4.8) ▲
Japan	45 (4.1)	-4 (5.7)	14 (5.6) ▲	20 (5.3) ▲
Malaysia	44 (4.2)	26 (5.4) ▲	21 (5.6) ▲	◊ ◊
Chinese Taipei	39 (4.0)	14 (5.6) ▲	34 (4.5) ▲	◊ ◊
Israel	39 (4.2)	-15 (6.0) ▼	3 (5.9)	--
Lebanon	34 (4.2)	0 (5.6)	◊ ◊	◊ ◊
England	s 32 (3.6)	-3 (7.5)	5 (5.5)	8 (6.0)
Cyprus	r 28 (0.2)	12 (0.3) ▲	12 (0.2) ▲	5 (0.5) ▲
Egypt	25 (3.4)	-8 (5.5)	◊ ◊	◊ ◊
Korea, Rep. of	25 (3.8)	-5 (5.5)	18 (4.4) ▲	23 (4.0) ▲
Russian Federation	25 (3.0)	22 (3.2) ▲	23 (3.1) ▲	24 (3.0) ▲
Jordan	24 (3.0)	6 (4.7)	19 (3.6) ▲	◊ ◊
Lithuania	23 (3.8)	13 (4.8) ▲	17 (4.3) ▲	22 (3.9) ▲
Bahrain	23 (0.2)	4 (0.3) ▲	◊ ◊	◊ ◊
Norway	r 22 (3.8)	0 (5.5)	◊ ◊	-8 (5.5)
Palestinian Nat'l Auth.	19 (3.0)	8 (4.2)	◊ ◊	◊ ◊
Romania	19 (3.6)	13 (4.2) ▲	17 (3.8) ▲	16 (3.8) ▲
Italy	19 (3.2)	-12 (4.6) ▼	-4 (4.4)	--
Thailand	15 (2.5)	◊ ◊	14 (2.7) ▲	--
Colombia	15 (3.0)	◊ ◊	◊ ◊	2 (4.4)
Serbia	14 (2.9)	10 (3.5) ▲	◊ ◊	◊ ◊
Armenia	r 13 (2.3)	8 (3.1) ▲	◊ ◊	◊ ◊
Ghana	10 (2.6)	-1 (4.0)	◊ ◊	◊ ◊
Iran, Islamic Rep. of	10 (2.0)	0 (3.2)	5 (2.7)	8 (2.2) ▲
Indonesia	7 (2.1)	-2 (3.2)	-14 (4.3) ▼	◊ ◊
Tunisia	6 (2.0)	-6 (3.5)	2 (2.8)	◊ ◊
Botswana	4 (1.6)	-3 (3.0)	◊ ◊	◊ ◊
<b>International Avg.</b>	<b>32 (0.6)</b>			
<b>Benchmarking Participants</b>				
Basque Country, Spain	71 (4.5)	10 (6.7)	◊ ◊	◊ ◊
Quebec, Canada	r 54 (5.0)	-2 (6.7)	-3 (7.9)	13 (8.2)
British Columbia, Canada	53 (5.2)	◊ ◊	17 (8.1) ▲	◊ ◊
Massachusetts, US	s 42 (7.2)	◊ ◊	10 (9.8)	◊ ◊
Ontario, Canada	37 (5.2)	13 (6.7)	20 (6.2) ▲	22 (6.5) ▲
Minnesota, US	35 (7.6)	◊ ◊	◊ ◊	23 (8.6) ▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

 2007 percent significantly higher ▲  
 2007 percent significantly lower ▼

For a detailed definition of the ASRSI index, refer to Exhibit 8.7.

Trend notes: Data are not shown for Kuwait, Morocco, Saudi Arabia, and Turkey, because comparable data from previous cycles are not available. Data for Indonesia do not include Islamic schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (◊) indicates the country did not participate in the assessment.



## Exhibit 8.9 Schools with Science Laboratory

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Have Science Laboratory in the School		Do Not Have Science Laboratory in the School	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Kuwait	100 (0.0)	348 (4.4)	0 (0.0)	~ ~
Japan	98 (1.1)	548 (2.0)	2 (1.1)	~ ~
Singapore	98 (0.0)	587 (4.2)	2 (0.0)	~ ~
Qatar	92 (0.1)	8 (0.1)	8 (0.1)	326 (4.0)
Chinese Taipei	87 (2.8)	558 (2.1)	13 (2.8)	550 (6.2)
Denmark	75 (3.4)	515 (3.8)	25 (3.4)	523 (4.9)
Armenia	64 (4.2)	486 (7.9)	36 (4.2)	481 (7.8)
Georgia	43 (4.9)	418 (5.3)	57 (4.9)	418 (6.8)
Colombia	38 (3.6)	426 (9.1)	62 (3.6)	386 (6.7)
Czech Republic	37 (4.5)	510 (4.7)	63 (4.5)	519 (3.5)
Iran, Islamic Rep. of	35 (3.8)	469 (8.4)	65 (3.8)	418 (5.3)
Hungary	34 (4.0)	550 (6.7)	66 (4.0)	530 (4.7)
Sweden	33 (3.7)	530 (4.2)	67 (3.7)	523 (3.7)
Slovak Republic	32 (3.9)	526 (6.2)	68 (3.9)	526 (6.0)
Italy	29 (3.1)	533 (5.7)	71 (3.1)	536 (3.9)
Hong Kong SAR	25 (4.0)	555 (5.5)	75 (4.0)	553 (4.4)
United States	22 (2.5)	552 (6.6)	78 (2.5)	535 (3.2)
El Salvador	22 (3.0)	438 (7.4)	78 (3.0)	376 (4.1)
Latvia	20 (3.5)	544 (4.8)	80 (3.5)	543 (2.4)
Norway	18 (3.1)	477 (9.0)	82 (3.1)	476 (4.0)
Yemen	17 (3.1)	243 (12.0)	83 (3.1)	189 (8.0)
Kazakhstan	14 (3.8)	521 (24.9)	86 (3.8)	535 (4.6)
Australia	12 (2.2)	541 (5.0)	88 (2.2)	525 (3.9)
Ukraine	11 (2.7)	479 (12.0)	89 (2.7)	473 (3.3)
Scotland	9 (2.4)	527 (10.6)	91 (2.4)	498 (2.5)
Slovenia	9 (2.4)	496 (9.5)	91 (2.4)	521 (2.2)
Morocco	8 (2.5)	421 (19.2)	92 (2.5)	283 (5.9)
New Zealand	8 (1.9)	530 (8.4)	92 (1.9)	502 (2.8)
Germany	7 (1.9)	515 (9.5)	93 (1.9)	529 (2.8)
England	7 (1.4)	559 (9.3)	93 (1.4)	540 (3.0)
Russian Federation	6 (1.8)	540 (17.0)	94 (1.8)	547 (4.6)
Lithuania	3 (1.5)	480 (10.7)	97 (1.5)	516 (2.3)
Tunisia	2 (1.2)	~ ~	98 (1.2)	321 (6.3)
Austria	1 (0.8)	~ ~	99 (0.8)	526 (2.5)
Algeria	1 (0.6)	~ ~	99 (0.6)	352 (6.2)
Netherlands	0 (0.0)	~ ~	100 (0.0)	522 (2.9)
<b>International Avg.</b>	<b>31 (0.5)</b>	<b>491 (1.9)</b>	<b>69 (0.5)</b>	<b>473 (1.2)</b>
<b>Benchmarking Participants</b>				
Dubai, UAE	r 92 (0.1)	457 (3.6)	8 (0.1)	508 (5.1)
Alberta, Canada	34 (3.9)	541 (4.8)	66 (3.9)	543 (5.1)
Ontario, Canada	28 (4.2)	545 (4.6)	72 (4.2)	533 (4.3)
Massachusetts, US	21 (5.3)	545 (11.7)	79 (5.3)	578 (4.1)
Minnesota, US	12 (4.7)	537 (28.8)	88 (4.7)	555 (7.3)
Quebec, Canada	11 (2.7)	523 (4.9)	89 (2.7)	516 (3.0)
British Columbia, Canada	4 (2.0)	535 (41.9)	96 (2.0)	537 (2.8)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by schools.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.



Exhibit 8.9 Schools with Science Laboratory (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Have Science Laboratory in the School		Do Not Have Science Laboratory in the School	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Australia	100 (0.0)	516 (3.6)	0 (0.0)	~ ~
Chinese Taipei	100 (0.0)	561 (3.7)	0 (0.0)	~ ~
England	100 (0.0)	542 (4.4)	0 (0.0)	~ ~
Korea, Rep. of	100 (0.0)	553 (2.0)	0 (0.0)	~ ~
Malta	100 (0.0)	457 (1.4)	0 (0.0)	~ ~
Singapore	100 (0.0)	567 (4.7)	0 (0.0)	~ ~
Qatar	100 (0.0)	318 (1.7)	0 (0.0)	~ ~
Japan	99 (0.6)	554 (1.9)	1 (0.0)	~ ~
Hong Kong SAR	99 (0.9)	529 (5.0)	1 (0.0)	~ ~
Tunisia	98 (1.1)	445 (2.2)	2 (1.1)	~ ~
Kuwait	98 (0.9)	418 (3.0)	2 (0.9)	~ ~
Sweden	98 (0.5)	510 (2.6)	2 (0.5)	~ ~
Malaysia	98 (1.2)	469 (6.0)	2 (1.2)	~ ~
Bahrain	98 (0.1)	468 (1.7)	2 (0.1)	~ ~
Botswana	97 (1.5)	353 (3.1)	3 (1.5)	359 (25.3)
Cyprus	97 (0.1)	451 (2.1)	3 (0.1)	446 (10.0)
Thailand	96 (1.7)	470 (4.3)	4 (1.7)	501 (50.8)
Jordan	96 (1.4)	483 (3.9)	4 (1.4)	454 (19.8)
Scotland	96 (2.0)	496 (3.8)	4 (2.0)	488 (8.7)
Algeria	92 (2.4)	408 (1.9)	8 (2.4)	410 (4.4)
Egypt	92 (2.1)	408 (3.8)	8 (2.1)	408 (21.2)
Oman	91 (2.3)	426 (3.5)	9 (2.3)	387 (14.0)
Norway	90 (2.4)	487 (2.5)	10 (2.4)	487 (3.9)
Israel	88 (2.9)	473 (5.5)	12 (2.9)	448 (14.3)
Lebanon	87 (3.5)	417 (6.6)	13 (3.5)	387 (14.2)
Palestinian Nat'l Auth.	86 (2.9)	407 (4.0)	14 (2.9)	383 (11.0)
Saudi Arabia	84 (3.1)	403 (2.9)	16 (3.1)	399 (8.6)
Turkey	84 (2.6)	460 (4.0)	16 (2.6)	425 (9.4)
United States	80 (3.1)	522 (3.5)	20 (3.1)	513 (6.6)
Syrian Arab Republic	76 (3.6)	453 (3.4)	24 (3.6)	449 (6.9)
Iran, Islamic Rep. of	74 (3.0)	470 (4.3)	26 (3.0)	427 (6.0)
Russian Federation	71 (3.2)	531 (5.3)	29 (3.2)	527 (4.7)
Colombia	70 (4.6)	427 (4.2)	30 (4.6)	397 (5.4)
Armenia	69 (4.3)	489 (5.8)	31 (4.3)	485 (9.8)
Italy	69 (3.6)	498 (3.6)	31 (3.6)	489 (5.8)
Romania	66 (4.2)	468 (4.2)	34 (4.2)	452 (7.9)
Indonesia	62 (3.9)	439 (4.7)	38 (3.9)	408 (5.7)
Slovenia	56 (3.8)	537 (3.5)	44 (3.8)	539 (3.3)
Georgia	50 (5.2)	419 (6.8)	50 (5.2)	423 (5.7)
Czech Republic	47 (4.1)	544 (3.5)	53 (4.1)	534 (3.2)
Hungary	42 (3.9)	548 (4.9)	58 (3.9)	533 (4.0)
El Salvador	32 (3.8)	414 (5.1)	68 (3.8)	375 (3.6)
Serbia	30 (4.1)	485 (5.9)	70 (4.1)	464 (3.9)
Bosnia and Herzegovina	26 (3.6)	474 (6.6)	74 (3.6)	462 (3.3)
Ukraine	19 (3.6)	490 (9.3)	81 (3.6)	484 (3.9)
Bulgaria	9 (2.4)	464 (12.5)	91 (2.4)	471 (6.4)
Lithuania	4 (1.9)	519 (20.2)	96 (1.9)	519 (2.7)
Ghana	3 (1.3)	415 (16.3)	97 (1.3)	300 (5.4)
‡ Morocco	96 (2.3)	402 (2.6)	4 (2.3)	363 (10.6)
International Avg.	76 (0.4)	470 (0.9)	24 (0.4)	446 (2.2)
<b>Benchmarking Participants</b>				
Basque Country, Spain	100 (0.0)	498 (3.0)	0 (0.0)	~ ~
Quebec, Canada	100 (0.3)	507 (3.4)	0 (0.3)	~ ~
Dubai, UAE	r 99 (0.0)	488 (3.5)	1 (0.0)	~ ~
British Columbia, Canada	95 (1.8)	528 (3.0)	5 (1.8)	521 (11.7)
Minnesota, US	82 (7.3)	539 (5.0)	18 (7.3)	532 (16.0)
Massachusetts, US	81 (5.6)	560 (5.7)	19 (5.6)	540 (17.6)
Ontario, Canada	57 (4.9)	530 (4.3)	43 (4.9)	527 (4.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Background data provided by schools.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.



As another perspective on school resources for science instruction, Exhibit 8.10 presents teachers' reports on physical aspects of the school environment that impact their working conditions and capacity to provide effective science instruction. Teachers were asked to respond to four statements about problems in their schools: school buildings need significant repair, classrooms are overcrowded, teachers do not have adequate workspace outside their classroom, and materials are not available to conduct science experiments or investigations. For each teacher, an average was computed on a three-point scale: 1 = *not a problem*; 2 = *minor problem*; and 3 = *serious problem*. Students were assigned to the high level of the Index of Teachers' Adequate Working Conditions (TAWC) if their teacher's average response was equal to 1. Students were assigned to the medium level if their teacher's average response was greater than 1 but less than or equal to 2, and to the low level of the index if their teacher's average was greater than 2.

Exhibit 8.10 presents the percentage of students at each of the three levels of the Index of Teachers' Adequate Working Conditions, together with average science achievement, for all TIMSS 2007 participants at the fourth and eighth grades. The average percentage of students at each level of the index was similar at both grades—8 percent at the high level, 55 to 56 percent at the medium level, and 36 to 37 percent at the low level. At fourth grade, only Singapore (29%), Dubai (60%), and Minnesota (20%) had 20 percent or more students at the high level of the index, i.e., in schools where teachers reported few problems with working conditions. Likewise at eighth grade, only Singapore (23%), Slovenia (21%), Lebanon (20%), and Dubai (43%) had 20 percent or more students at the high level of the index. At both grades, students at the high level of the adequate working conditions index had higher average science achievement than students at the other levels.

Well-educated teachers who have kept abreast of pedagogical developments in their fields may be a school's most important educational resource. TIMSS asked principals to report on the percentage of teachers in their schools that had been involved in professional development opportunities in mathematics and science during the past two years.

More specifically, principals were asked about three areas of professional development in these subjects—improving content knowledge, improving teaching skills, and using information and communication technology for educational purposes. Schools were categorized into three groups on the basis of principals' responses: schools where most (76-100%) teachers had professional development, schools where some (26-75%) teachers had professional development, and schools where few (25% or less) teachers had professional development during the past two years.

Exhibit 8.10 Index of Teachers' Adequate Working Conditions (TAWC)

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	High TAWC		Medium TAWC		Low TAWC	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Singapore	29 (2.7)	582 (8.0)	61 (2.8)	586 (4.9)	10 (1.4)	604 (11.3)
England	16 (3.2)	545 (7.2)	68 (3.9)	542 (3.8)	15 (2.9)	537 (6.5)
Austria	16 (2.3)	521 (4.7)	66 (3.0)	525 (2.9)	18 (2.9)	532 (5.0)
United States	16 (2.0)	552 (4.6)	70 (2.5)	539 (2.9)	14 (1.7)	516 (8.7)
Czech Republic	16 (2.7)	508 (5.5)	77 (3.3)	516 (3.8)	8 (1.9)	525 (8.5)
Qatar	14 (0.1)	245 (4.6)	41 (0.2)	274 (3.3)	44 (0.2)	322 (3.3)
Chinese Taipei	14 (2.9)	554 (6.2)	54 (4.0)	557 (3.0)	32 (3.9)	558 (3.2)
Kuwait	12 (3.0)	374 (10.9)	49 (4.5)	351 (8.6)	39 (4.3)	336 (10.5)
New Zealand	11 (2.2)	511 (6.3)	76 (2.7)	505 (3.1)	13 (1.8)	497 (8.6)
Kazakhstan	10 (2.7)	537 (20.6)	59 (5.5)	534 (7.0)	30 (5.3)	528 (8.3)
Hungary	9 (2.4)	519 (13.7)	72 (3.7)	537 (4.2)	19 (3.1)	541 (7.9)
Scotland	9 (2.2)	493 (10.3)	68 (3.8)	503 (3.2)	24 (3.8)	498 (5.1)
Australia	8 (2.3)	549 (12.2)	63 (3.9)	527 (4.7)	28 (3.6)	518 (6.0)
Hong Kong SAR	8 (2.1)	557 (7.3)	62 (4.2)	557 (4.3)	30 (4.1)	557 (7.1)
Norway	7 (1.9)	505 (7.9)	62 (3.4)	474 (4.3)	31 (3.1)	474 (4.8)
Russian Federation	7 (2.5)	546 (18.3)	68 (3.0)	545 (6.2)	25 (4.0)	553 (4.4)
Slovenia	7 (1.4)	519 (5.8)	64 (3.0)	513 (2.4)	29 (2.9)	530 (3.3)
El Salvador	6 (1.9)	437 (28.4)	49 (3.9)	401 (5.2)	45 (4.1)	370 (6.6)
Denmark	6 (2.4)	527 (14.7)	61 (4.7)	521 (3.6)	33 (4.1)	514 (5.8)
Italy	6 (1.6)	539 (13.0)	45 (3.6)	541 (4.2)	50 (3.7)	530 (5.1)
Netherlands	6 (2.0)	528 (14.5)	65 (3.6)	523 (2.8)	29 (3.8)	518 (5.2)
Armenia	5 (1.3)	476 (10.9)	55 (3.7)	482 (7.7)	40 (3.6)	491 (10.9)
Algeria	5 (2.0)	369 (16.7)	17 (3.3)	344 (11.2)	78 (3.8)	353 (8.3)
Georgia	5 (2.0)	403 (16.8)	58 (4.8)	424 (6.3)	37 (5.0)	414 (7.1)
Iran, Islamic Rep. of	5 (1.9)	468 (20.8)	59 (4.1)	436 (6.4)	36 (4.0)	432 (7.2)
Sweden	5 (1.8)	538 (9.9)	62 (4.0)	525 (3.7)	34 (4.1)	524 (5.4)
Colombia	4 (1.6)	418 (36.3)	41 (5.1)	414 (10.3)	55 (5.3)	392 (7.8)
Germany	4 (1.4)	518 (11.4)	58 (3.9)	532 (3.2)	38 (3.8)	521 (4.2)
Slovak Republic	4 (1.4)	533 (13.7)	61 (3.6)	523 (6.1)	36 (3.4)	531 (7.1)
Ukraine	4 (1.5)	475 (15.6)	70 (3.6)	473 (3.5)	26 (3.5)	475 (6.8)
Tunisia	4 (1.4)	282 (55.8)	41 (4.2)	323 (9.2)	55 (4.0)	316 (8.3)
Japan	3 (1.3)	536 (21.8)	46 (4.2)	547 (2.7)	51 (4.0)	550 (2.3)
Latvia	3 (1.6)	538 (16.7)	59 (3.6)	538 (3.0)	38 (3.6)	550 (3.0)
Lithuania	3 (1.3)	461 (9.1)	58 (4.0)	516 (3.2)	40 (4.0)	516 (2.8)
Morocco	2 (1.5)	~ ~	17 (3.8)	327 (24.3)	80 (4.0)	286 (7.4)
Yemen	1 (0.9)	~ ~	16 (3.8)	201 (20.5)	83 (3.4)	201 (8.5)
International Avg.	8 (0.3)	490 (3.0)	56 (0.6)	477 (1.6)	36 (0.6)	475 (1.4)
<b>Benchmarking Participants</b>						
Dubai, UAE	60 (3.7)	464 (8.8)	29 (3.9)	446 (8.9)	11 (2.2)	391 (18.3)
Minnesota, US	20 (6.1)	558 (6.3)	70 (7.7)	549 (9.3)	10 (4.4)	564 (10.7)
Massachusetts, US	14 (2.9)	572 (11.8)	76 (5.2)	573 (4.8)	10 (4.4)	563 (7.1)
Alberta, Canada	13 (3.0)	560 (11.3)	73 (3.9)	542 (3.9)	14 (2.9)	526 (8.4)
Ontario, Canada	10 (3.6)	546 (10.5)	70 (4.6)	531 (4.6)	20 (4.3)	539 (10.8)
British Columbia, Canada	8 (2.2)	537 (7.6)	65 (4.4)	535 (3.5)	28 (4.1)	537 (7.2)
Quebec, Canada	4 (1.5)	524 (6.1)	76 (4.0)	519 (3.2)	20 (3.8)	515 (7.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on teachers' responses to four statements about severity of problems in their schools: school building needs significant repair; classrooms are overcrowded; teachers do not have adequate workspace outside their classroom; and materials are not available to conduct science experiments or investigations. Average is computed based on a 3-point scale: 1 = not a problem; 2 = minor problem; and 3 = serious problem. High level indicates average is equal to 1. Medium level indicates that average value is greater than 1 and less than or equal to 2. Low level indicates average is greater than 2.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 8.10 Index of Teachers' Adequate Working Conditions (TAWC) (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	High TAWC		Medium TAWC		Low TAWC	
	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement	2007 Percent of Students	Average Achievement
Singapore	23 (2.0)	570 (9.6)	64 (2.2)	570 (5.1)	13 (1.5)	549 (16.1)
Slovenia	21 (2.9)	531 (6.2)	58 (3.0)	538 (2.5)	21 (2.7)	542 (3.1)
Lebanon	20 (2.5)	459 (10.4)	61 (3.6)	413 (7.2)	19 (3.2)	378 (15.5)
Hong Kong SAR	17 (3.5)	507 (13.7)	64 (4.3)	534 (6.3)	19 (3.4)	531 (11.9)
Czech Republic	16 (1.6)	536 (3.9)	76 (2.0)	538 (2.0)	8 (1.7)	549 (10.7)
United States <sup>r</sup>	15 (1.9)	532 (6.3)	64 (2.7)	520 (3.8)	21 (2.4)	503 (8.7)
Chinese Taipei	15 (3.0)	566 (8.3)	60 (4.3)	555 (4.9)	25 (3.7)	571 (5.9)
Saudi Arabia	15 (3.4)	411 (7.8)	49 (4.4)	407 (4.0)	36 (4.0)	393 (5.3)
Qatar	13 (0.1)	307 (3.4)	60 (0.2)	308 (1.9)	27 (0.2)	345 (2.8)
Egypt	13 (2.6)	418 (14.3)	59 (3.9)	409 (5.1)	28 (3.4)	399 (6.7)
Australia	13 (2.2)	546 (12.5)	68 (3.3)	518 (4.6)	20 (2.9)	497 (7.0)
Hungary	12 (1.9)	520 (6.2)	68 (2.7)	539 (3.5)	20 (2.4)	549 (5.7)
Scotland <sup>r</sup>	11 (1.6)	518 (5.8)	68 (2.5)	492 (4.5)	21 (2.6)	497 (6.3)
Kuwait <sup>r</sup>	11 (3.0)	426 (13.9)	54 (4.9)	416 (4.4)	36 (4.5)	412 (7.4)
England	11 (2.1)	575 (12.8)	57 (3.2)	540 (5.7)	32 (3.0)	536 (6.9)
Malta	10 (0.1)	516 (3.4)	51 (0.3)	471 (1.8)	39 (0.3)	411 (2.1)
Cyprus <sup>r</sup>	9 (0.5)	448 (2.9)	46 (1.3)	451 (2.5)	45 (1.2)	452 (2.6)
Tunisia	8 (2.6)	437 (8.4)	44 (3.9)	445 (3.0)	47 (4.1)	446 (2.7)
Japan	8 (2.4)	568 (12.4)	54 (4.1)	554 (3.7)	38 (3.8)	551 (3.5)
Sweden	8 (1.9)	516 (7.7)	63 (3.2)	510 (3.3)	29 (3.1)	509 (4.0)
Korea, Rep. of	8 (1.7)	546 (5.2)	67 (3.5)	554 (2.4)	25 (3.4)	554 (3.9)
Turkey	8 (2.5)	471 (18.1)	46 (4.6)	473 (6.0)	46 (4.2)	433 (5.3)
Romania	7 (1.2)	471 (7.8)	61 (2.5)	462 (4.9)	32 (2.6)	459 (4.7)
Norway	7 (2.1)	500 (11.2)	56 (4.0)	488 (2.4)	37 (4.0)	483 (3.5)
Thailand	7 (1.7)	526 (20.9)	73 (3.5)	465 (4.9)	20 (3.6)	473 (11.3)
Bahrain	7 (1.3)	473 (9.4)	66 (2.3)	476 (2.8)	28 (2.1)	447 (4.0)
Colombia	6 (1.9)	485 (13.2)	50 (4.3)	424 (4.3)	43 (4.0)	396 (5.1)
Oman	6 (1.8)	428 (8.0)	62 (3.3)	429 (3.9)	32 (3.3)	408 (5.4)
Armenia	6 (1.0)	476 (10.2)	54 (2.5)	492 (7.8)	40 (2.4)	484 (4.8)
Syrian Arab Republic	6 (1.8)	466 (9.3)	52 (3.9)	455 (4.2)	43 (3.7)	445 (4.1)
Iran, Islamic Rep. of	5 (1.6)	479 (13.7)	44 (3.6)	467 (5.5)	51 (3.7)	450 (5.0)
Malaysia	5 (1.8)	494 (24.0)	74 (3.4)	474 (6.3)	21 (3.1)	457 (14.7)
Jordan	5 (1.9)	470 (28.8)	58 (3.9)	489 (5.7)	38 (4.0)	471 (6.2)
Israel	5 (1.6)	483 (10.5)	55 (3.5)	472 (6.5)	40 (3.5)	460 (7.5)
Bulgaria	4 (0.7)	494 (14.5)	55 (3.3)	470 (7.2)	41 (3.3)	467 (7.7)
Russian Federation	4 (0.8)	559 (13.5)	71 (2.2)	532 (4.2)	26 (2.2)	520 (5.0)
Ukraine	4 (1.6)	532 (14.8)	68 (2.8)	485 (4.1)	28 (2.5)	482 (3.9)
Palestinian Nat'l Auth.	3 (1.1)	440 (21.8)	49 (4.1)	415 (5.5)	49 (4.1)	390 (5.7)
Lithuania	3 (0.8)	513 (9.2)	52 (2.5)	513 (3.1)	45 (2.6)	525 (3.2)
Bosnia and Herzegovina	3 (0.6)	476 (12.1)	36 (2.1)	468 (4.0)	61 (2.1)	465 (3.3)
El Salvador	2 (1.3)	~ ~	45 (4.0)	386 (5.2)	53 (3.9)	385 (4.8)
Italy	2 (1.0)	~ ~	53 (3.5)	495 (3.6)	45 (3.5)	498 (4.9)
Serbia	2 (0.6)	~ ~	49 (3.0)	476 (3.8)	49 (3.0)	464 (4.6)
Algeria	2 (1.0)	~ ~	44 (3.6)	410 (2.9)	54 (3.5)	407 (2.3)
Georgia	2 (0.8)	~ ~	52 (3.7)	424 (6.0)	46 (3.8)	418 (5.3)
Indonesia	1 (0.7)	~ ~	23 (3.1)	440 (7.1)	76 (3.2)	426 (3.8)
Botswana	1 (0.5)	~ ~	30 (3.8)	371 (6.8)	69 (3.8)	346 (4.0)
Ghana	0 (0.2)	~ ~	29 (3.6)	313 (11.4)	70 (3.5)	299 (6.9)
‡ Morocco <sup>r</sup>	4 (1.6)	455 (17.6)	27 (3.4)	405 (6.3)	69 (3.8)	399 (3.5)
International Avg.	8 (0.3)	491 (2.0)	55 (0.5)	468 (0.9)	37 (0.5)	460 (1.1)
<b>Benchmarking Participants</b>						
Dubai, UAE <sup>s</sup>	43 (3.2)	506 (4.5)	53 (3.6)	476 (5.0)	3 (1.1)	451 (19.1)
Basque Country, Spain	14 (3.6)	497 (7.5)	70 (4.6)	499 (4.0)	16 (3.4)	499 (6.6)
Massachusetts, US	13 (5.1)	557 (14.9)	69 (6.7)	555 (8.4)	18 (5.1)	548 (12.9)
British Columbia, Canada	13 (3.2)	523 (7.6)	71 (3.6)	529 (3.5)	16 (2.9)	514 (7.8)
Ontario, Canada	13 (3.2)	517 (17.5)	68 (4.3)	526 (4.0)	20 (3.7)	532 (7.9)
Minnesota, US	12 (5.4)	572 (10.0)	74 (8.0)	532 (6.1)	14 (6.4)	530 (15.5)
Quebec, Canada	5 (1.9)	517 (15.8)	80 (4.0)	514 (4.4)	15 (3.4)	501 (10.4)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Index based on teachers' responses to four statements about severity of problems in their schools: school building needs significant repair; classrooms are overcrowded; teachers do not have adequate workspace outside their classroom; and materials are not available to conduct science experiments or investigations. Average is computed based on a 3-point scale: 1 = not a problem; 2 = minor problem; and 3 = serious problem. High level indicates average is equal to 1. Medium level indicates that average value is greater than 1 and less than or equal to 2. Low level indicates average is greater than 2.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

An "s" indicates data are available for at least 50 but less than 70% of the students.



Exhibit 8.11 presents the percentage of students in each of the three school categories by area of professional development, for each TIMSS 2007 participant at fourth and eighth grades. At fourth grade, 26 percent of students, on average internationally, were in schools where most teachers (at least 76%) had professional development in improving content knowledge in mathematics and science, 30 percent in schools where teachers of most students had worked on improving teaching skills, and 25 percent where teachers of most students had professional development in using information and communication technology for educational purposes. Participants with most emphasis on professional development for improving content knowledge (more than 50 percent of students in schools where most teachers had this type of professional development) included Australia, England, New Zealand, and the U.S. states of Massachusetts and Minnesota. Similarly, most professional development emphasis on improving teaching skills was in Australia, England, New Zealand, Scotland, Singapore, the United States, and among benchmarking participants, Alberta, Ontario, Dubai, Massachusetts, and Minnesota, and on using information technology in Australia, England, New Zealand, Scotland, the Slovak Republic, and Massachusetts. Relatively few students (less than 15%) were in schools where most teachers had professional development in any of the areas in Algeria, Denmark, Italy, Morocco, and Yemen.

At eighth grade, the overall picture was similar to fourth grade, although with the level of professional development reported to be somewhat less. On average across countries, 21 percent of students were in schools where most teachers had professional development in improving content knowledge, 23 percent in schools where most teachers had professional development in improving teaching skills, and 20 percent in schools where most teachers had professional development in using information technology. Participants with the most emphasis on professional development for improving content knowledge at eighth grade included Lithuania (40%), Malaysia (41%), Singapore (48%), Slovenia (45%), and the United States (48%), as well as the benchmarking participants of Dubai (46%), Massachusetts (58%), and

Quebec (45%). The highest proportion of professional development emphasis on improving teaching skills was in England (43%), Lithuania (43%), Scotland (49%), Singapore (60%), the United States (53%), and benchmarking participants Dubai (57%), Massachusetts (57%), and Ontario (47%), and on using information technology in Bulgaria (44%), England (48%), Scotland (51%), Singapore (48%), the United States (43%), and the state of Massachusetts (41%).

**Exhibit 8.11 Schools' Reports on Teachers' Mathematics and Science Professional Development in the Past 2 Years**
**TIMSS2007**  
 Science **4<sup>th</sup>** Grade

Country	Percentage of Students in Schools Where Most (76-100%) Teachers Had Professional Development in			Percentage of Students in Schools Where Some (26-75%) Teachers Had Professional Development in			Percentage of Students in Schools Where Few (25% or less) Teachers Had Professional Development in		
	Improving Content Knowledge	Improving Teaching Skills	Using Information and Communication Technology for Educational Purposes	Improving Content Knowledge	Improving Teaching Skills	Using Information and Communication Technology for Educational Purposes	Improving Content Knowledge	Improving Teaching Skills	Using Information and Communication Technology for Educational Purposes
Algeria	6 (2.0)	9 (2.6)	1 (0.0)	70 (4.0)	70 (4.1)	19 (4.8)	24 (3.6)	21 (3.6)	81 (4.8)
Armenia	27 (4.2)	32 (4.4)	14 (2.9)	57 (4.1)	55 (4.4)	48 (4.5)	17 (3.6)	13 (3.1)	39 (4.3)
Australia	58 (4.0)	63 (3.8)	53 (4.8)	29 (3.9)	26 (3.4)	32 (4.7)	12 (2.1)	11 (2.6)	15 (3.0)
Austria	30 (2.9)	26 (2.9)	23 (3.0)	44 (3.1)	46 (3.5)	45 (3.8)	26 (2.9)	28 (3.2)	33 (3.6)
Chinese Taipei	19 (3.1)	22 (3.3)	23 (3.7)	60 (4.4)	64 (4.4)	60 (4.3)	21 (3.8)	14 (3.2)	17 (3.3)
Colombia	12 (2.9)	21 (3.8)	16 (3.9)	56 (5.5)	64 (4.3)	45 (5.3)	32 (5.3)	15 (3.2)	39 (4.6)
Czech Republic	31 (4.3)	26 (3.9)	43 (4.1)	37 (4.2)	43 (4.0)	38 (4.7)	32 (3.9)	30 (3.9)	19 (3.5)
Denmark	8 (2.7)	7 (2.4)	10 (2.7)	24 (4.4)	39 (4.4)	40 (4.7)	68 (4.8)	55 (4.5)	50 (4.4)
El Salvador	13 (2.7)	18 (3.2)	9 (2.1)	53 (4.3)	55 (4.4)	29 (3.5)	34 (3.8)	28 (3.6)	62 (4.0)
England	55 (4.6)	62 (4.4)	72 (4.1)	26 (4.3)	22 (3.8)	19 (3.4)	20 (3.3)	16 (3.3)	9 (2.7)
Georgia	26 (4.3)	23 (4.0)	10 (2.7)	47 (5.2)	54 (4.9)	39 (4.8)	27 (4.7)	24 (4.2)	50 (5.2)
Germany	14 (1.9)	13 (2.0)	11 (2.1)	50 (3.0)	49 (3.1)	34 (2.7)	36 (3.0)	38 (3.0)	55 (3.2)
Hong Kong SAR	23 (3.6)	27 (4.0)	30 (4.5)	66 (4.3)	63 (4.2)	54 (4.7)	11 (3.0)	10 (2.8)	16 (3.6)
Hungary	17 (3.7)	22 (4.0)	12 (3.0)	42 (4.1)	43 (4.1)	35 (4.0)	41 (4.0)	35 (3.7)	53 (4.2)
Iran, Islamic Rep. of	20 (3.2)	31 (3.9)	10 (2.2)	60 (3.7)	54 (4.1)	43 (3.6)	20 (2.9)	16 (2.9)	47 (4.0)
Italy	7 (2.0)	9 (2.3)	14 (2.8)	38 (3.9)	47 (4.2)	49 (4.0)	55 (4.1)	43 (4.4)	37 (3.8)
Japan	22 (3.3)	25 (3.5)	7 (1.9)	49 (4.3)	50 (4.1)	44 (4.0)	28 (3.4)	25 (3.7)	49 (4.0)
Kazakhstan	31 (4.2)	37 (4.5)	7 (2.1)	52 (4.3)	46 (3.3)	33 (4.6)	17 (4.2)	17 (4.2)	60 (4.5)
Kuwait	10 (2.6)	21 (3.6)	24 (3.7)	59 (4.5)	62 (4.5)	60 (4.6)	31 (4.2)	16 (3.6)	16 (3.5)
Latvia	30 (3.9)	31 (3.9)	14 (3.0)	33 (4.2)	39 (4.0)	38 (4.0)	37 (4.2)	30 (3.9)	48 (3.8)
Lithuania	43 (3.9)	42 (4.1)	34 (4.1)	39 (4.0)	42 (4.0)	33 (3.8)	18 (3.3)	16 (3.2)	33 (4.3)
Morocco	4 (1.4)	6 (2.6)	1 (0.8)	25 (3.6)	23 (3.9)	13 (2.6)	72 (3.4)	71 (3.4)	87 (2.7)
Netherlands	r 23 (3.9)	r 37 (4.2)	r 30 (3.9)	24 (4.3)	27 (4.2)	34 (4.7)	54 (4.2)	36 (4.0)	37 (4.2)
New Zealand	66 (3.8)	70 (3.4)	60 (3.4)	26 (3.3)	25 (3.3)	25 (3.2)	8 (2.0)	4 (1.3)	14 (2.6)
Norway	24 (3.4)	18 (3.4)	38 (4.2)	25 (3.7)	15 (3.1)	20 (3.8)	51 (4.4)	67 (4.3)	43 (4.4)
Qatar	r 17 (0.1)	r 24 (0.1)	r 10 (0.1)	50 (0.2)	53 (0.2)	57 (0.2)	33 (0.2)	23 (0.2)	32 (0.2)
Russian Federation	30 (2.9)	35 (3.6)	27 (4.0)	40 (4.1)	41 (4.4)	31 (3.3)	30 (4.0)	24 (3.7)	42 (3.8)
Scotland	47 (4.6)	65 (4.3)	69 (4.3)	29 (4.4)	18 (3.2)	24 (4.0)	24 (4.0)	17 (3.6)	7 (2.0)
Singapore	46 (0.0)	57 (0.0)	44 (0.0)	46 (0.0)	38 (0.0)	47 (0.0)	8 (0.0)	5 (0.0)	9 (0.0)
Slovak Republic	17 (3.0)	21 (3.2)	67 (3.4)	38 (3.9)	44 (4.1)	24 (3.2)	45 (3.9)	36 (4.0)	10 (2.3)
Slovenia	46 (4.4)	31 (4.0)	37 (4.7)	48 (4.1)	61 (4.4)	45 (4.5)	5 (2.0)	8 (2.3)	18 (3.3)
Sweden	25 (3.8)	21 (3.5)	15 (3.2)	33 (4.6)	31 (4.3)	31 (4.2)	42 (4.9)	48 (4.7)	53 (4.9)
Tunisia	17 (3.1)	20 (3.1)	7 (2.2)	54 (3.9)	58 (4.3)	29 (3.7)	29 (3.6)	23 (3.5)	64 (4.1)
Ukraine	34 (4.2)	38 (4.3)	20 (3.2)	32 (4.2)	37 (4.3)	29 (3.9)	34 (3.8)	25 (3.6)	52 (4.0)
United States	45 (3.0)	55 (3.2)	46 (3.4)	32 (2.8)	33 (3.4)	34 (3.0)	22 (2.5)	12 (2.1)	20 (2.3)
Yemen	0 (0.4)	5 (1.9)	2 (1.2)	45 (4.5)	47 (4.2)	4 (1.5)	55 (4.5)	48 (4.0)	95 (1.9)
International Avg.	26 (0.6)	30 (0.6)	25 (0.5)	43 (0.7)	44 (0.7)	36 (0.7)	31 (0.6)	26 (0.6)	39 (0.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Benchmarking Participants**

Alberta, Canada	42 (4.3)	56 (4.5)	46 (4.4)	30 (4.1)	24 (3.4)	31 (4.0)	27 (4.2)	19 (3.7)	23 (3.5)
British Columbia, Canada	41 (3.7)	43 (4.5)	32 (4.2)	44 (4.3)	45 (4.6)	42 (4.9)	16 (3.1)	12 (2.7)	26 (4.4)
Dubai, UAE	r 47 (0.4)	r 53 (0.4)	r 27 (0.3)	39 (0.4)	43 (0.4)	67 (0.3)	14 (0.2)	5 (0.1)	7 (0.2)
Massachusetts, US	60 (6.6)	58 (7.0)	51 (7.5)	29 (7.2)	34 (6.5)	32 (7.4)	10 (5.0)	8 (4.5)	17 (5.9)
Minnesota, US	67 (6.8)	63 (7.3)	27 (8.1)	15 (6.8)	18 (7.1)	45 (8.0)	17 (7.1)	18 (7.5)	28 (7.1)
Ontario, Canada	43 (4.1)	57 (4.8)	36 (5.0)	38 (4.9)	34 (4.4)	39 (5.2)	18 (4.3)	9 (2.5)	24 (4.5)
Quebec, Canada	33 (4.7)	23 (4.5)	15 (3.6)	23 (4.0)	30 (4.3)	33 (4.6)	43 (4.6)	46 (4.9)	52 (5.0)

Background data provided by schools.

An "r" indicates data are available for at least 70 but less than 85% of the students.

(i) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.


**TIMSS & PIRLS**  
 International Study Center  
 Lynch School of Education, Boston College

Exhibit 8.11 Schools' Reports on Teachers' Mathematics and Science Professional Development in the Past 2 Years (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Percentage of Students in Schools Where Most (76-100%) Teachers Had Professional Development in			Percentage of Students in Schools Where Some (26-75%) Teachers Had Professional Development in			Percentage of Students in Schools Where Few (25% or less) Teachers Had Professional Development in		
	Improving Content Knowledge	Improving Teaching Skills	Using Information and Communication Technology for Educational Purposes	Improving Content Knowledge	Improving Teaching Skills	Using Information and Communication Technology for Educational Purposes	Improving Content Knowledge	Improving Teaching Skills	Using Information and Communication Technology for Educational Purposes
Algeria	6 (2.2)	9 (2.5)	4 (1.8)	63 (4.2)	60 (4.2)	37 (4.1)	31 (4.1)	31 (4.2)	59 (4.0)
Armenia	21 (3.2)	26 (3.9)	11 (3.4)	61 (4.3)	62 (3.7)	53 (4.6)	18 (3.7)	11 (2.7)	36 (4.0)
Australia	29 (3.3)	28 (4.1)	39 (3.8)	53 (3.8)	59 (4.4)	47 (3.2)	19 (2.9)	13 (2.8)	14 (2.8)
Bahrain	24 (0.3)	33 (0.2)	31 (0.3)	48 (0.2)	46 (0.2)	53 (0.3)	28 (0.2)	21 (0.2)	16 (0.2)
Bosnia and Herzegovina	18 (3.1)	18 (3.4)	9 (2.2)	55 (3.8)	51 (4.3)	51 (3.7)	27 (3.4)	31 (3.7)	40 (3.7)
Botswana	13 (2.7)	14 (2.9)	10 (2.6)	42 (4.2)	41 (4.5)	41 (4.3)	45 (4.3)	45 (4.5)	49 (4.3)
Bulgaria	17 (3.0)	18 (3.9)	44 (4.5)	52 (4.5)	54 (4.3)	37 (4.2)	31 (4.1)	28 (3.9)	18 (2.6)
Chinese Taipei	21 (3.4)	21 (3.2)	17 (3.1)	62 (3.9)	60 (4.0)	58 (3.7)	17 (3.3)	19 (3.2)	25 (3.7)
Colombia	19 (5.2)	22 (5.1)	12 (2.3)	66 (5.2)	63 (5.1)	56 (4.5)	16 (2.8)	15 (2.7)	33 (4.0)
Cyprus	11 (0.2)	7 (0.2)	9 (0.2)	49 (0.3)	57 (0.3)	65 (0.3)	40 (0.2)	36 (0.2)	25 (0.2)
Czech Republic	15 (3.2)	11 (2.6)	34 (3.8)	54 (4.2)	59 (4.3)	47 (4.3)	31 (4.0)	30 (4.0)	19 (3.2)
Egypt	15 (2.4)	25 (3.3)	34 (3.6)	68 (3.7)	70 (3.7)	59 (3.9)	17 (2.8)	5 (1.6)	6 (2.0)
El Salvador	18 (3.3)	23 (3.7)	15 (2.8)	48 (4.3)	46 (4.1)	35 (3.8)	35 (3.8)	31 (3.6)	50 (3.8)
England	23 (3.5)	43 (4.1)	48 (4.4)	53 (4.3)	43 (4.6)	38 (4.5)	24 (3.4)	14 (3.2)	14 (3.2)
Georgia	18 (3.5)	19 (3.7)	5 (1.4)	63 (4.9)	65 (4.4)	58 (5.4)	19 (3.9)	17 (3.5)	36 (5.2)
Ghana	13 (3.2)	14 (3.1)	3 (1.7)	59 (4.4)	64 (4.2)	20 (3.6)	28 (3.9)	22 (3.7)	77 (3.7)
Hong Kong SAR	17 (3.5)	22 (4.0)	18 (3.9)	68 (4.4)	64 (4.7)	62 (4.8)	15 (3.3)	14 (3.1)	20 (4.0)
Hungary	13 (3.0)	17 (3.3)	7 (2.6)	44 (4.4)	42 (4.0)	48 (4.2)	43 (4.6)	41 (3.9)	45 (3.7)
Indonesia	38 (3.4)	34 (3.0)	9 (2.2)	52 (3.6)	57 (3.2)	56 (4.3)	10 (2.7)	9 (2.4)	34 (4.1)
Iran, Islamic Rep. of	16 (2.8)	18 (3.0)	14 (2.7)	62 (4.2)	65 (4.0)	40 (3.8)	22 (3.5)	17 (3.0)	46 (3.7)
Israel	24 (3.7)	24 (3.8)	11 (3.0)	63 (4.3)	62 (4.2)	54 (4.5)	14 (3.2)	14 (3.0)	35 (4.3)
Italy	9 (2.3)	9 (2.3)	11 (2.6)	38 (4.0)	49 (3.8)	50 (4.1)	53 (4.2)	42 (3.9)	40 (4.0)
Japan	23 (3.4)	27 (3.5)	11 (2.5)	50 (4.0)	44 (4.1)	39 (4.2)	27 (3.9)	29 (3.9)	50 (4.4)
Jordan	18 (2.9)	24 (3.1)	33 (3.8)	64 (3.6)	66 (3.8)	55 (4.4)	19 (3.2)	10 (2.4)	12 (2.7)
Korea, Rep. of	8 (2.4)	10 (2.2)	8 (2.2)	58 (4.0)	59 (4.3)	60 (4.1)	34 (4.0)	32 (3.9)	32 (4.0)
Kuwait	11 (3.3)	12 (3.0)	11 (2.6)	54 (4.8)	61 (4.4)	61 (4.0)	35 (4.4)	26 (3.9)	28 (3.9)
Lebanon	23 (3.5)	25 (4.0)	11 (2.9)	62 (4.1)	66 (4.6)	57 (5.0)	15 (3.2)	10 (2.6)	32 (4.4)
Lithuania	40 (4.1)	43 (4.1)	23 (3.9)	52 (4.4)	53 (4.2)	65 (4.7)	8 (2.5)	5 (1.8)	12 (3.0)
Malaysia	41 (4.2)	35 (4.2)	38 (4.3)	51 (4.1)	58 (4.2)	55 (4.5)	8 (2.1)	7 (2.2)	7 (2.2)
Malta	23 (0.2)	26 (0.2)	29 (0.2)	62 (0.2)	57 (0.2)	45 (0.2)	15 (0.2)	17 (0.2)	26 (0.2)
Norway	20 (3.8)	14 (3.3)	35 (4.3)	27 (4.8)	27 (4.5)	27 (4.3)	53 (5.0)	58 (5.1)	39 (4.4)
Oman	8 (2.6)	14 (3.5)	14 (3.2)	56 (3.9)	64 (3.6)	47 (4.4)	36 (3.6)	22 (3.4)	39 (4.6)
Palestinian Nat'l Auth.	6 (2.0)	8 (2.1)	5 (1.4)	61 (4.3)	69 (3.9)	53 (4.2)	33 (3.8)	24 (3.6)	42 (4.3)
Qatar	r 24 (0.1)	r 22 (0.1)	r 22 (0.1)	48 (0.2)	58 (0.2)	48 (0.2)	28 (0.1)	20 (0.1)	30 (0.2)
Romania	36 (4.3)	37 (4.3)	21 (3.5)	46 (4.1)	52 (4.7)	51 (4.2)	18 (3.7)	11 (2.9)	28 (3.8)
Russian Federation	30 (3.3)	30 (3.6)	20 (2.9)	47 (3.6)	48 (3.3)	44 (3.3)	23 (3.5)	22 (3.7)	36 (3.3)
Saudi Arabia	11 (3.0)	10 (2.3)	15 (3.6)	51 (4.1)	55 (4.4)	41 (4.2)	38 (4.0)	34 (4.0)	44 (4.7)
Scotland	r 33 (4.6)	r 49 (4.8)	r 51 (5.0)	50 (4.9)	40 (4.6)	37 (4.8)	17 (3.9)	11 (3.0)	12 (3.1)
Serbia	19 (3.6)	16 (3.4)	15 (3.0)	59 (4.0)	50 (4.5)	45 (4.0)	22 (3.2)	34 (4.0)	40 (4.0)
Singapore	48 (0.0)	60 (0.0)	48 (0.0)	43 (0.0)	38 (0.0)	49 (0.0)	9 (0.0)	2 (0.0)	3 (0.0)
Slovenia	45 (4.3)	31 (3.6)	34 (4.2)	46 (4.7)	60 (4.3)	50 (4.1)	8 (2.6)	9 (2.7)	16 (3.3)
Sweden	16 (3.4)	15 (2.6)	16 (3.5)	40 (4.4)	29 (4.1)	28 (3.6)	44 (4.2)	56 (4.1)	56 (4.1)
Syrian Arab Republic	5 (1.8)	5 (1.8)	8 (2.2)	50 (3.8)	60 (3.8)	39 (4.3)	45 (4.0)	34 (4.0)	53 (4.3)
Thailand	19 (3.1)	17 (3.0)	15 (3.1)	76 (3.3)	78 (3.2)	78 (3.6)	5 (1.8)	5 (1.8)	7 (2.1)
Tunisia	15 (3.1)	18 (3.4)	6 (2.2)	50 (3.9)	57 (3.7)	35 (3.9)	35 (4.1)	25 (3.2)	59 (4.0)
Turkey	13 (2.6)	15 (2.8)	17 (3.0)	74 (3.7)	70 (4.0)	73 (3.9)	13 (3.3)	15 (3.4)	10 (2.4)
Ukraine	34 (3.5)	33 (3.6)	16 (2.9)	41 (4.2)	45 (3.9)	38 (4.4)	25 (3.9)	21 (3.5)	46 (4.2)
United States	48 (4.0)	53 (3.7)	43 (3.6)	40 (4.0)	40 (3.5)	40 (3.4)	12 (2.4)	7 (2.1)	17 (2.5)
‡ Morocco	r 5 (1.7)	r 4 (0.8)	r 8 (4.0)	56 (5.0)	61 (5.7)	26 (3.9)	39 (4.9)	35 (5.7)	67 (5.5)
International Avg.	21 (0.4)	23 (0.5)	20 (0.4)	54 (0.6)	55 (0.6)	48 (0.6)	25 (0.5)	22 (0.5)	32 (0.5)
<b>Benchmarking Participants</b>									
Basque Country, Spain	12 (3.2)	11 (3.1)	16 (3.8)	36 (5.0)	35 (4.5)	41 (5.5)	53 (5.2)	53 (4.5)	42 (5.0)
British Columbia, Canada	28 (4.2)	31 (4.0)	30 (4.2)	54 (5.0)	55 (4.4)	49 (4.8)	18 (3.5)	14 (2.8)	21 (3.5)
Dubai, UAE	s 46 (0.7)	s 57 (0.6)	s 34 (0.6)	45 (0.6)	40 (0.6)	59 (0.6)	9 (0.3)	3 (0.1)	6 (0.2)
Massachusetts, US	58 (8.3)	57 (7.7)	41 (6.2)	36 (8.2)	43 (7.7)	38 (6.7)	7 (4.0)	0 (0.0)	21 (7.2)
Minnesota, US	37 (8.6)	32 (8.4)	37 (7.7)	47 (9.8)	60 (8.1)	47 (8.6)	16 (6.9)	8 (4.0)	16 (6.6)
Ontario, Canada	36 (4.5)	47 (4.6)	34 (4.3)	48 (4.3)	45 (4.9)	45 (3.6)	16 (3.2)	8 (2.8)	20 (3.8)
Quebec, Canada	45 (4.7)	25 (4.0)	17 (3.6)	40 (4.9)	49 (4.7)	40 (4.4)	14 (3.2)	27 (4.0)	42 (4.7)

Background data provided by schools.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

An "r" indicates data are available for at least 70 but less than 85% of the students.

An "s" indicates data are available for at least 50 but less than 70% of the students.



### What Are the Perceptions of School Climate?

TIMSS asked both school principals and teachers to characterize the climate of their school in terms of an environment supportive of learning. The Index of Principals' Perception of School Climate (PPSC) was based on school principals' ratings of the following on a scale from *very high* to *very low*:

- ▶ Teachers' job satisfaction
- ▶ Teachers' understanding of the school's curricular goals
- ▶ Teachers' degree of success in implementing the school's curriculum
- ▶ Teachers' expectations for student achievement
- ▶ Parental support for student achievement
- ▶ Parental involvement in school activities
- ▶ Students' regard for school property
- ▶ Students' desire to do well in school.

Students were assigned to the high level of the index if they attended schools where the principal averaged *high* or *very high* on these aspects of school climate, and to the low level where the principal averaged *low* or *very low*. Students at the medium level had principals with other response combinations.

Exhibit 8.12 presents, for each TIMSS participant at fourth and eighth grade, the percentage of students at each level of the index, together with average science achievement and changes in percentages since 2003. At fourth grade, on average internationally, 22 percent of students were at the high level of the principals' perception of school climate index. That is, they attended schools where the principal rated the school climate positively. The majority of students (68%) were at the medium index level and just 10 percent at the low level. More than 40 percent of students were at the high level of the principals' perception index in Chinese Taipei, Australia, New Zealand, Scotland, the United States, and England, and six of the seven benchmarking participants—Massachusetts, Dubai, Alberta, Minnesota,

British Columbia, and Ontario. In contrast, less than 10 percent of students were at this index level in the Russian Federation, Tunisia, Algeria, Armenia, the Slovak Republic, the Ukraine, Latvia, Georgia, and the Czech Republic. The percentage of students at the high index level increased in Australia, Slovenia, Morocco, and the Russian Federation and decreased in Lithuania and Japan.

At eighth grade, 16 percent of students were at the high level of the principals' perception of school climate index, on average, with 68 percent at the medium level and 16 percent at the low level. There was only one country (Chinese Taipei) and three benchmarking participants where 40 percent or more of students were at the high level of the index. Sixteen countries had less than 10 percent at the low level.

At both fourth and eighth grades, average science achievement was highest among students at the high level of the principals' perception of school climate index (491 points and 484 points, respectively), next highest at the medium level (474 and 465 points, respectively), and lowest at the low level (444 and 445 points, respectively).

Exhibit 8.13 presents science<sup>1</sup> teachers' perceptions of their school climate, based on teachers' ratings of the same eight attributes as rated by the principals. The Index of Science Teachers' Perception of School Climate (TPSC) was calculated in the same way as the principals' index, and shows generally similar results. At the fourth grade, 17 percent of students, on average, were in schools where teachers had a positive view of the school climate and so were at the high level of the index. Two-thirds of students were at the medium level of the teachers' perception of social climate index, and 17 percent at the low level. Teacher perceptions of school climate were most favorable in Scotland, New Zealand, Australia, the United States, England, El Salvador, and in Dubai, Massachusetts, Alberta, and Minnesota, where 30 percent or more of students were at the high index level. However, there were 13 countries with less than 10 percent of the fourth grade students at the high level.

1 At fourth grade in most countries, the science teacher was the classroom teacher.

Exhibit 8.12 Index of Principals' Perception of School Climate (PPSC) with Trends

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	High PPSC			Medium PPSC			Low PPSC		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Chinese Taipei	64 (3.7)	558 (2.8)	7 (5.3)	35 (3.6)	557 (3.2)	-6 (5.3)	1 (0.7)	~ ~	-1 (1.1)
Australia	50 (4.2)	545 (4.6)	12 (6.2) ▲	47 (3.8)	512 (4.4)	-7 (6.4)	2 (1.2)	~ ~	-5 (3.8)
New Zealand	49 (3.2)	525 (4.0)	0 (4.6)	47 (3.0)	487 (4.5)	0 (4.4)	4 (1.2)	478 (11.6)	0 (1.9)
Scotland	48 (4.8)	505 (3.6)	-2 (6.9)	51 (4.8)	497 (4.3)	6 (6.8)	0 (0.5)	~ ~	-3 (1.8)
United States	48 (3.0)	559 (3.9)	0 (4.6)	46 (3.1)	525 (3.5)	1 (4.6)	6 (1.5)	474 (10.9)	-1 (2.2)
England	r 45 (4.5)	549 (4.4)	11 (6.5)	47 (4.6)	538 (4.3)	-17 (6.8) ▼	8 (2.3)	516 (7.3)	6 (2.7) ▲
Austria	36 (3.1)	532 (4.2)	◊ ◊	62 (3.1)	521 (2.8)	◊ ◊	1 (0.6)	~ ~	◊ ◊
Singapore	36 (0.0)	605 (6.6)	4 (4.1)	62 (0.0)	578 (4.8)	-1 (4.1)	2 (0.0)	~ ~	-3 (1.6)
Iran, Islamic Rep. of	31 (3.8)	449 (9.6)	7 (5.5)	64 (3.8)	429 (6.1)	-3 (5.7)	5 (1.7)	433 (12.8)	-3 (3.1)
Kazakhstan	29 (5.4)	532 (10.9)	◊ ◊	65 (5.7)	535 (5.7)	◊ ◊	5 (2.3)	513 (37.7)	◊ ◊
Sweden	27 (3.6)	532 (4.4)	◊ ◊	66 (4.0)	526 (3.5)	◊ ◊	6 (2.6)	480 (9.7)	◊ ◊
Hong Kong SAR	27 (3.9)	554 (6.4)	-3 (6.0)	69 (4.2)	555 (4.1)	4 (6.4)	5 (2.0)	531 (17.7)	-1 (2.9)
El Salvador	26 (4.1)	418 (11.4)	◊ ◊	60 (4.4)	377 (4.8)	◊ ◊	14 (3.1)	388 (12.2)	◊ ◊
Denmark	26 (3.9)	533 (4.5)	◊ ◊	69 (4.1)	514 (3.8)	◊ ◊	5 (2.1)	485 (17.4)	◊ ◊
Qatar	24 (0.2)	325 (4.1)	◊ ◊	69 (0.2)	279 (2.4)	◊ ◊	7 (0.1)	335 (5.2)	◊ ◊
Norway	21 (3.8)	484 (5.8)	-5 (5.5)	78 (3.9)	473 (4.0)	6 (5.6)	1 (1.0)	~ ~	-1 (1.4)
Kuwait	18 (2.9)	359 (13.6)	◊ ◊	73 (3.5)	352 (5.6)	◊ ◊	9 (2.3)	298 (12.5)	◊ ◊
Slovenia	18 (3.7)	517 (6.8)	10 (4.2) ▲	78 (3.8)	519 (2.2)	-7 (4.7)	4 (1.7)	522 (9.4)	-3 (2.7)
Lithuania	15 (3.0)	524 (4.4)	-10 (4.6) ▼	81 (3.3)	514 (2.8)	9 (5.0)	4 (1.4)	493 (3.9)	1 (2.0)
Morocco	r 13 (3.8)	337 (32.4)	10 (4.0) ▲	56 (5.0)	301 (9.1)	16 (6.9) ▲	31 (3.9)	268 (12.7)	-25 (6.1) ▼
Germany	13 (2.6)	541 (4.4)	◊ ◊	78 (3.0)	531 (2.6)	◊ ◊	9 (2.0)	489 (10.6)	◊ ◊
Hungary	12 (3.0)	573 (8.9)	4 (3.7)	78 (4.0)	537 (3.7)	-7 (5.0)	10 (3.1)	489 (11.2)	3 (3.9)
Colombia	12 (2.6)	452 (10.4)	◊ ◊	63 (5.0)	398 (6.8)	◊ ◊	25 (4.8)	386 (13.3)	◊ ◊
Italy	12 (2.7)	534 (8.2)	-3 (3.9)	81 (2.9)	536 (3.3)	5 (4.4)	8 (1.8)	531 (16.5)	-2 (3.0)
Netherlands	r 11 (2.6)	534 (10.6)	-8 (4.6)	84 (3.1)	522 (3.3)	5 (5.0)	5 (2.1)	483 (10.6)	3 (2.4)
Yemen	11 (2.7)	227 (14.2)	◊ ◊	71 (3.8)	199 (8.3)	◊ ◊	18 (3.6)	174 (16.3)	◊ ◊
Japan	10 (2.6)	551 (5.7)	-8 (4.0) ▼	84 (3.0)	548 (2.1)	6 (4.5)	7 (1.9)	540 (5.5)	2 (2.6)
Russian Federation	9 (2.0)	568 (9.9)	5 (2.3) ▲	83 (3.1)	546 (4.9)	-1 (4.1)	8 (2.5)	524 (20.2)	-4 (3.5)
Tunisia	9 (2.5)	371 (22.4)	0 (3.5)	66 (3.9)	327 (6.3)	17 (5.5) ▲	25 (3.6)	273 (13.5)	-17 (5.3) ▼
Algeria	7 (2.1)	353 (12.6)	◊ ◊	65 (4.4)	355 (8.3)	◊ ◊	28 (4.1)	346 (10.7)	◊ ◊
Armenia	r 5 (1.8)	502 (43.1)	3 (2.2)	72 (3.7)	484 (6.7)	-8 (5.2)	23 (3.5)	482 (14.9)	5 (4.9)
Slovak Republic	4 (1.5)	574 (9.7)	◊ ◊	69 (3.4)	531 (3.8)	◊ ◊	27 (3.4)	501 (11.9)	◊ ◊
Ukraine	3 (1.3)	475 (19.3)	◊ ◊	93 (2.3)	475 (3.0)	◊ ◊	5 (1.9)	445 (25.6)	◊ ◊
Latvia	2 (1.4)	~ ~	-4 (3.1)	84 (3.2)	544 (2.5)	-1 (5.3)	14 (3.2)	537 (5.6)	5 (4.4)
Georgia	2 (1.1)	~ ~	◊ ◊	73 (4.0)	424 (5.5)	◊ ◊	26 (4.1)	401 (8.9)	◊ ◊
Czech Republic	1 (0.0)	~ ~	◊ ◊	79 (3.8)	517 (3.4)	◊ ◊	21 (3.9)	508 (6.6)	◊ ◊
International Avg.	22 (0.5)	491 (2.3)		68 (0.6)	474 (0.8)		10 (0.4)	444 (2.6)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Benchmarking Participants

Massachusetts, US	70 (7.8)	579 (5.8)	◊ ◊	30 (7.9)	554 (9.5)	◊ ◊	1 (0.9)	~ ~	◊ ◊
Dubai, UAE	r 60 (0.4)	466 (4.0)	◊ ◊	37 (0.4)	456 (6.0)	◊ ◊	4 (0.3)	435 (5.6)	◊ ◊
Alberta, Canada	58 (4.4)	552 (4.5)	◊ ◊	39 (4.3)	533 (4.3)	◊ ◊	3 (1.6)	492 (18.7)	◊ ◊
Minnesota, US	54 (9.4)	561 (10.9)	◊ ◊	46 (9.4)	548 (9.5)	◊ ◊	0 (0.0)	~ ~	◊ ◊
British Columbia, Canada	45 (4.6)	548 (5.2)	◊ ◊	49 (4.3)	530 (3.7)	◊ ◊	6 (1.8)	504 (9.8)	◊ ◊
Ontario, Canada	41 (5.0)	548 (4.9)	-2 (6.7)	50 (5.1)	533 (4.9)	-2 (6.9)	9 (2.3)	496 (15.0)	4 (3.3)
Quebec, Canada	17 (3.1)	532 (5.1)	-8 (4.7)	82 (3.3)	514 (3.3)	12 (5.1) ▲	2 (1.0)	~ ~	-4 (2.3)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Index based on principals' responses to eight questions about their schools: teachers' job satisfaction; teachers' understanding of the school's curricular goals; teachers' degree of success in implementing the school's curriculum; teachers' expectations for student achievement; parental support for student achievement; parental involvement in school activities; students' regard for school property; and students' desire to do well in school. Average is computed based on a 5-point scale: 1 = very high; 2 = high; 3 = medium; 4 = low; and 5 = very low. High level indicates average is less than or equal to 2. Medium level indicates that average is greater than 2 and less or equal to 3. Low level indicates average is greater than 3.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

A diamond (◊) indicates the country did not participate in the assessment.



Exhibit 8.12 Index of Principals' Perception of School Climate (PPSC) with Trends (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	High PPSC			Medium PPSC			Low PPSC		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Chinese Taipei	54 (4.2)	571 (4.8)	17 (5.7) ▲	42 (4.2)	552 (5.3)	-18 (5.7) ▼	4 (1.6)	518 (11.5)	1 (1.9)
Scotland s	35 (4.1)	512 (6.7)	-7 (5.9)	59 (4.6)	485 (5.1)	7 (6.6)	6 (2.4)	497 (30.3)	0 (3.5)
Australia	33 (3.5)	557 (8.1)	2 (5.6)	58 (4.5)	501 (3.8)	-3 (6.5)	9 (2.4)	465 (10.3)	2 (3.6)
Indonesia	32 (4.0)	445 (8.6)	13 (5.1) ▲	58 (4.4)	428 (5.6)	-13 (5.8) ▼	11 (3.1)	424 (10.7)	0 (4.2)
United States	32 (3.2)	547 (4.4)	-11 (4.6) ▼	57 (3.7)	513 (3.8)	8 (4.9)	12 (2.2)	485 (10.6)	4 (2.9)
England s	31 (3.9)	563 (8.3)	-1 (7.0)	65 (3.9)	536 (5.9)	2 (7.3)	4 (1.7)	474 (19.0)	-1 (3.6)
Israel	26 (3.4)	493 (10.2)	-2 (5.3)	66 (4.1)	465 (5.7)	-3 (5.8)	7 (2.3)	441 (16.3)	5 (2.6) ▲
Egypt	25 (3.4)	427 (7.6)	-1 (4.8)	65 (3.8)	403 (4.9)	3 (5.7)	10 (2.9)	386 (12.5)	-2 (4.2)
Korea, Rep. of	25 (3.6)	553 (3.5)	9 (4.9)	66 (3.6)	553 (2.6)	-2 (5.3)	9 (2.2)	551 (8.3)	-7 (3.7)
Jordan	25 (3.4)	510 (6.7)	7 (4.7)	67 (4.1)	477 (4.7)	-5 (5.9)	8 (2.3)	432 (14.9)	-3 (3.5)
Singapore	24 (0.0)	626 (7.1)	-6 (0.0) ▼	70 (0.0)	552 (5.9)	4 (0.0) ▲	6 (0.0)	502 (17.1)	2 (0.0) ▲
Malaysia	23 (3.8)	508 (12.4)	7 (5.0)	70 (3.7)	459 (6.3)	0 (5.6)	6 (1.8)	469 (16.8)	-7 (3.6)
Qatar	23 (0.1)	298 (3.4)	0 0	70 (0.1)	322 (1.6)	0 0	7 (0.1)	341 (4.5)	0 0
El Salvador	23 (3.4)	405 (6.6)	0 0	62 (4.3)	387 (4.3)	0 0	15 (3.3)	365 (7.8)	0 0
Thailand	22 (3.6)	489 (11.2)	0 0	73 (4.0)	467 (5.1)	0 0	5 (1.9)	441 (19.7)	0 0
Malta	21 (0.2)	499 (2.2)	0 0	61 (0.2)	477 (1.8)	0 0	18 (0.2)	338 (3.4)	0 0
Hong Kong SAR	21 (3.6)	564 (7.5)	9 (4.5) ▲	67 (4.4)	523 (6.3)	-3 (6.0)	12 (3.2)	499 (16.8)	-6 (4.7)
Oman	20 (3.6)	434 (7.6)	0 0	69 (4.0)	422 (4.2)	0 0	11 (2.6)	403 (13.0)	0 0
Ghana	20 (3.2)	351 (10.4)	7 (4.7)	59 (4.2)	295 (8.3)	-9 (6.1)	21 (3.9)	281 (9.9)	3 (5.1)
Bahrain	18 (0.2)	492 (5.0)	7 (0.2) ▲	76 (0.2)	466 (1.7)	3 (0.3) ▲	6 (0.1)	422 (4.8)	-9 (0.2) ▼
Syrian Arab Republic	17 (3.1)	450 (8.0)	0 0	69 (3.3)	452 (3.6)	0 0	14 (2.8)	453 (8.4)	0 0
Lebanon	17 (3.3)	455 (10.5)	-1 (4.8)	66 (4.3)	417 (6.5)	2 (6.3)	18 (3.2)	356 (15.8)	-1 (4.3)
Iran, Islamic Rep. of	16 (2.6)	512 (10.0)	6 (3.4)	64 (3.8)	456 (3.7)	-4 (5.3)	20 (3.1)	425 (5.8)	-2 (4.3)
Saudi Arabia	16 (3.3)	411 (8.2)	--	63 (4.6)	405 (3.6)	--	21 (3.9)	389 (8.2)	--
Kuwait	15 (2.7)	429 (8.8)	0 0	70 (3.8)	418 (3.6)	0 0	15 (3.1)	406 (10.7)	0 0
Colombia	14 (2.6)	443 (8.6)	0 0	52 (4.5)	420 (4.4)	0 0	34 (4.8)	403 (9.6)	0 0
Sweden	13 (2.5)	532 (7.3)	-8 (4.0)	78 (3.6)	507 (3.1)	6 (5.2)	8 (2.6)	513 (10.3)	2 (3.4)
Palestinian Nat'l Auth.	11 (2.6)	422 (7.2)	-3 (4.0)	78 (3.3)	403 (3.9)	1 (4.8)	11 (2.4)	392 (14.8)	2 (3.5)
Cyprus	11 (0.1)	437 (7.3)	-10 (0.2) ▼	74 (0.2)	454 (2.2)	-2 (0.3) ▼	16 (0.2)	447 (4.5)	12 (0.2) ▲
Japan	10 (2.3)	598 (10.3)	-18 (4.2) ▼	77 (3.2)	552 (2.2)	8 (4.7)	13 (2.7)	530 (7.6)	10 (3.0) ▲
Hungary	9 (2.8)	584 (10.4)	3 (3.5)	79 (4.0)	537 (3.7)	-4 (5.2)	11 (3.1)	521 (7.5)	1 (4.0)
Turkey	8 (2.2)	499 (19.0)	0 0	55 (4.4)	465 (5.1)	0 0	36 (4.3)	427 (6.4)	0 0
Romania	8 (2.1)	496 (13.0)	1 (3.1)	61 (4.2)	464 (4.8)	-8 (5.9)	31 (4.1)	452 (8.6)	8 (5.5)
Bosnia and Herzegovina	7 (2.0)	475 (7.4)	0 0	80 (3.0)	465 (3.4)	0 0	13 (2.5)	463 (6.3)	0 0
Algeria	7 (2.2)	412 (7.5)	0 0	60 (4.0)	408 (2.1)	0 0	33 (3.9)	408 (3.0)	0 0
Italy	7 (2.2)	503 (11.1)	-5 (3.5)	77 (3.7)	497 (3.4)	1 (5.1)	16 (3.1)	480 (6.9)	4 (3.9)
Slovenia	7 (2.0)	558 (8.0)	-2 (3.0)	85 (3.0)	537 (2.4)	2 (4.1)	8 (2.2)	527 (9.5)	0 (3.2)
Serbia	7 (2.3)	464 (16.4)	4 (2.7)	81 (3.4)	472 (3.4)	9 (5.3)	13 (2.9)	462 (8.9)	-13 (4.8) ▼
Botswana	6 (2.1)	378 (17.9)	5 (2.3) ▲	58 (4.6)	357 (4.4)	27 (6.2) ▲	35 (4.8)	342 (5.3)	-32 (6.4) ▼
Bulgaria	5 (2.1)	500 (36.7)	--	65 (4.2)	475 (7.6)	--	31 (4.2)	458 (11.1)	--
Norway	5 (2.0)	504 (8.3)	-8 (3.3) ▼	89 (2.9)	486 (2.5)	8 (4.5)	6 (2.2)	477 (4.0)	1 (3.1)
Armenia r	4 (1.7)	461 (15.6)	1 (2.2)	73 (3.8)	491 (7.6)	-6 (5.6)	23 (3.5)	482 (8.1)	5 (5.3)
Ukraine	4 (1.6)	550 (10.9)	0 0	87 (2.9)	486 (3.7)	0 0	10 (2.4)	449 (11.3)	0 0
Tunisia	3 (1.4)	477 (7.7)	1 (1.7)	44 (3.6)	451 (3.3)	14 (5.2) ▲	54 (3.5)	439 (2.7)	-15 (5.1) ▼
Czech Republic	2 (1.8)	~ ~	0 0	58 (4.0)	548 (2.9)	0 0	40 (4.2)	526 (3.2)	0 0
Lithuania	2 (1.4)	~ ~	-6 (2.7) ▼	94 (2.1)	519 (2.7)	6 (3.7)	4 (1.6)	495 (7.4)	0 (2.5)
Russian Federation	2 (0.9)	~ ~	1 (1.1)	79 (3.0)	532 (4.1)	9 (4.2) ▲	19 (3.1)	514 (6.1)	-10 (4.2) ▼
Georgia	0 (0.0)	~ ~	0 0	72 (4.3)	422 (5.9)	0 0	28 (4.3)	414 (5.8)	0 0
‡ Morocco	16 (5.3)	410 (12.5)	--	68 (5.4)	400 (4.0)	--	15 (4.1)	403 (12.6)	--
International Avg.	16 (0.4)	484 (1.6)		68 (0.5)	465 (0.6)		16 (0.4)	445 (1.6)	
<b>Benchmarking Participants</b>									
Dubai, UAE r	56 (0.7)	506 (4.8)	0 0	42 (0.7)	466 (4.5)	0 0	2 (0.3)	~ ~	0 0
Massachusetts, US	44 (7.4)	571 (6.6)	0 0	45 (8.1)	561 (10.0)	0 0	10 (3.0)	491 (13.9)	0 0
Minnesota, US	44 (7.2)	534 (8.1)	0 0	53 (6.9)	548 (4.8)	0 0	3 (2.7)	429 (6.0)	0 0
British Columbia, Canada	35 (4.9)	539 (5.2)	0 0	62 (5.0)	521 (4.0)	0 0	3 (1.5)	527 (37.1)	0 0
Ontario, Canada	34 (4.7)	545 (5.1)	-8 (6.4)	57 (5.1)	522 (4.0)	5 (6.9)	9 (2.5)	509 (10.4)	4 (3.3)
Basque Country, Spain	23 (4.8)	520 (5.3)	11 (5.9)	65 (4.9)	495 (3.4)	-13 (6.2) ▼	12 (2.1)	468 (8.1)	3 (3.3)
Quebec, Canada	18 (3.5)	545 (9.2)	4 (4.1)	71 (4.3)	502 (4.2)	-7 (5.3)	12 (3.1)	478 (6.0)	4 (3.8)

▲ 2007 percent significantly higher ▼ 2007 percent significantly lower

Index based on principals' responses to eight questions about their schools: teachers' job satisfaction; teachers' understanding of the school's curricular goals; teachers' degree of success in implementing the school's curriculum; teachers' expectations for student achievement; parental support for student achievement; parental involvement in school activities; students' regard for school property; and students' desire to do well in school. Average is computed based on a 5-point scale: 1 = very high; 2 = high; 3 = medium; 4 = low; and 5 = very low. High level indicates average is less than or equal to 2. Medium level indicates that average is greater than 2 and less or equal to 3. Low level indicates average is greater than 3.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.  
 An "r" indicates data are available for at least 70 but less than 85% of the students.  
 An "s" indicates data are available for at least 50 but less than 70% of the students.  
 A diamond (0) indicates the country did not participate in the assessment.

**Exhibit 8.13 Index of Science Teachers' Perception of School Climate (TPSC) with Trends**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

Country		High TPSC			Medium TPSC			Low TPSC		
		2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Scotland	r	47 (3.3)	513 (3.1)	6 (6.1)	50 (3.2)	493 (3.8)	-7 (6.0)	2 (1.3)	~ ~	1 (1.7)
New Zealand		37 (2.4)	528 (3.2)	0 (3.8)	57 (2.6)	494 (3.5)	-1 (4.1)	6 (1.4)	469 (8.5)	1 (1.8)
Australia		37 (3.6)	546 (5.5)	6 (5.1)	54 (3.3)	520 (4.8)	-5 (5.0)	10 (1.8)	497 (12.4)	-1 (3.1)
United States		36 (2.7)	562 (3.5)	-6 (3.9)	51 (2.9)	534 (3.1)	4 (4.0)	13 (1.8)	488 (7.0)	2 (2.4)
England	r	35 (3.8)	556 (5.4)	6 (5.9)	59 (3.8)	536 (3.7)	-4 (6.2)	6 (1.7)	502 (8.0)	-2 (2.9)
El Salvador		31 (4.1)	402 (9.3)	0 0	60 (4.5)	386 (5.9)	0 0	10 (2.5)	371 (12.6)	0 0
Austria		29 (2.5)	535 (3.2)	0 0	66 (2.4)	524 (3.0)	0 0	4 (1.3)	477 (12.2)	0 0
Kazakhstan		29 (5.5)	526 (12.0)	0 0	67 (5.7)	535 (5.8)	0 0	4 (1.8)	552 (19.1)	0 0
Chinese Taipei		28 (3.8)	557 (4.6)	-6 (5.8)	65 (4.3)	557 (2.5)	2 (6.2)	7 (2.0)	545 (9.1)	4 (2.4)
Iran, Islamic Rep. of		28 (3.8)	451 (11.0)	3 (5.5)	58 (4.0)	434 (5.9)	-2 (6.1)	15 (2.6)	415 (10.0)	-1 (4.4)
Qatar		21 (0.1)	306 (5.0)	0 0	65 (0.2)	296 (2.4)	0 0	14 (0.1)	250 (4.9)	0 0
Lithuania		20 (3.0)	525 (5.2)	-14 (4.5) ▼	76 (3.2)	512 (2.7)	11 (4.6) ●	4 (1.2)	493 (10.3)	3 (1.2) ●
Hong Kong SAR		19 (3.2)	575 (5.4)	8 (4.2)	67 (3.9)	555 (4.3)	-9 (5.7)	14 (3.3)	539 (8.2)	1 (4.6)
Germany		18 (2.4)	543 (4.3)	0 0	69 (3.2)	533 (2.5)	0 0	13 (2.4)	478 (9.8)	0 0
Norway		18 (3.1)	491 (6.2)	0 (4.7)	80 (3.1)	474 (3.7)	3 (4.8)	3 (0.8)	455 (18.7)	-3 (2.0)
Kuwait	r	18 (3.5)	363 (12.7)	0 0	56 (4.1)	355 (8.2)	0 0	27 (3.9)	323 (11.7)	0 0
Sweden		17 (2.5)	542 (5.6)	0 0	75 (2.9)	525 (3.4)	0 0	8 (2.0)	495 (11.3)	0 0
Denmark		17 (3.7)	538 (4.0)	0 0	69 (4.7)	520 (2.9)	0 0	14 (3.5)	495 (9.8)	0 0
Ukraine		15 (2.9)	475 (6.7)	0 0	80 (3.2)	474 (3.6)	0 0	5 (1.7)	466 (4.7)	0 0
Slovenia		15 (2.2)	518 (5.0)	-2 (4.2)	81 (2.3)	519 (2.2)	1 (4.6)	5 (1.2)	510 (7.7)	1 (2.2)
Singapore		13 (2.3)	587 (9.0)	-7 (4.2)	74 (2.9)	592 (5.0)	3 (4.8)	13 (1.8)	556 (8.2)	4 (2.8)
Yemen		11 (3.0)	184 (25.7)	0 0	57 (4.3)	212 (9.2)	0 0	32 (3.8)	186 (13.3)	0 0
Colombia		10 (2.6)	439 (22.8)	0 0	62 (4.7)	402 (7.1)	0 0	28 (4.4)	390 (11.9)	0 0
Georgia		9 (2.6)	437 (12.2)	0 0	72 (4.3)	416 (5.2)	0 0	19 (3.8)	412 (10.6)	0 0
Italy		9 (2.0)	545 (6.8)	1 (3.0)	73 (3.0)	539 (3.3)	0 (4.5)	18 (2.7)	515 (8.0)	-1 (3.8)
Russian Federation		9 (2.0)	572 (16.1)	3 (2.7)	83 (2.7)	548 (5.1)	4 (4.3)	8 (1.9)	515 (15.5)	-7 (3.7)
Tunisia	r	7 (1.9)	363 (23.0)	1 (2.9)	54 (3.5)	326 (7.9)	-4 (5.2)	38 (3.6)	298 (10.4)	2 (5.2)
Hungary		6 (1.5)	575 (10.4)	-8 (3.2) ▼	74 (3.7)	543 (3.5)	-4 (4.9)	19 (3.6)	496 (9.6)	13 (4.1) ●
Slovak Republic		5 (1.8)	536 (13.3)	0 0	67 (3.4)	532 (4.6)	0 0	27 (3.3)	508 (12.1)	0 0
Latvia		5 (1.5)	554 (11.3)	0 (2.8)	79 (2.7)	542 (2.4)	-10 (4.3) ▼	16 (2.6)	544 (6.2)	10 (3.5) ●
Algeria		5 (1.9)	370 (10.1)	0 0	57 (4.9)	356 (10.8)	0 0	38 (4.9)	345 (9.5)	0 0
Netherlands		4 (1.9)	528 (7.9)	-3 (3.2)	83 (3.2)	527 (3.2)	-1 (4.8)	13 (2.6)	497 (9.1)	5 (3.6)
Japan		4 (1.5)	573 (9.9)	-9 (3.1) ▼	76 (3.5)	547 (2.3)	1 (4.9)	20 (3.2)	545 (3.3)	8 (4.2)
Armenia	s	4 (1.4)	482 (23.3)	-14 (4.2) ▼	52 (4.0)	482 (8.0)	-8 (6.9)	45 (4.0)	489 (10.0)	22 (6.8) ●
Czech Republic		3 (1.4)	498 (7.7)	0 0	68 (3.7)	520 (3.7)	0 0	29 (3.7)	505 (4.8)	0 0
Morocco	s	2 (1.3)	~ ~	-4 (2.7)	39 (3.8)	319 (12.8)	11 (6.4)	58 (3.8)	276 (8.1)	-7 (6.3)
International Avg.		17 (0.5)	494 (1.9)		66 (0.6)	477 (0.9)		17 (0.5)	454 (1.8)	
<b>Benchmarking Participants</b>										
Dubai, UAE	s	53 (4.2)	464 (10.2)	0 0	40 (3.9)	446 (6.3)	0 0	7 (0.8)	384 (7.7)	0 0
Massachusetts, US		50 (7.2)	581 (5.9)	0 0	47 (6.5)	566 (5.7)	0 0	3 (2.7)	498 (47.1)	0 0
Alberta, Canada		48 (4.1)	555 (4.4)	0 0	48 (4.1)	533 (4.6)	0 0	4 (1.5)	500 (34.7)	0 0
Minnesota, US	r	45 (8.9)	555 (13.3)	0 0	52 (8.9)	552 (7.2)	0 0	4 (1.9)	504 (14.1)	0 0
Ontario, Canada		27 (4.7)	545 (6.2)	-10 (6.2)	61 (4.8)	537 (5.4)	6 (6.5)	12 (3.3)	500 (12.9)	3 (4.6)
British Columbia, Canada	r	26 (3.6)	554 (4.9)	0 0	67 (4.3)	531 (3.5)	0 0	8 (2.8)	511 (14.2)	0 0
Quebec, Canada		16 (3.2)	536 (5.0)	2 (4.2)	68 (4.3)	518 (3.5)	-5 (5.8)	16 (3.2)	503 (7.3)	3 (4.5)

● 2007 percent significantly higher

▼ 2007 percent significantly lower

Index based on teachers' responses to eight questions about their schools: teachers' job satisfaction; teachers' understanding of the school's curricular goals; teachers' degree of success in implementing the school's curriculum; teachers' expectations for student achievement; parental support for student achievement; parental involvement in school activities; students' regard for school property; and students' desire to do well in school. Average is computed based on a 5-point scale: 1 = very high; 2 = high; 3 = medium; 4 = low; and 5 = very low. High level indicates average is less than or equal to 2. Medium level indicates that average is greater than 2 and less or equal to 3. Low level indicates average is greater than 3.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.



**Exhibit 8.13 Index of Science Teachers' Perception of School Climate (TPSC) with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	High TPSC			Medium TPSC			Low TPSC		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Indonesia	25 (3.7)	445 (9.8)	11 (4.1) ▲	57 (4.0)	435 (5.5)	-12 (5.0) ▼	18 (3.3)	424 (10.8)	1 (4.2)
Egypt	25 (3.0)	434 (6.4)	5 (4.2)	59 (3.9)	405 (4.8)	-1 (5.6)	16 (2.7)	377 (9.9)	-4 (4.2)
Lebanon	25 (3.2)	442 (13.2)	5 (4.3)	51 (4.1)	423 (6.3)	-4 (5.4)	25 (3.6)	369 (9.9)	0 (4.8)
Israel	r 23 (3.7)	499 (7.6)	-2 (4.8)	64 (4.4)	469 (6.1)	2 (5.7)	13 (2.7)	416 (13.6)	0 (3.7)
Malaysia	22 (3.5)	500 (11.3)	6 (4.6)	60 (4.1)	469 (7.6)	-11 (5.7) ▼	19 (3.3)	442 (10.2)	5 (4.7)
Chinese Taipei	22 (3.5)	574 (6.9)	2 (4.9)	65 (4.0)	561 (4.1)	0 (5.8)	13 (2.9)	541 (10.8)	-2 (4.3)
Scotland	s 21 (1.7)	520 (6.0)	8 (2.5) ▲	63 (2.2)	491 (4.4)	3 (3.7)	16 (2.2)	484 (10.0)	-12 (3.7) ▼
Qatar	18 (0.1)	350 (2.8)	0 0	55 (0.2)	320 (1.8)	0 0	26 (0.1)	292 (3.2)	0 0
Malta	18 (0.2)	511 (2.2)	0 0	46 (0.3)	482 (1.9)	0 0	36 (0.3)	382 (2.2)	0 0
England	s 18 (2.2)	584 (8.4)	6 (3.1) ▲	60 (3.1)	542 (5.7)	-10 (5.5)	22 (2.9)	510 (8.3)	3 (5.2)
United States	18 (2.3)	545 (6.6)	-6 (3.4)	54 (3.2)	521 (3.9)	3 (4.4)	28 (2.6)	495 (5.5)	3 (3.7)
Oman	16 (3.3)	446 (8.3)	0 0	68 (4.1)	426 (4.0)	0 0	17 (2.9)	387 (8.9)	0 0
Ghana	14 (2.6)	353 (15.5)	0 (4.1)	56 (3.8)	300 (7.8)	-5 (6.0)	30 (3.6)	285 (8.3)	5 (5.3)
Australia	r 14 (1.8)	547 (8.3)	0 (2.8)	56 (3.5)	526 (5.8)	-1 (5.3)	30 (3.4)	487 (5.8)	1 (5.2)
Saudi Arabia	14 (3.4)	417 (5.8)	--	57 (4.0)	408 (3.2)	--	30 (3.4)	384 (5.8)	--
Syrian Arab Republic	14 (2.5)	465 (5.8)	0 0	66 (3.5)	451 (3.4)	0 0	20 (3.1)	442 (8.3)	0 0
Jordan	14 (3.0)	518 (11.9)	7 (3.6)	49 (4.4)	487 (5.4)	-5 (6.2)	38 (3.9)	462 (7.4)	-1 (5.5)
Singapore	13 (1.5)	626 (11.8)	4 (2.2) ▲	64 (2.6)	568 (5.2)	-7 (3.6)	23 (1.9)	531 (10.4)	3 (2.8)
Cyprus	r 13 (0.6)	452 (3.2)	0 (1.1)	61 (1.1)	450 (2.4)	4 (1.6) ▲	26 (0.9)	453 (3.4)	-4 (1.4) ▼
Iran, Islamic Rep. of	12 (2.4)	496 (12.1)	3 (3.3)	49 (3.8)	464 (5.1)	6 (5.5)	38 (3.9)	441 (4.7)	-10 (5.5)
Bahrain	12 (1.2)	475 (4.2)	1 (2.4)	63 (2.3)	474 (2.5)	13 (4.2) ▲	25 (2.0)	447 (5.1)	-14 (4.1) ▼
El Salvador	12 (3.1)	404 (9.5)	0 0	58 (4.3)	388 (4.2)	0 0	30 (3.6)	379 (6.3)	0 0
Thailand	10 (2.1)	505 (18.3)	0 0	65 (3.6)	470 (5.9)	0 0	25 (3.6)	457 (7.8)	0 0
Hong Kong SAR	10 (2.7)	565 (10.9)	3 (3.6)	65 (4.0)	528 (6.8)	-1 (6.2)	26 (4.0)	520 (8.4)	-2 (6.0)
Bosnia and Herzegovina	10 (1.6)	471 (10.6)	0 0	60 (2.3)	467 (2.8)	0 0	30 (2.1)	461 (3.7)	0 0
Palestinian Nat'l Auth.	9 (2.2)	432 (14.5)	-1 (3.6)	62 (3.7)	408 (4.3)	-6 (5.4)	29 (3.5)	382 (7.5)	7 (5.0)
Colombia	9 (2.4)	443 (16.1)	0 0	46 (5.4)	421 (6.1)	0 0	45 (5.0)	408 (4.8)	0 0
Korea, Rep. of	r 9 (2.3)	553 (6.3)	3 (2.8)	65 (3.7)	556 (2.6)	-5 (4.9)	26 (3.2)	545 (3.3)	2 (4.4)
Kuwait	r 8 (2.2)	443 (14.6)	0 0	67 (3.6)	412 (4.4)	0 0	25 (3.4)	415 (8.4)	0 0
Romania	8 (1.3)	495 (9.5)	-3 (2.1)	58 (2.6)	464 (5.0)	-2 (3.8)	34 (2.8)	450 (5.8)	5 (4.0)
Serbia	8 (1.5)	480 (7.8)	1 (1.9)	67 (2.5)	472 (3.4)	4 (3.3)	25 (2.6)	464 (5.2)	-5 (3.4)
Turkey	7 (2.0)	525 (12.9)	0 0	32 (4.4)	473 (8.3)	0 0	60 (4.5)	435 (4.3)	0 0
Japan	7 (2.0)	592 (14.5)	-2 (3.0)	51 (4.3)	558 (2.7)	-10 (5.9)	42 (4.3)	543 (3.9)	12 (5.7) ▲
Sweden	7 (1.2)	534 (7.2)	0 (2.1)	70 (2.5)	510 (3.0)	5 (4.1)	23 (2.4)	503 (5.3)	-6 (3.8)
Hungary	7 (1.5)	567 (12.1)	2 (1.7)	73 (2.4)	541 (3.4)	-6 (3.2)	21 (2.3)	521 (4.7)	4 (3.0)
Botswana	6 (2.1)	414 (14.3)	5 (2.3) ▲	31 (4.5)	368 (6.4)	0 (6.2)	63 (4.8)	342 (3.9)	-6 (6.4)
Lithuania	6 (1.0)	535 (6.7)	0 (1.5)	78 (1.8)	519 (2.7)	-6 (2.4) ▼	16 (1.8)	509 (3.3)	6 (2.3) ▲
Slovenia	6 (1.3)	558 (7.8)	2 (1.9)	71 (2.6)	536 (2.6)	-6 (3.8)	23 (2.6)	538 (3.4)	4 (3.6)
Ukraine	6 (1.6)	499 (13.1)	0 0	84 (2.3)	487 (3.5)	0 0	10 (1.8)	472 (6.3)	0 0
Algeria	5 (1.5)	407 (5.6)	0 0	43 (3.4)	410 (2.8)	0 0	52 (3.3)	407 (2.3)	0 0
Bulgaria	5 (1.7)	514 (31.3)	--	44 (3.4)	478 (7.3)	--	51 (3.6)	456 (7.9)	--
Norway	4 (1.7)	502 (8.2)	-3 (2.7)	81 (3.0)	488 (2.4)	-4 (4.3)	14 (2.7)	473 (5.1)	7 (3.5)
Tunisia	4 (1.7)	434 (6.5)	-2 (2.7)	47 (4.2)	446 (3.1)	-7 (6.0)	49 (4.0)	445 (3.0)	9 (5.5)
Armenia	r 3 (0.8)	514 (17.3)	-8 (1.7) ▼	59 (2.1)	487 (6.5)	-5 (2.9)	38 (2.2)	487 (5.7)	13 (3.2) ▲
Italy	3 (1.1)	488 (26.7)	-1 (2.1)	55 (3.6)	504 (3.7)	6 (5.6)	42 (3.7)	486 (4.4)	-5 (5.4)
Georgia	3 (0.9)	445 (6.4)	0 0	54 (2.8)	425 (5.9)	0 0	43 (2.9)	415 (5.6)	0 0
Russian Federation	2 (0.7)	~ ~	1 (0.9)	67 (2.1)	534 (4.7)	15 (3.3) ▲	31 (2.0)	516 (3.3)	-16 (3.3) ▼
Czech Republic	1 (0.6)	~ ~	0 0	42 (2.7)	547 (3.4)	0 0	57 (2.8)	532 (2.5)	0 0
‡ Morocco	7 (2.8)	445 (14.7)	--	30 (5.5)	421 (7.1)	--	63 (4.7)	393 (3.4)	--
<b>International Avg.</b>	<b>11 (0.3)</b>	<b>489 (1.7)</b>		<b>58 (0.5)</b>	<b>469 (0.7)</b>		<b>31 (0.4)</b>	<b>449 (1.0)</b>	

**Benchmarking Participants**

Dubai, UAE	s 36 (3.1)	518 (6.1)	0 0	59 (3.2)	475 (5.6)	0 0	5 (0.7)	432 (9.9)	0 0
Ontario, Canada	28 (5.1)	536 (4.6)	9 (6.3)	60 (5.2)	531 (4.2)	-2 (7.0)	12 (2.8)	484 (13.4)	-7 (5.0)
Massachusetts, US	27 (7.0)	574 (11.3)	0 0	51 (7.6)	554 (10.2)	0 0	22 (5.2)	528 (13.1)	0 0
British Columbia, Canada	20 (3.0)	541 (4.2)	0 0	67 (3.7)	525 (3.7)	0 0	12 (2.7)	504 (13.3)	0 0
Basque Country, Spain	17 (3.4)	518 (7.4)	10 (4.3) ▲	57 (5.4)	498 (4.4)	-11 (7.2)	27 (4.5)	490 (5.9)	0 (6.2)
Minnesota, US	17 (5.5)	549 (13.0)	0 0	60 (7.3)	545 (4.0)	0 0	23 (5.7)	508 (13.0)	0 0
Quebec, Canada	9 (2.5)	571 (19.5)	1 (3.7)	52 (5.6)	516 (5.0)	-15 (7.1) ▼	39 (5.1)	493 (4.6)	14 (6.1) ▲

▲ 2007 percent significantly higher      ▼ 2007 percent significantly lower

Index based on teachers' responses to eight questions about their schools: teachers' job satisfaction; teachers' understanding of the school's curricular goals; teachers' degree of success in implementing the school's curriculum; teachers' expectations for student achievement; parental support for student achievement; parental involvement in school activities; students' regard for school property; and students' desire to do well in school. Average is computed based on a 5-point scale: 1 = very high; 2 = high; 3 = medium; 4 = low; and 5 = very low. High level indicates average is less than or equal to 2. Medium level indicates that average is greater than 2 and less or equal to 3. Low level indicates average is greater than 3.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.  
 An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.  
 A diamond (0) indicates the country did not participate in the assessment.

At the eighth grade, teachers had a somewhat less positive outlook on school climate than principals. On average across countries, 11 percent of students were at the high level of the index (vs. 16% for principals), 58 percent at the medium level (vs. 68% for principals), and 31 percent at the low level (vs. 16% for principals). Twenty-four countries and the province of Quebec had less than 10 percent of students at the high level of the teachers' perception index. Average science achievement was positively related to teachers' perceptions of school climate at both fourth and eighth grades, with average achievement higher among students at the high index level and lower among students at the low level of the index.

### **How Safe and Orderly Are Schools?**

Since a supportive school environment for learning is one in which teachers and students feel safe and secure, TIMSS asked teachers and students about their perceptions of safety in their schools. The Index of Science Teachers' Perception of Safety in School (TPSS) is based on science teachers' responses to three statements about their schools:

- ▶ This school is located in a safe neighborhood
- ▶ I feel safe at this school
- ▶ This school's security policies and practices are sufficient.

Students were assigned to the high level when their teachers agreed with all three statements and to the low level when their teachers disagreed with all three. Students whose teachers provided other response combinations were assigned to the medium level.

As shown in Exhibit 8.14, fourth grade teachers generally agreed that their schools were safe, reporting that, on average, most students were at the high (80%) or medium (15%) level of the teacher perception of safety index. In Singapore, Austria, Norway, the Czech Republic, the Slovak Republic, Georgia, Germany, Lithuania, Hong Kong SAR, and in Dubai, Massachusetts, and Alberta, 90 percent or more of students were at the high level of the index. There were increased percentages of students at the high level (since 2003) in Singapore, Lithuania, Scotland, Australia, England, Slovenia, Italy,

the Russian Federation, and the province of Quebec, and decreases in Tunisia and Armenia. Average science achievement was highest at the high level of the index (478 points, on average), next at the medium level (464 points), and lowest at the low level (414 points).

Eighth grade science teachers also tended to report that schools felt safe, with more than three fourths of students at the high (76%) and another 18 percent at the medium level of the teacher perception of safety index, on average. Ninety percent, or more, of students in Norway, Singapore, Hong Kong SAR, Hungary, the Czech Republic, and Dubai were at the high level of the index. Countries with increased percentages since 2003 included Norway, Hungary, Australia, Malaysia, Cyprus, Slovenia, the Russian Federation, Italy, England, Korea, and the Palestinian National Authority, while the United States and Armenia had decreases. Similar to the fourth grade, average science achievement was positively related to teacher perceptions of safety at eighth grade, with achievement highest among students at the high index level, and lowest at the low level of the index.

To complement teachers' perceptions of school safety, TIMSS asked students about their school experiences in terms of how often the following happened in their school in the past month:

- ▶ Something of mine was stolen
- ▶ I was hit or hurt by other student(s) (e.g., shoving, hitting, kicking)
- ▶ I was made to do things I didn't want to do by other students
- ▶ I was made fun of or called names
- ▶ I was left out of activities by other students

Students at the high level of the Index of Students' Perception of Being Safe in School (SPBSS) responded *No* to all five statements, while students at the low level responded *Yes* to three or more statements. Students with other combinations of responses were at the medium index level.

As shown in Exhibit 8.15, students at both grades reported a range of experiences across the TIMSS participants. At fourth grade, 42 percent of students were at the high level of the index, on average internationally,

**Exhibit 8.14 Index of Science Teachers' Perception of Safety in School (TPSS) with Trends**
**TIMSS2007**  
**Science 4<sup>th</sup> Grade**

Country	High TPSS			Medium TPSS			Low TPSS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Singapore	96 (1.1)	586 (4.0)	8 (2.7) ▲	3 (1.1)	632 (20.4)	-9 (2.7) ▼	0 (0.0)	~ ~	0 (0.0)
Austria	96 (1.1)	526 (2.7)	◊ ◊	4 (1.0)	503 (12.6)	◊ ◊	0 (0.2)	~ ~	◊ ◊
Norway	95 (1.7)	476 (3.6)	5 (3.2)	4 (1.4)	483 (11.8)	-5 (3.0)	1 (0.9)	~ ~	1 (1.1)
Czech Republic	94 (1.5)	516 (3.3)	◊ ◊	6 (1.4)	506 (13.1)	◊ ◊	0 (0.0)	~ ~	◊ ◊
Slovak Republic	92 (2.0)	525 (5.3)	◊ ◊	8 (2.0)	537 (6.6)	◊ ◊	0 (0.0)	~ ~	◊ ◊
Georgia	91 (2.2)	420 (5.0)	◊ ◊	5 (1.5)	409 (10.1)	◊ ◊	4 (1.5)	413 (19.5)	◊ ◊
Germany	91 (1.5)	532 (2.5)	◊ ◊	9 (1.6)	480 (14.8)	◊ ◊	0 (0.4)	~ ~	◊ ◊
Lithuania	91 (2.1)	515 (2.5)	10 (3.8) ▲	7 (1.8)	513 (5.7)	-10 (3.3) ▼	2 (1.1)	~ ~	0 (1.6)
Hong Kong SAR	90 (2.6)	559 (3.5)	6 (4.6)	9 (2.4)	536 (13.5)	-5 (4.3)	1 (0.8)	~ ~	-1 (1.5)
Scotland r	89 (2.5)	504 (2.6)	11 (4.0) ▲	11 (2.5)	476 (10.0)	-11 (4.0) ▼	0 (0.0)	~ ~	-1 (0.0)
Kazakhstan	88 (3.3)	535 (4.8)	◊ ◊	12 (3.2)	517 (24.6)	◊ ◊	0 (0.0)	~ ~	◊ ◊
Australia	87 (2.3)	532 (4.1)	9 (4.2) ▲	12 (2.3)	491 (10.1)	-8 (4.1)	1 (0.4)	~ ~	-1 (0.9)
Kuwait r	86 (3.1)	354 (6.2)	◊ ◊	12 (2.8)	306 (13.8)	◊ ◊	1 (1.1)	~ ~	◊ ◊
Hungary	86 (2.6)	541 (3.3)	-2 (4.0)	12 (2.4)	505 (9.6)	2 (3.7)	1 (0.9)	~ ~	0 (1.3)
New Zealand	86 (1.8)	512 (2.8)	-2 (2.7)	14 (1.8)	456 (6.9)	2 (2.6)	0 (0.2)	~ ~	0 (0.4)
Netherlands	86 (2.9)	528 (3.1)	1 (3.6)	10 (2.1)	482 (7.7)	-3 (2.9)	5 (1.8)	518 (14.4)	2 (2.4)
England r	86 (2.4)	547 (3.2)	15 (4.7) ▲	14 (2.4)	508 (6.1)	-14 (4.7) ▼	0 (0.3)	~ ~	-1 (1.2)
Qatar	85 (0.1)	288 (2.8)	◊ ◊	15 (0.1)	313 (4.4)	◊ ◊	0 (0.0)	~ ~	◊ ◊
Ukraine	84 (3.0)	475 (3.6)	◊ ◊	14 (2.8)	465 (6.7)	◊ ◊	2 (1.0)	~ ~	◊ ◊
Denmark	84 (3.1)	523 (3.0)	◊ ◊	15 (3.2)	503 (7.0)	◊ ◊	1 (0.9)	~ ~	◊ ◊
Slovenia	84 (2.0)	518 (2.1)	11 (4.6) ▲	14 (1.9)	519 (4.8)	-9 (4.4) ▼	2 (0.8)	~ ~	-2 (1.9)
Italy	83 (2.4)	538 (3.1)	18 (4.2) ▲	15 (2.0)	527 (10.5)	-9 (3.6) ▼	2 (1.1)	~ ~	-9 (2.5) ▼
Sweden	83 (2.9)	529 (2.8)	◊ ◊	16 (2.8)	507 (7.1)	◊ ◊	1 (0.6)	~ ~	◊ ◊
Russian Federation	82 (3.2)	546 (5.2)	9 (4.5) ▲	18 (3.2)	553 (7.5)	-8 (4.5)	0 (0.5)	~ ~	-1 (0.8)
Iran, Islamic Rep. of	81 (3.1)	439 (4.9)	0 (5.3)	14 (2.6)	427 (10.6)	-3 (4.8)	5 (1.8)	424 (24.9)	3 (2.3)
Chinese Taipei	80 (3.2)	558 (2.5)	4 (4.7)	18 (3.0)	554 (4.9)	-3 (4.5)	2 (1.4)	~ ~	0 (1.9)
United States	78 (2.5)	549 (3.1)	-6 (3.2)	21 (2.4)	498 (6.4)	6 (3.1) ▲	1 (0.5)	~ ~	-1 (0.9)
Latvia	74 (3.3)	542 (2.5)	9 (5.4)	24 (3.3)	545 (3.9)	-7 (5.3)	2 (0.6)	~ ~	-2 (2.0)
Yemen	72 (4.3)	202 (8.3)	◊ ◊	26 (4.2)	201 (16.0)	◊ ◊	1 (1.0)	~ ~	◊ ◊
Algeria	68 (4.8)	356 (6.7)	◊ ◊	24 (4.3)	342 (18.6)	◊ ◊	8 (2.5)	352 (17.5)	◊ ◊
Japan	67 (3.6)	548 (2.4)	10 (5.3)	30 (3.4)	548 (3.2)	-6 (5.3)	3 (1.5)	546 (6.7)	-4 (2.7)
Tunisia r	66 (3.7)	312 (8.4)	-14 (5.3) ▼	17 (3.1)	334 (13.3)	6 (4.1)	17 (3.1)	320 (10.5)	7 (4.1)
El Salvador	63 (3.8)	391 (6.1)	◊ ◊	22 (3.3)	386 (9.6)	◊ ◊	15 (3.3)	379 (9.7)	◊ ◊
Colombia	52 (5.8)	407 (10.3)	◊ ◊	26 (4.1)	391 (8.9)	◊ ◊	22 (4.9)	403 (10.1)	◊ ◊
Morocco s	40 (3.9)	308 (12.4)	-10 (6.1)	30 (3.4)	283 (11.1)	0 (6.1)	29 (3.5)	288 (14.4)	10 (5.3)
Armenia s	38 (4.0)	487 (10.1)	-44 (6.2) ▼	23 (3.4)	459 (10.6)	8 (5.6)	39 (3.5)	499 (9.9)	36 (3.8) ▲
International Avg.	80 (0.5)	478 (0.9)		15 (0.4)	464 (1.9)		5 (0.3)	414 (4.7)	
<b>Benchmarking Participants</b>									
Dubai, UAE s	98 (0.2)	452 (6.0)	◊ ◊	2 (0.2)	~ ~	◊ ◊	0 (0.0)	~ ~	◊ ◊
Massachusetts, US	91 (4.0)	577 (4.5)	◊ ◊	8 (3.9)	527 (10.0)	◊ ◊	1 (0.0)	~ ~	◊ ◊
Alberta, Canada	90 (2.4)	544 (4.3)	◊ ◊	9 (2.4)	530 (6.2)	◊ ◊	1 (0.3)	~ ~	◊ ◊
Quebec, Canada	89 (2.7)	522 (2.9)	9 (4.6) ▲	8 (2.2)	486 (8.2)	-10 (4.1) ▼	3 (1.3)	517 (9.5)	0 (1.8)
British Columbia, Canada r	88 (2.9)	539 (2.7)	◊ ◊	12 (2.9)	513 (11.2)	◊ ◊	0 (0.0)	~ ~	◊ ◊
Minnesota, US	87 (6.0)	561 (5.3)	◊ ◊	13 (6.0)	495 (20.2)	◊ ◊	0 (0.0)	~ ~	◊ ◊
Ontario, Canada	84 (3.5)	540 (3.8)	-6 (4.7)	15 (3.5)	505 (12.1)	5 (4.6)	0 (0.3)	~ ~	0 (0.4)

▲ 2007 percent significantly higher

▼ 2007 percent significantly lower

Index based on teachers' responses to three statements about their schools: this school is located in a safe neighborhood; I feel safe at this school; and this school's security policies and practices are sufficient. High level indicates that the teacher agrees a lot or agrees to all three statements. Low level indicates that teacher disagrees or disagrees a lot to all three statements. Medium level includes all other combinations of responses.

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students.

An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (◊) indicates the country did not participate in the assessment.



**Exhibit 8.14 Index of Science Teachers' Perception of Safety in School (TPSS) with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	High TPSS			Medium TPSS			Low TPSS			
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	
Norway	94 (1.6)	487 (2.2)	13 (3.3) ▲	5 (1.5)	480 (9.0)	-13 (3.2) ▼	1 (0.0)	~ ~	1 (0.0)	
Singapore	94 (1.2)	568 (4.8)	2 (1.9)	6 (1.1)	557 (16.0)	-2 (1.8)	1 (0.5)	~ ~	0 (0.8)	
Hong Kong SAR	92 (2.7)	529 (5.1)	4 (4.0)	7 (2.6)	540 (23.6)	-5 (3.9)	1 (0.9)	~ ~	1 (0.9)	
Hungary	91 (1.6)	539 (3.0)	7 (2.7) ▲	8 (1.3)	543 (10.0)	-6 (2.4) ▼	2 (0.6)	~ ~	-1 (0.9)	
Czech Republic	90 (1.8)	539 (2.1)	0 0	9 (1.7)	534 (5.8)	0 0	1 (0.4)	~ ~	0 0	
Oman	89 (2.7)	427 (3.0)	0 0	10 (2.6)	392 (13.5)	0 0	1 (0.7)	~ ~	0 0	
Syrian Arab Republic	89 (2.4)	455 (2.9)	0 0	10 (2.2)	422 (11.9)	0 0	1 (0.7)	~ ~	0 0	
Indonesia	88 (2.6)	439 (4.2)	3 (3.6)	11 (2.7)	406 (11.1)	-1 (3.5)	1 (0.0)	~ ~	-2 (1.2)	
Qatar	87 (0.1)	316 (1.9)	0 0	12 (0.1)	335 (3.9)	0 0	1 (0.0)	~ ~	0 0	
Georgia	87 (2.3)	421 (5.3)	0 0	8 (1.6)	418 (6.0)	0 0	5 (1.2)	417 (10.9)	0 0	
Kuwait	r 86 (3.1)	417 (3.9)	0 0	12 (2.9)	411 (13.0)	0 0	2 (1.4)	~ ~	0 0	
Ukraine	86 (2.1)	486 (3.6)	0 0	13 (2.0)	483 (8.5)	0 0	1 (0.6)	~ ~	0 0	
Australia	r 86 (2.4)	521 (4.6)	15 (4.3) ▲	13 (2.1)	498 (6.9)	-14 (4.1) ▼	2 (0.9)	~ ~	-2 (1.5)	
Egypt	85 (3.1)	408 (3.9)	-1 (4.1)	14 (3.0)	417 (8.4)	1 (4.0)	2 (1.2)	~ ~	0 (1.6)	
Thailand	84 (3.1)	473 (5.0)	0 0	14 (3.0)	456 (8.9)	0 0	2 (0.9)	~ ~	0 0	
Israel	r 83 (2.9)	478 (5.7)	1 (4.0)	13 (2.4)	427 (14.9)	-2 (3.5)	3 (1.6)	434 (22.3)	1 (2.0)	
Malaysia	83 (3.2)	473 (6.4)	10 (5.2) ▲	14 (3.1)	455 (15.3)	-7 (4.7)	2 (1.3)	~ ~	-3 (2.7)	
Cyprus	r 82 (0.7)	451 (2.2)	8 (1.5) ▲	15 (0.6)	451 (3.5)	-7 (1.4) ▼	3 (0.4)	432 (11.7)	-1 (0.5)	
Lithuania	82 (2.1)	518 (2.7)	3 (3.3)	14 (1.8)	524 (4.9)	-5 (3.1)	3 (0.8)	507 (8.0)	1 (1.1)	
Sweden	82 (2.7)	514 (2.7)	4 (3.8)	18 (2.7)	492 (5.9)	-3 (3.8)	0 (0.0)	~ ~	-1 (0.7)	
Bosnia and Herzegovina	82 (1.6)	466 (3.0)	0 0	15 (1.3)	465 (4.7)	0 0	4 (1.0)	464 (8.5)	0 0	
Iran, Islamic Rep. of	80 (3.2)	466 (4.3)	6 (4.7)	15 (2.7)	432 (7.6)	-9 (4.3) ▼	6 (1.8)	432 (9.8)	2 (2.3)	
Slovenia	79 (2.2)	537 (2.6)	7 (3.4) ▲	18 (2.1)	540 (2.7)	-3 (3.1)	3 (1.1)	535 (9.5)	-3 (1.8)	
Serbia	79 (2.2)	470 (3.4)	3 (3.4)	18 (2.0)	477 (4.9)	1 (3.0)	4 (1.1)	453 (14.7)	-4 (1.7) ▼	
Romania	78 (2.2)	465 (4.3)	0 (3.2)	19 (2.1)	446 (5.3)	-1 (3.2)	3 (0.7)	470 (8.2)	0 (1.1)	
Russian Federation	78 (2.3)	530 (4.1)	18 (3.2) ▲	21 (2.1)	528 (5.4)	-13 (3.2) ▼	1 (0.5)	~ ~	-5 (1.4) ▼	
Bahrain	78 (1.9)	469 (2.5)	4 (2.8)	21 (1.9)	462 (6.0)	0 (2.7)	1 (0.0)	~ ~	-4 (1.6) ▼	
Italy	78 (2.9)	498 (3.2)	10 (4.4) ▲	18 (2.6)	488 (7.2)	-5 (3.9)	4 (1.3)	480 (11.4)	-5 (2.5)	
Turkey	77 (3.7)	460 (4.3)	0 0	17 (3.3)	433 (8.5)	0 0	5 (1.9)	431 (20.2)	0 0	
Bulgaria	77 (2.9)	469 (7.3)	--	18 (2.5)	464 (9.8)	--	4 (1.3)	482 (21.3)	--	
England	s 77 (3.0)	550 (5.1)	15 (5.8) ▲	21 (2.8)	523 (8.7)	-13 (5.7) ▼	2 (0.8)	~ ~	-2 (1.9)	
Saudi Arabia	77 (3.7)	409 (2.9)	--	19 (3.4)	380 (7.8)	--	4 (1.5)	381 (10.3)	--	
Lebanon	76 (3.5)	422 (6.2)	-5 (4.3)	19 (3.1)	387 (16.7)	2 (4.1)	5 (1.6)	371 (20.5)	3 (1.8)	
Jordan	75 (3.8)	486 (5.2)	3 (5.2)	19 (3.2)	467 (8.7)	-7 (4.8)	7 (2.2)	476 (12.8)	4 (2.6)	
United States	r 73 (2.3)	531 (3.5)	-7 (3.3) ▼	23 (2.2)	493 (6.7)	5 (3.2)	4 (1.3)	452 (14.1)	2 (1.5)	
Tunisia	72 (3.5)	445 (2.7)	-3 (4.8)	23 (3.1)	445 (3.6)	2 (4.5)	5 (1.8)	429 (7.3)	0 (2.4)	
Korea, Rep. of	r 72 (3.6)	555 (2.2)	22 (5.0) ▲	23 (3.5)	544 (4.1)	-20 (4.9) ▼	5 (1.7)	562 (6.4)	-3 (2.7)	
Palestinian Nat'l Auth.	72 (3.7)	411 (4.6)	17 (5.6) ▲	16 (3.2)	399 (9.1)	-10 (5.0)	12 (2.6)	364 (11.1)	-8 (4.4)	
Scotland	s 69 (3.0)	497 (4.4)	8 (4.3)	29 (2.8)	494 (6.9)	-7 (4.1)	3 (0.9)	485 (22.8)	-2 (1.7)	
Malta	67 (0.4)	459 (1.7)	0 0	25 (0.3)	452 (2.2)	0 0	8 (0.1)	387 (3.8)	0 0	
Algeria	65 (3.4)	410 (2.2)	0 0	25 (3.1)	404 (3.0)	0 0	9 (2.1)	412 (4.5)	0 0	
Japan	63 (4.5)	559 (3.0)	8 (5.9)	29 (4.0)	549 (5.6)	-6 (5.3)	8 (2.3)	540 (6.6)	-2 (3.3)	
Chinese Taipei	62 (4.6)	557 (4.9)	-1 (6.3)	31 (4.3)	569 (5.8)	-1 (5.9)	7 (1.9)	540 (11.4)	2 (2.5)	
El Salvador	59 (3.9)	386 (4.5)	0 0	28 (3.9)	392 (5.8)	0 0	14 (2.8)	378 (9.2)	0 0	
Colombia	56 (4.1)	426 (4.8)	0 0	30 (4.4)	408 (6.3)	0 0	14 (3.1)	395 (7.7)	0 0	
Ghana	39 (4.0)	328 (10.7)	-4 (6.1)	42 (4.2)	293 (9.0)	-1 (6.4)	18 (3.0)	273 (10.0)	5 (4.5)	
Botswana	39 (4.3)	365 (5.6)	2 (6.3)	41 (4.8)	344 (5.3)	-2 (6.5)	20 (3.5)	354 (7.7)	0 (5.2)	
Armenia	r 36 (2.5)	490 (5.2)	-30 (3.9) ▼	21 (1.8)	481 (5.7)	-9 (3.1) ▼	43 (2.5)	489 (9.9)	38 (2.8) ▲	
‡ Morocco	48 (3.8)	413 (5.5)	--	32 (4.9)	400 (6.0)	--	20 (5.6)	396 (8.2)	--	
International Avg.	76 (0.4)	469 (0.6)		18 (0.4)	457 (1.3)		6 (0.2)	441 (2.3)		
<b>Benchmarking Participants</b>										
Dubai, UAE	s 99 (0.7)	487 (3.2)	0 0	1 (0.0)	~ ~	0 0	0 (0.0)	~ ~	0 0	
British Columbia, Canada	r 87 (2.5)	528 (3.0)	0 0	13 (2.5)	519 (9.4)	0 0	0 (0.2)	~ ~	0 0	
Ontario, Canada	84 (3.6)	532 (3.0)	-7 (4.3)	16 (3.5)	499 (12.6)	8 (4.2)	1 (0.4)	~ ~	-1 (1.5)	
Quebec, Canada	83 (3.6)	516 (4.5)	2 (4.9)	15 (3.4)	491 (8.5)	-3 (4.7)	2 (1.1)	~ ~	1 (1.1)	
Basque Country, Spain	82 (4.3)	500 (3.6)	13 (6.7)	17 (4.1)	486 (8.9)	-13 (6.7)	2 (1.3)	~ ~	0 (1.7)	
Minnesota, US	72 (6.3)	543 (4.0)	0 0	28 (6.3)	519 (14.3)	0 0	0 (0.0)	~ ~	0 0	
Massachusetts, US	71 (5.0)	570 (4.7)	0 0	29 (5.0)	512 (13.7)	0 0	0 (0.0)	~ ~	0 0	

▲ 2007 percent significantly higher      ▼ 2007 percent significantly lower

Index based on teachers' responses to three statements about their schools: this school is located in a safe neighborhood; I feel safe at this school; and this school's security policies and practices are sufficient. High level indicates that the teacher agrees a lot or agrees to all three statements. Low level indicates that teacher disagrees or disagrees a lot to all three statements. Medium level includes all other combinations of responses.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (-) indicates comparable data are not available. A tilde (~) indicates insufficient data to report achievement.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

A diamond (0) indicates the country did not participate in the assessment.

**Exhibit 8.15 Index of Students' Perception of Being Safe in School (SPBSS) with Trends**

**TIMSS2007**  
Science **4<sup>th</sup>** Grade

Country	High SPBSS			Medium SPBSS			Low SPBSS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Kazakhstan	80 (2.3)	535 (6.4)	◊ ◊	18 (2.2)	524 (5.7)	◊ ◊	3 (0.4)	518 (13.9)	◊ ◊
Sweden	70 (1.2)	529 (2.8)	◊ ◊	25 (0.9)	519 (3.7)	◊ ◊	5 (0.5)	494 (9.0)	◊ ◊
Denmark	59 (1.5)	520 (3.2)	◊ ◊	34 (1.4)	519 (3.5)	◊ ◊	8 (0.5)	499 (6.1)	◊ ◊
Norway	55 (1.3)	490 (3.8)	2 (1.7)	34 (0.9)	472 (3.9)	0 (1.3)	12 (0.8)	451 (7.1)	-1 (1.1)
Germany	54 (1.1)	540 (2.5)	◊ ◊	34 (0.8)	524 (3.4)	◊ ◊	12 (0.6)	506 (5.0)	◊ ◊
Japan	52 (1.3)	553 (2.6)	7 (1.8) ▲	34 (0.9)	547 (2.3)	-4 (1.2) ▼	14 (0.8)	536 (4.6)	-3 (1.1) ▼
Ukraine	52 (1.4)	483 (3.2)	◊ ◊	37 (1.0)	473 (3.5)	◊ ◊	11 (0.8)	459 (7.0)	◊ ◊
Russian Federation	51 (1.3)	552 (4.5)	11 (1.8) ▲	40 (1.1)	543 (6.1)	-6 (1.5) ▼	9 (0.6)	529 (8.0)	-5 (1.0) ▼
Lithuania	50 (1.3)	523 (2.7)	6 (1.7) ▲	38 (1.1)	510 (3.0)	-5 (1.5) ▼	12 (0.7)	492 (4.3)	-1 (1.0)
Austria	49 (1.0)	533 (2.6)	◊ ◊	35 (0.9)	524 (3.3)	◊ ◊	15 (0.9)	508 (4.4)	◊ ◊
Armenia	r 49 (1.6)	495 (4.9)	-9 (2.2) ▼	38 (1.3)	480 (8.3)	1 (1.9)	13 (1.0)	488 (15.2)	7 (1.1) ▲
Netherlands	48 (1.4)	531 (3.3)	5 (2.0) ▲	38 (1.1)	522 (2.8)	-2 (1.5)	14 (0.8)	503 (4.9)	-3 (1.3) ▼
Georgia	48 (1.5)	434 (4.9)	◊ ◊	43 (1.4)	415 (5.1)	◊ ◊	9 (0.7)	395 (10.0)	◊ ◊
Czech Republic	45 (1.5)	525 (3.7)	◊ ◊	43 (1.2)	513 (3.3)	◊ ◊	11 (0.7)	487 (5.1)	◊ ◊
Slovak Republic	44 (1.3)	545 (3.3)	◊ ◊	40 (1.0)	523 (5.3)	◊ ◊	15 (1.2)	490 (7.6)	◊ ◊
Iran, Islamic Rep. of	43 (1.4)	437 (4.9)	10 (2.6) ▲	43 (1.2)	438 (5.1)	-1 (1.9)	14 (0.8)	431 (7.1)	-9 (1.7) ▼
Latvia	41 (1.2)	549 (2.8)	-1 (1.9)	46 (1.1)	544 (3.1)	2 (1.6)	12 (0.8)	518 (3.7)	-1 (1.2)
Scotland	40 (1.2)	506 (3.1)	7 (1.8) ▲	39 (0.9)	506 (3.0)	0 (1.4)	21 (1.0)	482 (5.0)	-6 (1.6) ▼
Slovenia	40 (1.2)	525 (2.3)	0 (1.9)	42 (1.0)	521 (2.8)	2 (1.5)	18 (0.6)	502 (3.7)	-2 (1.4)
Yemen	39 (2.1)	212 (9.1)	◊ ◊	42 (1.5)	214 (7.4)	◊ ◊	19 (1.2)	179 (8.7)	◊ ◊
Italy	39 (1.0)	545 (3.9)	6 (1.5) ▲	41 (0.9)	532 (3.5)	0 (1.3)	20 (0.9)	521 (4.3)	-5 (1.3) ▼
Hong Kong SAR	37 (1.3)	561 (3.7)	-3 (1.9)	42 (0.9)	555 (3.8)	2 (1.3)	22 (1.1)	541 (4.8)	1 (1.6)
Algeria	36 (2.2)	378 (7.1)	◊ ◊	47 (1.6)	351 (6.5)	◊ ◊	17 (1.1)	326 (9.7)	◊ ◊
Hungary	35 (1.5)	553 (3.8)	-2 (1.9)	42 (1.2)	537 (4.6)	-1 (1.6)	23 (1.2)	516 (5.6)	3 (1.4)
Kuwait	34 (1.4)	395 (5.3)	◊ ◊	39 (1.0)	355 (5.2)	◊ ◊	27 (1.1)	310 (7.1)	◊ ◊
El Salvador	32 (1.4)	399 (5.0)	◊ ◊	46 (0.9)	394 (4.0)	◊ ◊	22 (1.2)	379 (5.6)	◊ ◊
England	32 (1.1)	556 (3.6)	0 (1.6)	43 (0.9)	544 (3.5)	1 (1.3)	25 (0.9)	522 (4.1)	-1 (1.5)
Colombia	31 (1.3)	424 (5.7)	◊ ◊	48 (1.0)	401 (5.5)	◊ ◊	21 (1.1)	385 (9.2)	◊ ◊
Australia	30 (1.2)	541 (3.7)	1 (1.6)	44 (1.3)	530 (4.0)	5 (1.6) ▲	26 (1.4)	512 (4.7)	-6 (1.9) ▼
Singapore	30 (0.9)	609 (4.5)	4 (1.3) ●	45 (0.7)	585 (4.1)	-2 (1.0)	25 (0.7)	566 (5.5)	-3 (1.2) ▼
Qatar	28 (0.5)	338 (3.2)	◊ ◊	40 (0.6)	302 (3.6)	◊ ◊	31 (0.6)	271 (3.1)	◊ ◊
Chinese Taipei	28 (1.1)	572 (2.6)	0 (1.5)	38 (0.9)	557 (2.5)	0 (1.2)	35 (1.1)	545 (2.7)	0 (1.5)
Morocco	r 26 (1.3)	325 (8.4)	1 (2.5)	54 (1.5)	298 (7.2)	2 (2.3)	20 (1.4)	285 (12.6)	-4 (2.0)
New Zealand	25 (0.9)	529 (3.4)	-1 (1.2)	42 (0.9)	509 (2.9)	0 (1.3)	33 (1.1)	483 (3.7)	1 (1.3)
Tunisia	23 (1.4)	362 (8.4)	0 (2.3)	49 (1.1)	327 (6.8)	-1 (1.6)	28 (1.1)	300 (7.5)	1 (1.8)
United States	--	--	--	--	--	--	--	--	--
International Avg.	42 (0.2)	489 (0.8)		40 (0.2)	475 (0.8)		18 (0.2)	455 (1.2)	
<b>Benchmarking Participants</b>									
British Columbia, Canada	37 (0.9)	550 (3.2)	◊ ◊	41 (0.9)	538 (3.2)	◊ ◊	22 (0.7)	516 (3.8)	◊ ◊
Quebec, Canada	35 (1.2)	527 (3.4)	1 (1.6)	43 (1.1)	517 (3.5)	1 (1.4)	22 (1.0)	502 (4.0)	-3 (1.5)
Alberta, Canada	35 (1.1)	557 (4.5)	◊ ◊	41 (1.0)	541 (4.0)	◊ ◊	24 (1.1)	525 (4.2)	◊ ◊
Ontario, Canada	32 (1.1)	549 (4.1)	2 (1.6)	42 (1.0)	537 (4.5)	2 (1.4)	25 (1.1)	520 (4.4)	-4 (1.6) ▼
Dubai, UAE	25 (1.3)	498 (4.6)	◊ ◊	48 (1.1)	468 (4.0)	◊ ◊	27 (1.4)	438 (5.7)	◊ ◊
Massachusetts, US	--	--	◊ ◊	--	--	◊ ◊	--	--	◊ ◊
Minnesota, US	--	--	◊ ◊	--	--	◊ ◊	--	--	◊ ◊

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

● 2007 percent significantly higher      ▼ 2007 percent significantly lower

Index based on students' responses to five statements about things that happened in their schools in the last month (1 = yes and 2 = no): something of mine was stolen; I was hit or hurt by other student(s) (e.g., shoving, hitting, kicking); I was made to do things that I didn't want to do by other students; I was made fun of or called names; and I was left out of activities by other students. High level indicates that the student answered NO to all five statements. Low level indicates that the student answered YES to three or more statements. Medium level includes all other possible combinations of responses.

- ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.
- A dash (-) indicates comparable data are not available.
- An "r" indicates data are available for at least 70 but less than 85% of the students.
- A diamond (◊) indicates the country did not participate in the assessment.

**Exhibit 8.15 Index of Students' Perception of Being Safe in School (SPBSS) with Trends (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	High SPBSS			Medium SPBSS			Low SPBSS		
	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003	2007 Percent of Students	Average Achievement	Difference in Percent from 2003
Sweden	75 (0.8)	514 (2.7)	-3 (1.3) ▼	20 (0.7)	515 (3.0)	1 (1.1)	5 (0.4)	474 (8.2)	2 (0.5) ▲
Georgia	73 (1.5)	435 (5.7)	0 0	22 (1.5)	419 (5.1)	0 0	5 (0.5)	373 (9.3)	0 0
Russian Federation	71 (1.1)	534 (3.6)	12 (1.4) ▲	25 (0.9)	525 (5.5)	-10 (1.3) ▼	4 (0.3)	504 (9.5)	-2 (0.5) ▼
Ukraine	70 (0.9)	493 (3.2)	0 0	25 (0.8)	478 (4.4)	0 0	4 (0.4)	463 (11.4)	0 0
Serbia	69 (1.1)	478 (3.0)	1 (1.6)	25 (0.9)	464 (4.6)	-2 (1.4)	6 (0.5)	443 (9.8)	1 (0.7)
Bosnia and Herzegovina	67 (1.0)	473 (2.6)	0 0	26 (0.9)	462 (4.1)	0 0	7 (0.6)	429 (7.7)	0 0
Norway	65 (1.1)	490 (2.3)	2 (1.5)	29 (1.0)	485 (2.9)	-1 (1.3)	5 (0.3)	475 (6.8)	-1 (0.6)
Armenia	65 (1.1)	489 (5.0)	-7 (1.5) ▼	27 (0.9)	493 (8.9)	5 (1.2) ▲	8 (0.6)	478 (15.6)	2 (0.8)
Japan	65 (1.0)	556 (2.3)	4 (1.4) ▲	28 (0.8)	552 (2.8)	-3 (1.1) ▼	7 (0.5)	548 (5.3)	-1 (0.7)
Italy	63 (1.1)	499 (3.1)	7 (1.5) ▲	32 (1.1)	490 (3.0)	-3 (1.4)	5 (0.4)	480 (7.3)	-4 (0.7) ▼
Hungary	61 (1.0)	543 (3.3)	0 (1.5)	30 (0.8)	536 (3.2)	-2 (1.3)	9 (0.7)	530 (5.7)	2 (0.8) ▲
Israel	61 (1.3)	480 (4.4)	7 (1.8) ▲	29 (1.1)	474 (5.4)	-7 (1.6) ▼	10 (0.8)	428 (8.2)	-1 (1.0)
Scotland	60 (1.1)	495 (3.6)	0 (1.7)	32 (1.0)	502 (4.3)	0 (1.4)	8 (0.6)	491 (7.9)	0 (0.9)
Lithuania	59 (1.0)	522 (2.9)	0 (1.5)	35 (1.0)	518 (3.3)	1 (1.3)	6 (0.5)	496 (6.5)	-1 (0.7)
Czech Republic	59 (1.2)	543 (2.3)	0 0	35 (0.9)	536 (2.3)	0 0	6 (0.5)	515 (5.8)	0 0
England	58 (1.1)	543 (4.5)	7 (1.8) ▲	33 (0.9)	544 (5.4)	-5 (1.4) ▼	9 (0.6)	539 (8.7)	-3 (1.1) ▼
Kuwait	58 (1.1)	432 (2.8)	0 0	31 (1.0)	414 (4.3)	0 0	11 (0.6)	377 (5.2)	0 0
El Salvador	54 (1.1)	389 (3.0)	0 0	38 (1.0)	388 (3.4)	0 0	8 (0.6)	386 (6.5)	0 0
Slovenia	54 (1.2)	538 (2.3)	1 (1.8)	36 (1.0)	543 (2.9)	-1 (1.6)	10 (0.7)	524 (6.1)	0 (0.9)
Jordan	53 (1.4)	500 (4.5)	35 (2.7) ▲	38 (1.2)	474 (4.5)	16 (2.0) ▲	9 (0.6)	442 (6.5)	-51 (3.3) ▼
Singapore	52 (0.9)	578 (4.2)	8 (1.2) ▲	37 (0.7)	562 (5.1)	-6 (1.0) ▼	11 (0.7)	537 (8.7)	-2 (0.8) ▼
Malta	52 (0.8)	469 (2.2)	0 0	37 (0.7)	456 (3.0)	0 0	12 (0.5)	419 (6.2)	0 0
Korea, Rep. of	51 (1.3)	550 (2.5)	-11 (1.7) ▼	41 (1.1)	558 (2.5)	9 (1.4) ▲	8 (0.5)	553 (4.9)	2 (0.7) ▲
Hong Kong SAR	51 (1.0)	535 (4.6)	5 (1.7) ▲	39 (0.8)	530 (5.5)	-4 (1.2) ▼	10 (0.7)	512 (8.3)	-2 (1.0) ▼
Malaysia	51 (1.5)	486 (5.8)	0 (1.9)	40 (1.1)	460 (6.5)	-1 (1.5)	9 (0.7)	438 (11.3)	1 (0.9)
Turkey	50 (1.4)	468 (4.4)	0 0	40 (1.2)	446 (4.5)	0 0	10 (0.6)	421 (6.0)	0 0
Bulgaria	50 (1.4)	479 (6.0)	--	38 (1.1)	475 (8.4)	--	12 (1.1)	447 (7.5)	--
Cyprus	50 (0.9)	459 (2.4)	9 (1.3) ▲	37 (0.8)	455 (2.6)	-5 (1.2) ▼	13 (0.5)	420 (5.4)	-4 (0.9) ▼
Syrian Arab Republic	49 (1.1)	464 (3.0)	0 0	36 (0.9)	451 (3.9)	0 0	15 (0.8)	429 (5.0)	0 0
Chinese Taipei	49 (1.2)	566 (4.4)	2 (1.4)	35 (0.8)	557 (3.7)	-1 (1.1)	16 (0.7)	556 (5.1)	-1 (1.0)
Iran, Islamic Rep. of	49 (1.5)	469 (3.8)	-1 (2.1)	41 (1.2)	452 (4.1)	2 (1.6)	10 (0.7)	441 (6.4)	-1 (1.0)
Oman	48 (1.2)	439 (3.6)	0 0	39 (0.9)	421 (3.5)	0 0	13 (0.7)	386 (6.6)	0 0
Romania	48 (1.1)	477 (4.3)	0 (1.8)	38 (1.0)	459 (4.1)	0 (1.4)	14 (0.7)	434 (6.0)	0 (1.2)
Qatar	47 (0.5)	338 (2.3)	0 0	38 (0.6)	320 (2.6)	0 0	15 (0.4)	274 (4.7)	0 0
Australia	46 (1.2)	517 (4.4)	4 (1.7) ▲	38 (1.0)	515 (4.1)	-1 (1.4)	15 (0.7)	514 (4.9)	-3 (1.1) ▼
Saudi Arabia	46 (1.2)	409 (2.9)	--	41 (1.0)	406 (2.8)	--	13 (0.7)	385 (5.9)	--
Algeria	46 (1.3)	413 (2.1)	0 0	43 (1.1)	408 (2.0)	0 0	11 (0.6)	403 (4.3)	0 0
Palestinian Nat'l Auth.	45 (1.4)	427 (4.2)	4 (1.9) ▲	42 (1.1)	401 (3.8)	0 (1.5)	13 (0.8)	355 (9.1)	-4 (1.2) ▼
Tunisia	43 (1.2)	446 (2.7)	-3 (1.5) ▼	43 (0.9)	445 (2.3)	3 (1.3) ▲	14 (0.9)	443 (3.5)	1 (1.1)
Egypt	42 (1.3)	437 (3.6)	0 (1.9)	39 (0.8)	403 (4.8)	-1 (1.3)	19 (1.2)	371 (5.9)	1 (1.5)
Colombia	40 (1.6)	421 (4.1)	0 0	48 (1.2)	416 (3.8)	0 0	12 (0.8)	416 (4.4)	0 0
Lebanon	39 (1.9)	448 (6.4)	2 (2.6)	38 (1.8)	414 (8.3)	1 (2.0)	23 (1.5)	372 (5.9)	-3 (2.3)
Bahrain	37 (0.8)	486 (2.7)	-5 (1.3) ▼	45 (0.8)	468 (2.5)	3 (1.2) ▲	18 (0.7)	439 (3.5)	1 (1.1)
Indonesia	36 (1.3)	430 (4.4)	-3 (1.8)	45 (1.1)	433 (3.4)	0 (1.5)	19 (1.1)	415 (5.1)	3 (1.4) ▲
Thailand	30 (1.2)	480 (4.6)	0 0	47 (1.0)	471 (4.2)	0 0	23 (1.0)	458 (6.6)	0 0
Ghana	14 (0.9)	341 (7.3)	1 (1.4)	50 (1.0)	315 (5.5)	1 (1.4)	36 (1.1)	279 (6.2)	-1 (1.7)
Botswana	10 (0.6)	391 (4.9)	-2 (0.8) ▼	59 (0.9)	368 (3.1)	3 (1.2) ▲	31 (1.0)	323 (4.4)	-1 (1.4)
United States	--	--	--	--	--	--	--	--	--
‡ Morocco	37 (1.4)	406 (5.2)	--	47 (1.1)	403 (3.2)	--	16 (1.0)	389 (6.0)	--
International Avg.	51 (0.2)	475 (0.6)		37 (0.1)	464 (0.6)		12 (0.1)	442 (1.0)	
<b>Benchmarking Participants</b>									
Basque Country, Spain	63 (1.5)	505 (3.0)	1 (2.5)	31 (1.4)	491 (4.3)	-1 (2.1)	6 (0.7)	467 (8.8)	0 (1.0)
Quebec, Canada	60 (1.1)	510 (3.2)	5 (1.6) ▲	34 (1.0)	508 (3.8)	-2 (1.4)	7 (0.6)	495 (6.2)	-3 (0.9) ▼
British Columbia, Canada	49 (1.1)	528 (3.2)	0 0	38 (0.9)	528 (3.1)	0 0	13 (0.8)	515 (4.8)	0 0
Ontario, Canada	47 (1.5)	529 (5.0)	2 (2.1)	39 (1.1)	526 (3.6)	-1 (1.5)	14 (1.0)	521 (4.0)	-1 (1.5)
Dubai, UAE	47 (1.9)	504 (3.9)	0 0	41 (1.5)	485 (3.6)	0 0	12 (0.8)	471 (6.2)	0 0
Massachusetts, US	--	--	0 0	--	--	0 0	--	--	0 0
Minnesota, US	--	--	0 0	--	--	0 0	--	--	0 0

▲ 2007 percent significantly higher ▼ 2007 percent significantly lower

Index based on students' responses to five statements about things that happened in their schools in the last month (1 = yes and 2 = no): something of mine was stolen; I was hit or hurt by other student(s) (e.g., shoving, hitting, kicking); I was made to do things that I didn't want to do by other students; I was made fun of or called names; and I was left out of activities by other students. High level indicates that the student answered NO to all five statements. Low level indicates that the student answered YES to three or more statements. Medium level includes all other possible combinations of responses.

‡ Did not satisfy guidelines for sample participation rates (see Appendix A).  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.  
 A dash (-) indicates comparable data are not available.  
 A diamond (0) indicates the country did not participate in the assessment.

indicating that they encountered none of the events listed above. However, 40 percent were at the medium level and 18 percent at the low level, implying that they had encountered at least some of these unpleasant events in school in the past month. The majority of students in Kazakhstan, Sweden, Denmark, Norway, Germany, Japan, the Ukraine, and the Russian Federation were at the high level. The percentage of students at the high level increased since 2003 in Japan, the Russian Federation, the Netherlands, Iran, Scotland, Italy, and Singapore, and decreased in Armenia.

At eighth grade, more than half (51%) the students across countries were at the high level of the student perception of being safe index, with 37 percent at the medium level and 12 percent at the low level. In Sweden, Georgia, the Russian Federation, and the Ukraine, 70 percent or more of students were at the high level of the index. Less than 20% of students were at the high level in Ghana and Botswana. TIMSS participants with increased percentages of students since 2003 at the high level of the index included the Russian Federation, Japan, Italy, Israel, England, Jordan, Singapore, Hong Kong SAR, Cyprus, Australia, the Palestinian National Authority, and the province of Quebec. There were decreases in Sweden, Armenia, Korea, Tunisia, Bahrain, and Botswana.

There was a positive association between average science achievement and students' perception of being safe at both fourth and eighth grades, with highest achievement among students at the high level of the index and lowest achievement among those at the low index level.





# Appendix A

## *Supporting Documentation*

### **TIMSS 2007 Science Framework**

The content and cognitive domains were the foundation of the TIMSS 2007 fourth and eighth grade science assessments. Exhibit A.1, shows the content and cognitive domains together with the target percentages designated in the TIMSS 2007 assessment framework for science. The content domains differed for the fourth and eighth grades, reflecting the nature and difficulty of the science widely taught at each grade.<sup>1</sup> There was more emphasis on life science at the fourth grade than at the eighth grade, where it was labeled biology. There was less emphasis on physical science at fourth grade, where it was assessed as a single domain, than at eighth grade, where chemistry and physics were assessed as separate domains. Earth science was given about the same amount of emphasis at both grades. The cognitive domains were the same for both grades, encompassing a range of cognitive processes involved in working scientifically and solving problems through the primary and middle school years.

<sup>1</sup> Each content domain had several topic areas (e.g., “life science” at fourth grade was further categorized by characteristics and life processes of living things; life cycles, reproduction, and heredity; interaction with the environment; ecosystems; and human health). Each topic area was presented as a list of objectives covered in many participating countries, at either fourth grade or eighth grade as appropriate. For the complete framework for the TIMSS 2007 science assessment, see Mullis, I.V.S., Martin, M.O., Ruddock, G.J., O’Sullivan, C.Y., Arora, A., & Erberber, E. (2005). *TIMSS 2007 assessment frameworks*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Exhibit A.1 **Overview of TIMSS 2007 Science Framework**TIMSS2007  
Science **4<sup>th</sup> & 8<sup>th</sup>  
Grades**

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

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



### Number of Items by Science Content and Cognitive Domains

Exhibit A.2 shows the distribution of the TIMSS 2007 items by content and cognitive domain for fourth and eighth grades. The fourth grade assessment had 74 life science items, 64 physical science items, and 36 earth science items, for a total of 174 items. Each item also was categorized according to its cognitive domain, with 77 items in the knowing domain, 63 in the applying domain, and 34 in the reasoning domain. It can be seen that the percentages of score points for the content and cognitive domains were nearly identical to those designated in the science assessment framework. A little more than half the items (93) were in multiple-choice format and the rest (81) were constructed-response items. The constructed-response items required students to generate and write their own answers. Some items required short answers while others demanded a more elaborate response. In scoring the assessment, correct answers to most questions (including all those in multiple-choice format) were worth one point. However, responses to questions seeking more elaborate responses were evaluated for partial credit, with a fully-correct answer being awarded two points. Thus, the total number of score points available for analyses (194) somewhat exceeds the number of items in the assessment. Fifty-two percent of the score points came from constructed-response items.

In the eighth grade assessment, there were 76 biology items, 42 chemistry items, 55 physics items, and 41 earth science items, for a total of 214. Of these, 84 were classified as measuring knowing, 86 as measuring applying, and 44 as measuring reasoning skills. Half the items were multiple choice and half constructed response. Fifty-five percent of the score points on the eighth grade assessment came from constructed response items.

Exhibit A.2 **Distribution of Science Items by Content Domain and Cognitive Domain**

TIMSS2007  
Science **4**<sup>th</sup> Grade

Content Domain	Number of Multiple-choice Items	Number of Constructed-response Items	Total Number of Items	Total Number of Score Points <sup>1</sup>	Percentage of Score Points
Life Science	42	32	74	85	44
Physical Science	35	29	64	67	34
Earth Science	16	20	36	42	22
Total	93	81	174	194	100

Cognitive Domain	Number of Multiple-choice Items	Number of Constructed-response Items	Total Number of Items	Total Number of Score Points <sup>1</sup>	Percentage of Score Points
Knowing	49	28	77	89	46
Applying	31	32	63	68	35
Reasoning	13	21	34	37	19
Total	93	81	174	194	100

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

<sup>1</sup> In scoring the tests, correct answers to most items were worth one point. However, responses to some constructed-response items were evaluated for partial credit with a fully correct answer awarded two points. Thus, the number of score points exceeds the number of items in the test.

**Exhibit A.2 Distribution of Science Items by Content Domain and Cognitive Domain (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>**  
Grade

Content Domain	Number of Multiple-choice Items	Number of Constructed-response Items	Total Number of Items	Total Number of Score Points <sup>1</sup>	Percentage of Score Points
Biology	36	40	76	89	37
Chemistry	21	21	42	46	19
Physics	31	24	55	59	25
Earth Science	19	22	41	46	19
<b>Total</b>	<b>107</b>	<b>107</b>	<b>214</b>	<b>240</b>	<b>100</b>

Cognitive Domain	Number of Multiple-choice Items	Number of Constructed-response Items	Total Number of Items	Total Number of Score Points <sup>1</sup>	Percentage of Score Points
Knowing	65	19	84	89	37
Applying	30	56	86	97	40
Reasoning	12	32	44	54	23
<b>Total</b>	<b>107</b>	<b>107</b>	<b>214</b>	<b>240</b>	<b>100</b>

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

<sup>1</sup> In scoring the tests, correct answers to most items were worth one point. However, responses to some constructed-response items were evaluated for partial credit with a fully correct answer awarded two points. Thus, the number of score points exceeds the number of items in the test.

## Grades and Ages Assessed

At fourth grade, the TIMSS 2007 target population consisted of all students enrolled in the fourth year of formal schooling, counting from the first year of primary school as defined by UNESCO's International Standard Classification for Education (ISCED).<sup>2</sup> According to the ISCED classification, Level 1 corresponds to primary education or the first stage of basic education, and the first year of Level 1 should mark the beginning of formal instruction in reading, writing, and mathematics. Accordingly, the fourth year of Level 1 should be fourth grade in most countries. To avoid testing very young children, however, TIMSS has a policy that the average age of children in the grade tested should not be below 9.5 years old. At eighth grade, the TIMSS 2007 target population was all students enrolled in the eighth year of formal schooling, again counting from the first year of primary school. This should be the eighth grade in most countries. However, the average age of students should not be below 13.5 years old.

Exhibit A.3 presents, for each of the TIMSS 2007 participants, the name of the grade tested in TIMSS, the number of years of formal schooling, and the average age of the students when TIMSS was conducted. Although almost all students assessed by TIMSS were in the fourth grade and had four years of formal schooling or were in the eighth grade and had eight years of formal schooling (the exceptions were England, Malta, New Zealand, and Scotland where children at these grade levels would have been too young), there was some variation across participants in students' average age. Because the distribution of ages within a grade level is determined by the policy on age of entry to primary school and how this is implemented in practice, and by promotion and retention practices through the grades, the exhibit also provides a summary of each participant's policy on age of entry, the usual age of entry in practice, and an indication of whether or not participants have a policy on promotion and retention.

2 UNESCO Institute for Statistics. (1999). *Operational manual for ISCED-1997 (international standard classification of education)*. Paris: Author.

Although most TIMSS participants require children to begin primary school when they are 6 or 7 years old, there are many variations on how this policy is implemented that have an impact on the age of the assessed population. For example, participants that require children to begin school in the calendar year in which they turn six generally had the youngest student populations in TIMSS—about 9.8 years old in fourth grade and 13.8 in eighth grade. Australia, Italy, Norway, Qatar, and Slovenia, as well as the Canadian provinces of Alberta, British Columbia, and Ontario follow this model. Requiring students to be six years old by September of the year in which they start school results in a population older by about four months on average, and an average of about 10.2 or 14.2 years, at fourth and eighth grades, respectively, at the time of the TIMSS testing. Examples of TIMSS participants following this approach include Austria, Chinese Taipei, the Czech Republic, the Slovak Republic, and the state of Minnesota and province of Quebec. Where students begin school in the calendar year in which they turn seven, which is the practice in several northern and eastern European countries such as Bulgaria, Denmark, Latvia, Lithuania, and Sweden, the TIMSS student population is older still—10.8 to 11.0 years old, on average.

**Exhibit A.3 Information About the Grades and Ages of Students Tested in TIMSS 2007**
**TIMSS2007**  
**Science** **4<sup>th</sup> & 8<sup>th</sup> Grades**

Country	Grades 4 and 8		
	Policy on Age of Entry to Primary School*	Practice on Age of Entry to Primary School	Policy on Promotion/Retention
Algeria	Children must be 6 years old by December 31st of the academic year in which they enroll	6	●
Armenia	Children must be 6 years old by the end of June to begin in September	7	●
Australia	Age of entry requirement varies among the states and territories; generally children must start in the year in which they turn 6	5	○
Austria	Children must be 6 years old by September 1st, or upon special request, by March 1st the following year	6	●
Bahrain	Children must be 6 years old by the end of December	6	●
Bosnia and Herzegovina	Children must be 6 years old by December 31st	6	●
Botswana	Children must be 6 years old by June, although in rural or remote areas the entry age is flexible	6	●
Bulgaria	Children must be 7 years old in the calendar year, or 6 years old with parent/guardian permission	7	○
Chinese Taipei	Children must be 6 years old by September 1st	6	○
Colombia	Children must be 6 years old	6	●
Cyprus	Children must be 5 years, 8 months old by September 1st	5 years, 8 months	●
Czech Republic	Children must be 6 years old by September 1st	6	●
Denmark	Children must be 7 years old in the calendar year to begin August 1st	7	●
Egypt	Children must be 6 years old by October 1st	6	●
El Salvador	Children must be 7 years old by May of the academic year	7	●
England	Children must begin school at the start of the term following their 5th birthday	5	○
Georgia	Children must be 6 years old by the end of December	6	●
Germany	Children must be 6 years old by June 30th, or upon special request, by December 31st of that year	6	●
Ghana	Children must be 6 years old in the calendar year to begin in September	6	●
Hong Kong SAR	Children must be 5 years, 8 months old in September	6	●
Hungary	Children must be 6 years old by May 31st or upon special request, by December 31st to begin school in September	6 to 7	●
Indonesia	Children may enter at 6 years old, but must enter at 7 years old	6	●
Iran, Islamic Rep. of	Children must be 6 years old by September 20th to start school on September 21st of the same year	6	●
Israel	Children must be 6 years old; each year there is an announcement specifying the birth dates that are relevant to the requirement	6	●
Italy	Children must be 6 years old by December 31st, or by March 31st the following year with an examination	6	●
Japan	Children must be 6 years old by April 1st	6	●
Jordan	Children must be 5 years, 8 months old	5 years, 8 months	●
Kazakhstan	Children must be 6 years old by the end of August to begin in September	6 to 7	●
Korea, Rep. of	Children must be 6 years old, or 5 years old based on the guardian's decision	6	●
Kuwait	Children must be 5.5 years old by September 15th	6	–
Latvia	Children must be 7 years old during the calendar year	7	○
Lebanon	Children must be 6 years old	6	●
Lithuania	Children may begin school when they are 6 years old, and are required when they are 7	6 to 7 (more 7)	●
Malaysia	Children begin school during the calendar year of their 7th birthday	7	○
Malta	Children must be 5 years old by the end of December	5	●
Mongolia	Children must 7 years old, or in special cases, 8 years old	7 to 8	●
Morocco	Children must be 6 years old in September	6	●
Netherlands	Children usually begin primary school at age 6	6	○
New Zealand	Children must be in school by the time they are 6 years old, but they may start from their 5th birthday	5	●
Norway	Children begin school during the calendar year of their 6th birthday	6	●
Oman	Children must be 6 years old by September 1st	6	●
Palestinian Nat'l Auth.	Children must be 5 years, 8 months old by September 1st	5.5	●
Qatar	Children must be 6 years old at the end of September to begin school in September	6	●
Romania	Children are 6–7 years old, but there is no specific date regulation about the age of entry	7	●
Russian Federation	Children must be 6.5 years old	6 to 7	○
Saudi Arabia	Children must be 6 years old, or must turn 6 within 90 days of starting school	5 to 6	●
Scotland	Children can begin school between the ages of 4.5 and 6; those with a March–August birth date must start in the August following their 5th birthday; children with a September–February birth date may defer entry until the following year	4.5 to 5.5	○
Serbia	Children must be at least 6.5 years old and no older than 7.5 years old by September 1st to begin school in September	7	●
Singapore	Children must be 6 years old by January 1st of the year of admission	6	●
Slovak Republic	Children must be 6 years old by the end of August to begin school in September	6	●

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

 ● Yes  
 ○ No

Background data provided by National Research Coordinators.

\* Age of entry to primary school based on the beginning of ISCED Level 1 in UNESCO's International Standard Classification of Education (Operational Manual for ISCED–97).

\*\* Represents years of schooling counting from the first year of ISCED Level 1.


**TIMSS & PIRLS**  
 International Study Center  
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Exhibit A.3 Information About the Grades and Ages of Students Tested in TIMSS 2007 (Continued)						TIMSS2007 Science	4 <sup>th</sup> & 8 <sup>th</sup> Grades
Grade 4			Grade 8			Country	
Country's Name for Grade Tested	Years of Formal Schooling**	Average Age at Time of Testing	Country's Name for Grade Tested	Years of Formal Schooling**	Average Age at Time of Testing		
Four year primary	4	10.2	Second year of middle school	8	14.5	Algeria	
Grade 4	4	10.6	Grade 8	8	14.9	Armenia	
Year 4	4	9.9	Year 8	8	13.9	Australia	
Fourth grade / Last grade of primary education	4	10.3				Austria	
			Second intermediate	8	14.1	Bahrain	
			Final grade (grade 8 and grade 9)	8 or 9	14.7	Bosnia and Herzegovina	
			Form one	8	14.9	Botswana	
			Grade 8	8	14.9	Bulgaria	
Elementary school, grade 4	4	10.2	Junior high school, grade 8	8	14.2	Chinese Taipei	
Fourth grade	4	10.4	Eighth grade	8	14.5	Colombia	
			B Gymnasium	8	13.8	Cyprus	
Grade 4	4	10.3	Grade 8	8	14.4	Czech Republic	
Grade 4	4	11.0				Denmark	
			Preparatory 2	8	14.1	Egypt	
Fourth grade of basic education	4	11.0	Eighth grade of basic education	8	15.0	El Salvador	
Year 5	5	10.2	Year 9	9	14.2	England	
Grade 4	4	10.1	Grade 8	8	14.2	Georgia	
Grade 4	4	10.4				Germany	
			Junior secondary school II (JSS II)	8	15.8	Ghana	
Primary 4	4	10.2	Secondary 2	8	14.4	Hong Kong SAR	
Fourth grade	4	10.7	Eighth grade	8	14.6	Hungary	
			Grade 8	8	14.3	Indonesia	
Fourth grade of primary school	4	10.2	Third year in guidance school	8	14.2	Iran, Islamic Rep. of	
			Eighth Grade	8	14.0	Israel	
Grade 4 (IV class of primary school)	4	9.8	Grade 8 (III Media)	8	13.9	Italy	
Fourth grade at the elementary school	4	10.5	Second grade at the lower secondary school	8	14.5	Japan	
			Grade 8	8	14.0	Jordan	
Fourth grade (1st stage of basic education)	4	10.6				Kazakhstan	
			Grade 2 of middle school	8	14.3	Korea, Rep. of	
Grade 5 (Primary)	4	10.2	Ninth grade (Intermediate)	8	14.4	Kuwait	
Grade 4	4	11.0				Latvia	
			Grade 8 of the basic educational level	8	14.4	Lebanon	
Grade 4	4	10.8	Grade 8	8	14.9	Lithuania	
			Form 2 (Grade 8)	8	14.3	Malaysia	
			Form 3 (Grade 9)	9	14.0	Malta	
Primary 4	4	10.6	Secondary 8	8	14.9	Mongolia	
Grade 4 primary school	4	10.6	Second year collegial	8	14.8	Morocco	
Grade 6 (the first year of kindergarten is grade 1)	4	10.2				Netherlands	
Year 5 (year 1 is equivalent to kindergarten)	4.5–5.5	10.0				New Zealand	
Grade 4	4	9.8	Grade 8	8	13.8	Norway	
			Grade 8	8	14.3	Oman	
			Eighth grade	8	14.0	Palestinian Nat'l Auth.	
Fourth grade	4	9.7	Grade 8	8	13.9	Qatar	
			Grade 8	8	15.0	Romania	
Fourth grade	4	10.8	Eighth grade	7 or 8	14.6	Russian Federation	
			Second year of middle school	8	14.4	Saudi Arabia	
Primary 5 (P5)	5	9.8	Secondary 2 (S2)	9	13.7	Scotland	
			Eighth grade	8	14.9	Serbia	
Primary 4	4	10.4	Secondary 2	8	14.4	Singapore	
Fourth grade	4	10.4				Slovak Republic	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

**Exhibit A.3 Information About the Grades and Ages of Students Tested in TIMSS 2007 (Continued)**
**TIMSS2007**  
**Science** **4<sup>th</sup> & 8<sup>th</sup>**  
**Grades**

Country	Grades 4 and 8		
	Policy on Age of Entry to Primary School*	Practice on Age of Entry to Primary School	Policy on Promotion/Retention
Slovenia	Children must be 6 years old by December 31st	6	●
Sweden	Children must begin during the calendar year they turn 7; upon parental request, children may start school the year they turn 6 or 8	7	○
Syrian Arab Republic	Children must be 5 years, 9 months old by January	6	●
Thailand	Children must be 6 years old by May 16th	5 to 7	○
Tunisia	Children must be 6 years old by the end of December of the year in which they enter school, or by the end of March if there are vacancies	6	●
Turkey	Children must be 6 years old by the end of September	6	●
Ukraine	Children begin school during the calendar year of their 7th birthday	7	●
United States	Policies vary by state	6	○
Yemen	Children must be 6 years old by October 1st of the related school year	6	●
<b>Benchmarking Participants</b>			
Alberta, Canada	Children must be 6 years old by June 1st to begin school the following September	5	○
Basque Country, Spain	Children begin school during the calendar year of their 6th birthday	6	●
British Columbia, Canada	Children must be 6 years old by December 31 of that school year	6	○
Dubai, UAE	Children must be 5.5 years old by October 1st	5 years, 8 months	○
Massachusetts, US	Children must be 6 years old during the calendar year (or younger if the school committee agrees) to start in September	5 or 6	○
Minnesota, US	Children must be in school by the time they are 7 years old	6	○
Ontario, Canada	Children who are 6 years old by the first school day in September are required to begin, but any student who is 6 by December 31st may also begin in September	6	○
Quebec, Canada	Children must be 6 years old by October 1st to begin in September	6	●

 ● Yes  
 ○ No

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



**Exhibit A.3 Information About the Grades and Ages of Students Tested in TIMSS 2007 (Continued)**



Grade 4			Grade 8			Country
Country's Name for Grade Tested	Years of Formal Schooling**	Average Age at Time of Testing	Country's Name for Grade Tested	Years of Formal Schooling**	Average Age at Time of Testing	
Grade 4	4	9.8	Grade 8	7 or 8	13.8	Slovenia
Grade 4	4	10.8	Grade 8	8	14.8	Sweden
			Grade 8	8	13.9	Syrian Arab Republic
			Middle school grade 2	8	14.3	Thailand
Fourth grade of basic school	4	10.2	Eighth year of basic school	8	14.5	Tunisia
			Eighth Grade	8	14.0	Turkey
Grade 4	4	10.3	Grade 8	8	14.2	Ukraine
Grade 4 of elementary school	4	10.3	Grade 8	8	14.3	United States
Grade 4	4	11.2				Yemen
<b>Benchmarking Participants</b>						
Grade 4	4	9.8				Alberta, Canada
			Second course of secondary compulsory education	8	14.1	Basque Country, Spain
Grade 4	4	9.8	Grade 8	8	13.9	British Columbia, Canada
Grade 4 or Grade 5	4	10.0	Grade 8 or Grade 9	8	14.2	Dubai, UAE
Fourth grade	4	10.3	Eighth grade	8	14.2	Massachusetts, US
Fourth grade	4	10.3	Eighth grade	8	14.3	Minnesota, US
Grade 4	4	9.8	Grade 8	8	13.8	Ontario, Canada
Second year of second cycle	4	10.1	Secondary II (cycle one)	8	14.2	Quebec, Canada

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Sample Implementation and Participation Rates

The TIMSS 2007 assessment was administered to carefully-drawn random samples of students from the target population in each country. Because the accuracy of the TIMSS results depends on the quality of the national samples, TIMSS worked with participating countries on all phases of sampling to ensure efficient sampling design and implementation. National coordinators were trained in how to select the school and student samples, and in how to use the *WinW3S* sampling software provided by the IEA Data Processing and Research Center. Staff from Statistics Canada reviewed the national sampling plans, sampling data, sampling frames, and sample selections. The sampling documentation was used by the TIMSS & PIRLS International Study Center (in consultation with Statistics Canada and the sampling referee) to evaluate the quality of the samples.

In a few situations where it was not possible to test the entire international target population (i.e., all students enrolled in the fourth or eighth grade), countries were permitted to define a target population that excluded part of the international target population. Exhibit A.4 shows any differences in coverage between the international and national target populations. Almost all participants achieved 100% coverage, the exceptions at fourth grade being Georgia (tested only students taught in Georgian), Kazakhstan (students taught in Kazakh or Russian), Latvia (students taught in Latvian), and Lithuania (students taught in Lithuanian), and, at eighth grade, Georgia (tested only students taught in Georgian), Lithuania (students taught in Lithuanian), and Serbia (did not include Kosovo).

Within the target population, countries could define a population that excluded a small percentage (no more than 5%) of certain kinds of schools or students that would be very difficult or resource intensive to test (e.g., schools for students with special needs or schools that were very small or located in remote rural areas). Almost all countries kept their excluded students below the 5% limit. The only exceptions at the fourth grade were the United States and among benchmarking participants, the U.S. states of Massachusetts and Minnesota and the Canadian provinces of Alberta, British Columbia, Ontario and Quebec, which excluded more than 5 but less than

10 percent of their fourth grade populations. Exceptions at the eighth grade included Serbia and the United States, as well as Massachusetts, Minnesota, and Ontario, which excluded more than 5 but less than 10 percent of their eighth grade population, and Israel, British Columbia, and Quebec, which excluded more than 10 percent of their eighth-grade student population.

The basic design of the sample used in TIMSS 2007 was a two-stage stratified cluster design.<sup>3</sup> The first stage consisted of a sampling of schools, and the second stage of a sampling of intact classrooms from the target grade in the sampled schools. Schools were selected with probability proportional to size, and classrooms with equal probabilities. Most countries sampled 150 schools, and one or two intact classrooms from each school.<sup>4</sup> This approach was designed to yield a representative sample of at least 4,500 students in each country.

Exhibits A.5 and A.6 present achieved sample sizes for schools and students, respectively.<sup>5</sup> Exhibit A.7 shows the participation rates for schools, students, and overall—both with and without the use of replacement schools. Most countries achieved the minimum acceptable participation rates—85 percent of both the schools and students, or a combined rate (the product of school and student participation) of 75 percent—although, at the fourth grade, Denmark, Scotland, the United States, and Minnesota did so only after including replacement schools and have been annotated in the exhibits of this report. Although the Netherlands had an overall participation rate of 91 percent including replacement schools, its participation rate among schools before replacement (48%) was just below the required minimum of 50 percent, and so the Netherlands has been annotated accordingly. At the eighth grade, all participants except Morocco achieved the minimum acceptable participation rate, although England, Hong Kong SAR, Scotland, the United States, and Minnesota did so only after including replacement schools and were annotated in exhibits in this report. Morocco, with an overall participation rate of 55 percent, was annotated in report exhibits and placed below a line following the other countries. Mongolia did not provide the necessary documentation for sampling, data collection, and scoring activities so its achievement data are summarized in Appendix E.

3 See Joncas, M. (2008). TIMSS sampling design. In J.F. Olson, M.O. Martin, & I.V.S. Mullis (Eds.), *TIMSS 2007 technical report*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

4 For further detail, see Joncas, M. (2008). TIMSS 2007 sampling weights and participation rates. In J.F. Olson, M.O. Martin, & I.V.S. Mullis (Eds.), *TIMSS 2007 technical report*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

5 In cases where students were not given parental permission to participate, they were absent and included as such in Exhibits A.6 and A.7.

## Exhibit A.4 Coverage of TIMSS 2007 Target Population

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	International Target Population		Exclusions from National Target Population		
	Coverage	Notes on Coverage	School-level Exclusions	Within-sample Exclusions	Overall Exclusions
Algeria	100%		2.1%	0.0%	2.1%
Armenia	100%		2.7%	0.7%	3.4%
Australia	100%		1.3%	2.7%	4.0%
Austria	100%		1.3%	3.7%	5.0%
Chinese Taipei	100%		0.2%	2.5%	2.8%
Colombia	100%		1.3%	0.8%	2.1%
Czech Republic	100%		4.4%	0.5%	4.9%
Denmark	100%		2.0%	2.1%	4.1%
El Salvador	100%		1.4%	0.9%	2.3%
England	100%		1.6%	0.5%	2.1%
Georgia	85%	Students taught in Georgian	2.3%	2.5%	4.8%
Germany	100%		1.2%	0.2%	1.3%
Hong Kong SAR	100%		4.9%	0.5%	5.4%
Hungary	100%		2.6%	1.7%	4.4%
Iran, Islamic Rep. of	100%		2.9%	0.0%	3.0%
Italy	100%		0.1%	5.3%	5.3%
Japan	100%		0.4%	0.6%	1.1%
Kazakhstan	94%	Students taught in Kazakh or Russian	2.2%	3.1%	5.3%
Kuwait	100%		0.0%	0.0%	0.0%
Latvia	72%	Students taught in Latvian	4.2%	0.4%	4.6%
Lithuania	93%	Students taught in Lithuanian	2.2%	3.1%	5.4%
Morocco	100%		1.4%	0.0%	1.4%
Netherlands	100%		3.7%	1.0%	4.8%
New Zealand	100%		2.8%	2.6%	5.4%
Norway	100%		1.9%	3.3%	5.1%
Qatar	100%		1.5%	0.2%	1.8%
Russian Federation	100%		2.2%	1.5%	3.6%
Scotland	100%		2.6%	1.9%	4.5%
Singapore	100%		1.5%	0.0%	1.5%
Slovak Republic	100%		1.4%	1.9%	3.3%
Slovenia	100%		0.8%	1.3%	2.1%
Sweden	100%		2.0%	1.1%	3.1%
Tunisia	100%		2.7%	0.2%	2.9%
Ukraine	100%		0.6%	0.0%	0.6%
United States	100%		0.0%	9.2%	9.2%
Yemen	100%		1.9%	0.1%	2.0%
<b>Benchmarking Participants</b>					
Alberta, Canada	100%		2.0%	5.7%	7.6%
British Columbia, Canada	100%		2.2%	6.9%	9.2%
Dubai, UAE	100%		4.2%	1.2%	5.4%
Massachusetts, US	100%		0.0%	10.4%	10.4%
Minnesota, US	100%		0.0%	8.3%	8.3%
Ontario, Canada	100%		0.6%	5.7%	6.3%
Quebec, Canada	100%		2.1%	4.3%	6.4%

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit A.4 Coverage of TIMSS 2007 Target Population (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	International Target Population		Exclusions from National Target Population		
	Coverage	Notes on Coverage	School-level Exclusions	Within-sample Exclusions	Overall Exclusions
Algeria	100%		0.1%	0.0%	0.1%
Armenia	100%		2.7%	0.5%	3.3%
Australia	100%		0.6%	1.2%	1.9%
Bahrain	100%		1.4%	0.1%	1.5%
Bosnia and Herzegovina	100%		0.4%	1.1%	1.5%
Botswana	100%		0.0%	0.1%	0.1%
Bulgaria	100%		2.2%	18.2%	20.3%
Chinese Taipei	100%		0.1%	3.3%	3.3%
Colombia	100%		1.5%	0.1%	1.6%
Cyprus	100%		0.0%	2.5%	2.5%
Czech Republic	100%		4.3%	0.3%	4.6%
Egypt	100%		0.1%	0.4%	0.5%
El Salvador	100%		1.2%	1.6%	2.8%
England	100%		2.0%	0.3%	2.3%
Georgia	85%	Students taught in Georgian	2.3%	1.6%	3.9%
Ghana	100%		0.9%	0.0%	0.9%
Hong Kong SAR	100%		3.7%	0.1%	3.8%
Hungary	100%		2.6%	1.4%	3.9%
Indonesia	100%		3.4%	0.0%	3.4%
Iran, Islamic Rep. of	100%		0.5%	0.0%	0.5%
Israel	100%		14.5%	8.3%	22.8%
Italy	100%		0.0%	4.9%	5.0%
Japan	100%		0.6%	2.9%	3.5%
Jordan	100%		0.2%	1.8%	2.0%
Korea, Rep. of	100%		1.2%	0.5%	1.6%
Kuwait	100%		0.0%	0.3%	0.3%
Lebanon	100%		1.4%	0.0%	1.4%
Lithuania	92%	Students taught in Lithuanian	1.4%	2.7%	4.2%
Malaysia	100%		3.3%	0.0%	3.3%
Malta	100%		0.8%	2.1%	2.9%
Morocco	100%		0.1%	0.0%	0.1%
Norway	100%		0.9%	1.7%	2.6%
Oman	100%		0.3%	0.9%	1.2%
Palestinian Nat'l Auth.	100%		0.1%	0.9%	1.0%
Qatar	100%		0.6%	0.2%	0.8%
Romania	100%		1.5%	0.3%	1.8%
Russian Federation	100%		1.1%	1.2%	2.3%
Saudi Arabia	100%		0.4%	0.1%	0.5%
Scotland	100%		1.3%	0.4%	1.7%
Serbia	80%	Serbia without Kosovo	2.9%	3.9%	6.8%
Singapore	100%		1.8%	0.0%	1.8%
Slovenia	100%		0.9%	1.0%	1.9%
Sweden	100%		2.1%	1.6%	3.6%
Syrian Arab Republic	100%		0.6%	0.0%	0.6%
Thailand	100%		3.4%	0.0%	3.4%
Tunisia	100%		0.0%	0.0%	0.0%
Turkey	100%		2.1%	0.5%	2.6%
Ukraine	100%		0.2%	0.0%	0.2%
United States	100%		0.0%	7.9%	7.9%
<b>Benchmarking Participants</b>					
Basque Country, Spain	100%		1.2%	3.0%	4.2%
British Columbia, Canada	100%		2.8%	15.0%	17.7%
Dubai, UAE	100%		4.2%	0.8%	5.0%
Massachusetts, US	100%		0.0%	8.4%	8.4%
Minnesota, US	100%		0.0%	7.5%	7.5%
Ontario, Canada	100%		0.4%	5.8%	6.2%
Quebec, Canada	100%		1.5%	12.1%	13.6%

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Exhibit A.5 School Sample Sizes

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Number of Schools in Original Sample	Number of Eligible Schools in Original Sample	Number of Schools in Original Sample that Participated	Number of Replacement Schools that Participated	Total Number of Schools that Participated
Algeria	150	150	149	0	149
Armenia	150	148	143	5	148
Australia	230	229	226	3	229
Austria	199	197	194	2	196
Chinese Taipei	150	150	150	0	150
Colombia	150	143	132	10	142
Czech Republic	150	147	132	12	144
Denmark	150	150	105	32	137
El Salvador	150	148	146	2	148
England	160	159	131	12	143
Georgia	152	144	131	13	144
Germany	250	247	239	7	246
Hong Kong SAR	150	150	122	4	126
Hungary	150	145	135	9	144
Iran, Islamic Rep. of	240	224	224	0	224
Italy	170	170	155	15	170
Japan	150	150	145	3	148
Kazakhstan	150	141	140	1	141
Kuwait	150	150	149	0	149
Latvia	150	150	140	6	146
Lithuania	163	156	154	2	156
Morocco	226	224	184	0	184
Netherlands	150	148	72	69	141
New Zealand	220	220	213	7	220
Norway	150	150	131	14	145
Qatar	114	114	114	0	114
Russian Federation	206	206	206	0	206
Scotland	150	148	114	25	139
Singapore	177	177	177	0	177
Slovak Republic	184	184	181	3	184
Slovenia	150	150	138	10	148
Sweden	160	155	151	4	155
Tunisia	150	150	150	0	150
Ukraine	150	150	144	0	144
United States	300	290	202	55	257
Yemen	150	144	143	1	144
<b>Benchmarking Participants</b>					
Alberta, Canada	150	148	146	0	146
British Columbia, Canada	150	150	147	3	150
Dubai, UAE	143	132	97	0	97
Massachusetts, US	50	49	45	2	47
Minnesota, US	50	50	30	20	50
Ontario, Canada	200	197	179	9	188
Quebec, Canada	200	192	185	1	186

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit A.5 School Sample Sizes (Continued)					TIMSS2007 Science 8 <sup>th</sup> Grade
Country	Number of Schools in Original Sample	Number of Eligible Schools in Original Sample	Number of Schools in Original Sample that Participated	Number of Replacement Schools that Participated	Total Number of Schools that Participated
Algeria	150	150	149	0	149
Armenia	150	148	143	5	148
Australia	230	228	228	0	228
Bahrain	74	74	74	0	74
Bosnia and Herzegovina	150	150	150	0	150
Botswana	150	150	150	0	150
Bulgaria	170	142	134	5	139
Chinese Taipei	150	150	150	0	150
Colombia	150	148	142	6	148
Cyprus	67	67	67	0	67
Czech Republic	150	147	135	12	147
Egypt	237	233	231	2	233
El Salvador	150	145	143	2	145
England	160	160	126	11	137
Georgia	152	135	131	4	135
Ghana	163	163	163	0	163
Hong Kong SAR	152	152	112	8	120
Hungary	150	145	133	11	144
Indonesia	150	149	149	0	149
Iran, Islamic Rep. of	220	208	208	0	208
Israel	150	150	140	6	146
Italy	170	170	159	11	170
Japan	150	150	144	2	146
Jordan	200	200	200	0	200
Korea, Rep. of	150	150	150	0	150
Kuwait	163	163	158	0	158
Lebanon	150	148	120	16	136
Lithuania	150	144	141	1	142
Malaysia	150	150	150	0	150
Malta	60	59	59	0	59
Morocco	205	205	131	0	131
Norway	150	150	133	6	139
Oman	150	146	146	0	146
Palestinian Nat'l Auth.	155	148	147	1	148
Qatar	67	67	66	0	66
Romania	150	150	149	0	149
Russian Federation	210	210	210	0	210
Saudi Arabia	167	166	165	0	165
Scotland	150	150	109	20	129
Serbia	150	147	147	0	147
Singapore	164	164	164	0	164
Slovenia	150	150	138	10	148
Sweden	160	159	158	1	159
Syrian Arab Republic	150	150	150	0	150
Thailand	150	150	134	16	150
Tunisia	150	150	150	0	150
Turkey	150	146	146	0	146
Ukraine	150	150	146	0	146
United States	300	287	197	42	239
<b>Benchmarking Participants</b>					
Basque Country, Spain	130	130	130	0	130
British Columbia, Canada	150	150	147	3	150
Dubai, UAE	122	115	88	0	88
Massachusetts, US	50	49	45	3	48
Minnesota, US	50	50	32	17	49
Ontario, Canada	200	191	168	8	176
Quebec, Canada	191	183	170	0	170

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Exhibit A.6 Student Sample Sizes

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Within-school Student Participation (Weighted Percentage)	Number of Sampled Students in Participating Schools	Number of Students Withdrawn from Class/School	Number of Students Excluded	Number of Eligible Students	Number of Students Absent	Number of Students Assessed
Algeria	97%	4366	22	0	4344	121	4223
Armenia	96%	4253	0	0	4253	174	4079
Australia	95%	4511	78	105	4328	220	4108
Austria	98%	5158	18	156	4984	125	4859
Chinese Taipei	100%	4260	17	93	4150	19	4131
Colombia	98%	5320	349	40	4931	130	4801
Czech Republic	94%	4583	41	17	4525	290	4235
Denmark	94%	3907	59	89	3759	240	3519
El Salvador	98%	4467	202	0	4265	99	4166
England	93%	4784	128	33	4623	307	4316
Georgia	98%	4384	69	68	4247	139	4108
Germany	97%	5464	78	9	5377	177	5200
Hong Kong SAR	96%	3965	13	23	3929	138	3791
Hungary	97%	4221	22	26	4173	125	4048
Iran, Islamic Rep. of	99%	3939	53	2	3884	51	3833
Italy	97%	4912	20	256	4636	166	4470
Japan	97%	4677	7	20	4650	163	4487
Kazakhstan	100%	4063	22	39	4002	12	3990
Kuwait	85%	4468	439	0	4029	226	3803
Latvia	95%	4188	2	10	4176	268	3908
Lithuania	94%	4345	15	122	4208	228	3980
Morocco	96%	4282	215	0	4067	173	3894
Netherlands	97%	3608	152	9	3447	98	3349
New Zealand	96%	5347	104	86	5157	217	4940
Norway	95%	4462	21	143	4298	190	4108
Qatar	97%	7411	153	18	7240	221	7019
Russian Federation	98%	4659	36	42	4581	117	4464
Scotland	94%	4320	92	32	4196	267	3929
Singapore	96%	5235	26	1	5208	167	5041
Slovak Republic	97%	5269	47	64	5158	195	4963
Slovenia	95%	4664	10	57	4597	246	4351
Sweden	97%	4965	60	49	4856	180	4676
Tunisia	99%	4242	50	10	4182	48	4134
Ukraine	97%	4459	16	0	4443	151	4292
United States	95%	9000	140	543	8317	421	7896
Yemen	98%	6128	180	8	5940	129	5811
<b>Benchmarking Participants</b>							
Alberta, Canada	96%	4557	105	222	4230	193	4037
British Columbia, Canada	96%	4758	67	342	4349	196	4153
Dubai, UAE	91%	3421	19	4	3398	334	3064
Massachusetts, US	96%	1971	11	136	1824	77	1747
Minnesota, US	97%	2034	23	101	1910	64	1846
Ontario, Canada	95%	3903	34	194	3675	179	3496
Quebec, Canada	86%	4645	34	78	4533	648	3885

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit A.6 Student Sample Sizes (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Within-school Student Participation (Weighted Percentage)	Number of Sampled Students in Participating Schools	Number of Students Withdrawn from Class/School	Number of Students Excluded	Number of Eligible Students	Number of Students Absent	Number of Students Assessed
Algeria	96%	5793	83	0	5710	263	5447
Armenia	96%	4898	0	0	4898	209	4689
Australia	93%	4549	84	37	4428	359	4069
Bahrain	97%	4434	61	5	4368	138	4230
Bosnia and Herzegovina	98%	4373	22	44	4307	87	4220
Botswana	99%	4310	63	2	4245	37	4208
Bulgaria	96%	3426	69	124	3233	154	3079
Chinese Taipei	99%	4164	25	53	4086	40	4046
Colombia	98%	5343	368	4	4971	98	4873
Cyprus	96%	4755	41	139	4575	176	4399
Czech Republic	95%	5182	41	12	5129	284	4845
Egypt	98%	6906	151	1	6754	172	6582
El Salvador	98%	4329	191	0	4138	75	4063
England	88%	4768	153	15	4600	575	4025
Georgia	97%	4533	139	48	4346	168	4178
Ghana	98%	5678	270	0	5408	114	5294
Hong Kong SAR	96%	3657	29	2	3626	156	3470
Hungary	97%	4321	21	30	4270	159	4111
Indonesia	97%	4419	95	0	4324	121	4203
Iran, Islamic Rep. of	98%	4140	95	0	4045	64	3981
Israel	94%	3708	12	183	3513	219	3294
Italy	96%	4873	40	231	4602	194	4408
Japan	93%	4656	31	6	4619	307	4312
Jordan	96%	5733	184	88	5461	210	5251
Korea, Rep. of	99%	4358	36	19	4303	63	4240
Kuwait	87%	4721	381	18	4322	231	4091
Lebanon	93%	4062	0	0	4062	276	3786
Lithuania	91%	4537	35	96	4406	415	3991
Malaysia	98%	4589	33	0	4556	90	4466
Malta	95%	5053	18	106	4929	259	4670
Morocco	85%	3731	134	0	3597	537	3060
Norway	93%	5085	17	78	4990	363	4627
Oman	99%	4894	57	36	4801	49	4752
Palestinian Nat'l Auth.	98%	4572	70	29	4473	95	4378
Qatar	97%	7558	128	17	7413	229	7184
Romania	97%	4447	119	12	4316	118	4198
Russian Federation	97%	4706	42	51	4613	141	4472
Saudi Arabia	95%	4515	1	3	4511	268	4243
Scotland	90%	4700	137	19	4544	474	4070
Serbia	98%	4246	16	78	4152	107	4045
Singapore	95%	4828	37	0	4791	192	4599
Slovenia	93%	4414	10	42	4362	319	4043
Sweden	94%	5712	87	58	5567	352	5215
Syrian Arab Republic	96%	5025	199	0	4826	176	4650
Thailand	99%	5579	89	0	5490	78	5412
Tunisia	98%	4258	84	0	4174	94	4080
Turkey	98%	4682	87	19	4576	78	4498
Ukraine	97%	4598	27	0	4571	147	4424
United States	93%	8447	202	272	7973	596	7377
<b>Benchmarking Participants</b>							
Basque Country, Spain	98%	2481	46	83	2352	56	2296
British Columbia, Canada	94%	4836	129	146	4561	305	4256
Dubai, UAE	88%	3625	17	6	3602	407	3195
Massachusetts, US	94%	2093	23	56	2014	117	1897
Minnesota, US	95%	1988	21	82	1885	108	1777
Ontario, Canada	95%	3842	43	171	3628	180	3448
Quebec, Canada	85%	4739	59	45	4635	679	3956

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

## Exhibit A.7 Participation Rates (Weighted)

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	School Participation		Class Participation	Student Participation	Overall Participation	
	Before Replacement	After Replacement			Before Replacement	After Replacement
Algeria	99%	99%	100%	97%	97%	97%
Armenia	93%	100%	100%	96%	90%	96%
Australia	99%	100%	100%	95%	94%	95%
Austria	98%	99%	99%	98%	96%	97%
Chinese Taipei	100%	100%	100%	100%	100%	100%
Colombia	93%	99%	100%	98%	91%	97%
Czech Republic	89%	98%	100%	94%	83%	92%
Denmark	71%	91%	99%	94%	66%	85%
El Salvador	99%	100%	100%	98%	97%	98%
England	83%	90%	100%	93%	77%	84%
Georgia	92%	100%	100%	98%	90%	98%
Germany	96%	100%	100%	97%	93%	96%
Hong Kong SAR	81%	84%	100%	96%	78%	81%
Hungary	93%	99%	100%	97%	90%	96%
Iran, Islamic Rep. of	100%	100%	100%	99%	99%	99%
Italy	91%	100%	100%	97%	88%	97%
Japan	97%	99%	100%	97%	94%	95%
Kazakhstan	99%	100%	100%	100%	99%	100%
Kuwait	100%	100%	100%	85%	85%	85%
Latvia	93%	97%	100%	95%	89%	92%
Lithuania	99%	100%	100%	94%	93%	94%
Morocco	81%	81%	100%	96%	77%	77%
Netherlands	48%	95%	98%	97%	46%	91%
New Zealand	97%	100%	100%	96%	93%	96%
Norway	88%	97%	100%	95%	83%	92%
Qatar	100%	100%	100%	97%	97%	97%
Russian Federation	100%	100%	100%	98%	98%	98%
Scotland	77%	94%	100%	94%	72%	88%
Singapore	100%	100%	100%	96%	96%	96%
Slovak Republic	98%	100%	100%	97%	95%	97%
Slovenia	92%	99%	100%	95%	87%	93%
Sweden	98%	100%	100%	97%	94%	97%
Tunisia	100%	100%	100%	99%	99%	99%
Ukraine	96%	96%	100%	97%	93%	93%
United States	70%	89%	100%	95%	66%	84%
Yemen	99%	100%	100%	98%	97%	98%
<b>Benchmarking Participants</b>						
Alberta, Canada	99%	99%	100%	96%	94%	94%
British Columbia, Canada	98%	100%	100%	96%	94%	96%
Dubai, UAE	75%	75%	98%	91%	67%	67%
Massachusetts, US	92%	96%	100%	96%	88%	92%
Minnesota, US	53%	100%	100%	97%	52%	97%
Ontario, Canada	95%	96%	100%	95%	91%	92%
Quebec, Canada	97%	98%	100%	86%	83%	84%

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007



Exhibit A.7 Participation Rates (Weighted) (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	School Participation		Class Participation	Student Participation	Overall Participation	
	Before Replacement	After Replacement			Before Replacement	After Replacement
Algeria	99%	99%	100%	96%	95%	95%
Armenia	94%	100%	100%	96%	90%	96%
Australia	100%	100%	100%	93%	93%	93%
Bahrain	100%	100%	100%	97%	97%	97%
Bosnia and Herzegovina	100%	100%	100%	98%	98%	98%
Botswana	100%	100%	100%	99%	99%	99%
Bulgaria	93%	98%	100%	96%	89%	94%
Chinese Taipei	100%	100%	100%	99%	99%	99%
Colombia	96%	100%	100%	98%	94%	98%
Cyprus	100%	100%	100%	96%	96%	96%
Czech Republic	92%	100%	100%	95%	87%	95%
Egypt	99%	100%	100%	98%	97%	98%
El Salvador	99%	100%	100%	98%	97%	98%
England	78%	86%	100%	88%	69%	75%
Georgia	97%	100%	100%	97%	95%	97%
Ghana	100%	100%	100%	98%	98%	98%
Hong Kong SAR	73%	79%	100%	96%	70%	75%
Hungary	92%	99%	100%	97%	89%	96%
Indonesia	100%	100%	100%	97%	97%	97%
Iran, Islamic Rep. of	100%	100%	100%	98%	98%	98%
Israel	94%	97%	100%	94%	88%	91%
Italy	93%	100%	100%	96%	89%	96%
Japan	96%	97%	100%	93%	90%	91%
Jordan	100%	100%	100%	96%	96%	96%
Korea, Rep. of	100%	100%	100%	99%	99%	99%
Kuwait	97%	97%	100%	87%	84%	84%
Lebanon	81%	92%	100%	93%	76%	85%
Lithuania	98%	99%	100%	91%	89%	90%
Malaysia	100%	100%	100%	98%	98%	98%
Malta	100%	100%	100%	95%	94%	94%
Morocco	65%	65%	100%	85%	55%	55%
Norway	88%	93%	100%	93%	82%	86%
Oman	100%	100%	100%	99%	99%	99%
Palestinian Nat'l Auth.	100%	100%	100%	98%	98%	98%
Qatar	100%	100%	100%	97%	97%	97%
Romania	99%	99%	100%	97%	97%	97%
Russian Federation	100%	100%	100%	97%	97%	97%
Saudi Arabia	99%	99%	100%	95%	94%	94%
Scotland	74%	86%	100%	90%	66%	77%
Serbia	100%	100%	100%	98%	98%	98%
Singapore	100%	100%	99%	95%	95%	95%
Slovenia	92%	99%	100%	93%	85%	92%
Sweden	100%	100%	100%	94%	93%	94%
Syrian Arab Republic	100%	100%	100%	96%	96%	96%
Thailand	90%	100%	100%	99%	88%	99%
Tunisia	100%	100%	100%	98%	98%	98%
Turkey	100%	100%	100%	98%	98%	98%
Ukraine	98%	98%	100%	97%	95%	95%
United States	68%	83%	99%	93%	63%	77%
<b>Benchmarking Participants</b>						
Basque Country, Spain	100%	100%	100%	98%	98%	98%
British Columbia, Canada	98%	100%	100%	94%	92%	94%
Dubai, UAE	79%	79%	99%	88%	69%	69%
Massachusetts, US	93%	98%	100%	94%	88%	92%
Minnesota, US	61%	98%	100%	95%	58%	93%
Ontario, Canada	90%	94%	100%	95%	86%	89%
Quebec, Canada	93%	93%	97%	85%	77%	77%

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Because an important goal of the TIMSS 2007 assessment was to measure changes in students' science achievement since 1995, it was important to track any changes in population composition and coverage since then that might be related to student achievement. Exhibit A.8 presents, for each TIMSS participant, four attributes of the fourth grade populations sampled in 2007, 2003, and 1995 and the eighth grade populations sampled in 2007, 2003, 1999, and 1995: number of years of formal schooling, average student age at time of testing, percentage of students excluded from the assessment, and overall sampling participation rate (after replacement). Most countries and provinces were very similar with regard to these attributes across the three TIMSS cycles at fourth grade and four cycles at eighth grade, although there have been changes in some countries in the age and grade structure of the assessed populations, and in the exclusion rate.

Although Australia, since 2003, has tested only fourth grade students for the fourth grade population and only eighth grade students for the eighth grade population, in 1995 the younger assessment population contained fourth grade students from some states and fifth grade students from other states, and similarly the older population contained a mixture of eighth and ninth grade students. Because of this, Australian students were somewhat older, on average, in 1995. The Russian Federation and Slovenia have undergone structural changes in the age at which children enter schools that are reflected in their samples. In 2003, the Russian fourth grade sample contained third-grade students from some regions and fourth-grade students from others, whereas all students were in fourth grade in 2007. At the eighth grade, there was still a mixture of seventh and eighth grade students in 2007, although with proportionally more eighth grade students, and correspondingly a higher average age. Slovenia is in transition towards having all children begin school at an earlier age so that they all will have four years of primary schooling at the fourth grade instead of three years, as was the case in 2003. At eighth grade, the transition was not complete in 2007.

Exhibit A.8 Trends in Student Populations

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Years of Formal Schooling*			Average Age at Time of Testing			Overall Exclusion Rates			Overall Participation Rates (After Replacement)		
	2007	2003	1995	2007	2003	1995	2007	2003	1995	2007	2003	1995
Armenia	4	4		10.6	10.9		3.4%	2.9%		96%	90%	
Australia	4	4	4 or 5	9.9	9.9	10.2	4.0%	2.7%	1.8%	95%	85%	66%
Austria	4		4	10.3		10.5	5.0%		2.8%	97%		69%
Chinese Taipei	4	4		10.2	10.2		2.8%	3.1%		100%	99%	
Czech Republic	4		4	10.3		10.4	4.9%		4.1%	92%		86%
England	5	5	5	10.2	10.3	10.0	2.1%	1.9%	12.1%	84%	76%	83%
Hong Kong SAR	4	4	4	10.2	10.2	10.1	5.4%	3.8%	2.7%	81%	83%	83%
Hungary	4	4	4	10.7	10.5	10.4	4.4%	8.1%	3.8%	96%	93%	92%
Iran, Islamic Rep. of	4	4	4	10.2	10.4	10.5	3.0%	5.7%	1.3%	99%	98%	97%
Italy	4	4		9.8	9.8		5.3%	4.2%		97%	97%	
Japan	4	4	4	10.5	10.4	10.4	1.1%	0.8%	3.0%	95%	97%	92%
Latvia	4	4	4	11.0	11.1	10.5	4.6%	4.4%	2.1%	92%	88%	69%
Lithuania	4	4		10.8	10.9		5.4%	4.6%		94%	87%	
Morocco	4	4		10.6	11.0		1.4%	2.2%		77%	81%	
Netherlands	4	4	4	10.2	10.2	10.3	4.8%	5.2%	4.4%	91%	84%	59%
New Zealand	4.5 – 5.5	4.5 – 5.5	4.5 – 5.5	10.0	10.0	10.0	5.4%	4.0%	1.3%	96%	93%	95%
Norway	4	4	4	9.8	9.8	9.9	5.1%	4.4%	3.1%	92%	88%	91%
Russian Federation	4	3 or 4		10.8	10.6		3.6%	6.8%		98%	97%	
Scotland	5	5	5	9.8	9.7	9.7	4.5%	1.5%	6.7%	88%	77%	76%
Singapore	4	4	4	10.4	10.3	10.3	1.5%	0.0%	0.0%	96%	98%	98%
Slovenia	4	3 or 4	3	9.8	9.8	9.9	2.1%	1.3%	1.9%	93%	91%	77%
Tunisia	4	4		10.2	10.4		2.9%	0.9%		99%	99%	
United States	4	4	4	10.3	10.2	10.2	9.2%	5.1%	4.7%	84%	78%	80%
<b>Benchmarking Participants</b>												
Alberta, Canada	4		4	9.8		10.0	7.6%		–	94%		91%
Minnesota, US	4		4	10.3		10.3	8.3%		–	97%		–
Ontario, Canada	4	4	4	9.8	9.8	9.9	6.3%	4.8%	–	92%	90%	92%
Quebec, Canada	4	4	4	10.1	10.1	10.3	6.4%	3.6%	–	84%	91%	81%

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

\* Represents years of schooling counting from the first year of ISCED Level 1.  
A dash (–) indicates comparable data are not available.

## Exhibit A.8 Trends in Student Populations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Years of Formal Schooling*				Average Age at Time of Testing			
	2007	2003	1999	1995	2007	2003	1999	1995
Armenia	8	8			14.9	14.9		
Australia	8	8		8 or 9	13.9	13.9		14.2
Bahrain	8	8			14.1	14.1		
Botswana	8	8			14.9	15.1		
Chinese Taipei	8	8	8		14.2	14.2	14.2	
Colombia	8			8	14.5			14.5
Cyprus	8	8	8	8	13.8	13.8	13.8	13.7
Czech Republic	8		8	8	14.4		14.4	14.4
Egypt	8	8			14.1	14.4		
England	9	9	9	9	14.2	14.3	14.2	14.0
Ghana	8	8			15.8	15.5		
Hong Kong SAR	8	8	8	8	14.4	14.4	14.2	14.2
Hungary	8	8	8	8	14.6	14.5	14.4	14.3
Indonesia	8	8	8		14.3	14.5	14.6	
Iran, Islamic Rep. of	8	8	8	8	14.2	14.4	14.6	14.6
Israel	8	8	8		14.0	14.0	14.1	
Italy	8	8	8		13.9	13.9	14.0	
Japan	8	8	8	8	14.5	14.4	14.4	14.4
Jordan	8	8	8		14.0	13.9	14.0	
Korea, Rep. of**	8	8	8	8	14.3	14.6	14.4	14.2
Lebanon	8	8			14.4	14.6		
Lithuania**	8	8	8.5	8	14.9	14.9	15.2	14.3
Malaysia	8	8	8		14.3	14.3	14.4	
Norway	8	8		8	13.8	13.8		13.9
Palestinian Nat'l Auth.	8	8			14.0	14.1		
Romania	8	8	8	8	15.0	15.0	14.8	14.6
Russian Federation	7 or 8	7 or 8	7 or 8	7 or 8	14.6	14.2	14.1	14.0
Scotland	9	9		9	13.7	13.7		13.7
Serbia	8	8			14.9	14.9		
Singapore	8	8	8	8	14.4	14.3	14.4	14.5
Slovenia	7 or 8	7 or 8		7	13.8	13.8		13.8
Sweden	8	8		8	14.8	14.9		14.9
Thailand	8		8		14.3		14.5	
Tunisia	8	8	8		14.5	14.8	14.8	
United States	8	8	8	8	14.3	14.2	14.2	14.2
<b>Benchmarking Participants</b>								
Basque Country, Spain	8	8			14.1	14.1		
British Columbia, Canada	8		8		13.9		13.9	
Massachusetts, US	8		8		14.2		14.1	
Minnesota, US	8			8	14.3			14.3
Ontario, Canada	8	8	8	8	13.8	13.8	13.9	14.0
Quebec, Canada	8	8	8	8	14.2	14.2	14.3	14.5

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

\* Represents years of schooling counting from the first year of ISCED Level 1.

\*\* Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year. Korea tested the same cohort of students as other countries, but later in 2003, at the beginning of the next school year.

A dash (-) indicates comparable data are not available.

Exhibit A.8 Trends in Student Populations (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Overall Exclusion Rates				Overall Participation Rates (After Replacement)			
	2007	2003	1999	1995	2007	2003	1999	1995
Armenia	3.3%	2.9%			96%	89%		
Australia	1.9%	1.3%		0.8%	93%	83%		70%
Bahrain	1.5%	0.0%			97%	98%		
Botswana	0.1%	3.0%			99%	96%		
Chinese Taipei	3.3%	4.8%	1.6%		99%	99%	93%	
Colombia	1.6%			3.8%	98%			86%
Cyprus	2.5%	2.5%	0.8%	0.0%	96%	96%	97%	97%
Czech Republic	4.6%		5.2%	4.9%	95%		96%	92%
Egypt	0.5%	3.4%			98%	97%		
England	2.3%	2.1%	5.0%	11.3%	75%	46%	77%	77%
Ghana	0.9%	0.9%			98%	93%		
Hong Kong SAR	3.8%	3.4%	0.8%	2.0%	75%	80%	75%	81%
Hungary	3.9%	8.5%	4.3%	3.8%	96%	94%	93%	87%
Indonesia	3.4%	0.4%	0.0%		97%	99%	97%	
Iran, Islamic Rep. of	0.5%	6.5%	4.4%	0.3%	98%	98%	98%	98%
Israel	22.8%	22.5%	16.1%		91%	94%	94%	
Italy	5.0%	3.6%	6.7%		96%	97%	97%	
Japan	3.5%	0.6%	1.3%	0.6%	91%	93%	89%	90%
Jordan	2.0%	1.3%	3.0%		96%	96%	99%	
Korea, Rep. of**	1.6%	4.9%	4.0%	3.8%	99%	98%	100%	95%
Lebanon	1.4%	1.4%			85%	91%		
Lithuania**	4.2%	2.6%	4.5%	6.6%	90%	84%	89%	83%
Malaysia	3.3%	4.0%	4.6%		98%	98%	99%	
Norway	2.6%	2.3%		2.2%	86%	85%		93%
Palestinian Nat'l Auth.	1.0%	0.5%			98%	99%		
Romania	1.8%	0.5%	3.7%	2.8%	97%	98%	97%	89%
Russian Federation	2.3%	5.5%	1.7%	6.3%	97%	96%	97%	95%
Scotland	1.7%	0.0%		2.2%	77%	76%		73%
Serbia	6.8%	2.9%			98%	96%		
Singapore	1.8%	0.0%	0.0%	4.6%	95%	97%	98%	95%
Slovenia	1.9%	1.4%		2.6%	92%	91%		77%
Sweden	3.6%	2.8%		0.9%	94%	87%		90%
Thailand	3.4%		3.3%		99%		99%	
Tunisia	0.0%	1.8%	0.1%		98%	98%	98%	
United States	7.9%	4.9%	3.9%	2.1%	77%	73%	85%	78%
<b>Benchmarking Participants</b>								
Basque Country, Spain	4.2%	5.8%			98%	98%		
British Columbia, Canada	17.7%		3.6%		94%		93%	
Massachusetts, US	8.4%		5.0%		92%		93%	
Minnesota, US	7.5%			–	93%			–
Ontario, Canada	6.2%	6.0%	5.1%	–	89%	89%	93%	90%
Quebec, Canada	13.6%	4.8%	1.3%	–	77%	85%	92%	89%

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

In general, the exclusion rates do not exceed the TIMSS 2007 guidelines of 5 percent, and have not changed very much across assessments for most countries. Also, in most cases, the exclusion rates have decreased. However, the student exclusion rate was higher in 2007 than in previous assessments at eighth grade in Serbia, the United States, and the Canadian provinces of British Columbia and Quebec. For each assessment year in Exhibit 1.3 containing the trend results, exclusion rates over 5 percent were documented with footnote 2 and over 10 percent with footnote 3. At the fourth grade, those with a variation from assessment to assessment, included the United States, the state of Minnesota, and the provinces of Alberta and Quebec with a footnote 2 for 2007; the Russian Federation, Hungary, and Iran with a footnote 2 for 2003; England with a footnote 3 for 1995; Scotland with a footnote 2 for 1995; and the province of Ontario with a footnote 2 for 1995 and 2007. At the eighth grade, the United States and Serbia have a footnote 2 for 2007, Hungary and Iran have a footnote 2 for 2003, Italy a footnote 2 for 1999, the Russian Federation and Lithuania a footnote 2 for 1995, and England a footnote 3 for 1995. Among the benchmarking participants, the provinces of Quebec and British Columbia have a footnote 3 for 2007, the states of Massachusetts and Minnesota a footnote 2 for 2007, the province of Ontario a footnote 2 for 2003 and 2007, and the Basque Country in Spain a footnote 2 for 2003.

### **Translation and Layout Verification**

Participants were given detailed guidelines for translating the TIMSS 2007 instruments developed in English into their target language(s) and adapting them to be appropriate for their cultural contexts. They also were urged to work with an experienced translator who would be well suited to the task of working with the TIMSS materials. Because the goal was to create a set of instruments comparable to the originals in terms of difficulty and accessibility, the instruments were subjected to a stringent international translation verification process. Each participant was asked to submit the following materials for verification prior to both the field test and main

data collection: items and directions; questionnaires for students, teachers, and schools; manuals; and scoring guides for constructed-response items, where necessary. Verifiers documented their suggestions, and the NRCs were responsible for reviewing the suggestions and revising the instruments. The verified instruments were used to generate the booklets and questionnaires in their final form and these were submitted to the TIMSS & PIRLS International Study Center for international layout verification. Participants who tested in English also were required to go through the verification steps. Although they had not translated the instruments, the materials were reviewed for national adaptations and comparable layout. Further information is provided in the *TIMSS 2007 Technical Report*.

### **Survey Operations for Data Collection**

Designing the survey operations for data collection was a collaborative effort between the TIMSS & PIRLS International Study Center, the IEA Secretariat, the IEA Data Processing and Research Center, and Statistics Canada. Data collection involved contacting schools and sampling classes, preparing materials for data collection, administering the assessment, conducting quality control, scoring the assessment, and creating the data files. Detailed information is provided in the *TIMSS 2007 Technical Report*. However, in brief, guidelines for each of these activities were described in an international set of materials, software, and manuals provided to each NRC, for example, manuals for the school coordinator, the test administrators, and the national quality control observers. The school coordinator was responsible for coordinating the testing, including arranging for test administrators, receiving the testing materials, and returning the completed materials to the national center. Within the schools, the assessment was conducted by the Test Administrator for each class, which involved distributing materials to the appropriate students, following the script for the administration, and timing the sessions accurately. During the test administrations, 10 percent of the schools were visited by an International Quality Control Monitor hired by the IEA Secretariat, and trained to verify the quality of

the materials and adherence to the test administration procedures in each country. Additionally, countries were asked to conduct their own quality control procedures in another 10 percent of sampled schools, based on the international program.

### **Scoring the Constructed-Response Items**

Because more than half of the score points on the assessment came from constructed-response items, TIMSS 2007 had to develop procedures for reliably evaluating student responses within and across countries. To ensure reliable scoring procedures based on the TIMSS scoring rubrics, the TIMSS & PIRLS International Study Center prepared detailed guides containing the rubrics and explanations of how to implement them, together with example student responses for the various rubric categories. These guides, along with training packets containing extensive examples of student responses for practice in applying the rubrics, were used as a basis for intensive training in scoring the constructed-response items. The training sessions were designed to help representatives of national centers, who would then be responsible for training personnel in their own countries to apply the scoring rubrics reliably.

To gather and document empirical information about the within-country agreement among scorers, PIRLS arranged to have systematic subsamples of at least 200 students' responses to each item scored independently by two readers. Scoring reliability within countries was high – the percentage of exact agreement for score points, on average, across countries, was 96 percent at both grades. Country-by-country results are provided in the *TIMSS 2007 Technical Report*.

While the double scoring of a sample of the student test booklets provided a measure of the consistency with which the constructed-response questions were scored within each country, TIMSS also took steps to ensure that those constructed-response items from the 2003 assessment that were used in 2007 as part of the trend measurement were scored in the same way in both assessments. In anticipation of this, countries that participated

in TIMSS 2003 sent samples of scored student booklets from their 2003 assessment to the IEA Data Processing and Research Center, where they were digitally scanned and incorporated into custom-built presentation software for use in 2007. On average, the software contained about 8,000 student responses for each country. After being trained in using the scoring rubrics for these items, scorers scored half of the student responses, using the scoring software supplied by the DPC. The software then reported on their scoring accuracy for these student responses. Scorers with less than 85 percent exact agreement with the scores assigned to the responses in 2003 were retrained before proceeding. There was a high degree of scoring consistency across assessments, with 93 percent exact agreement, on average internationally, at fourth grade and 94 percent at eighth grade between the scores awarded in 2003 and those given by the 2007 scorers. Detailed results for the trend countries are presented in the *TIMSS 2007 Technical Report*.

To monitor the consistency with which the scoring rubrics were applied across countries, TIMSS 2007 collected from the countries that administered TIMSS in English a sample of 4,600 student responses to 23 constructed-response science items from across the assessment at the fourth grade and a sample of 4,000 responses to 20 items at the eighth grade. The set of fourth grade student responses was then sent to each TIMSS participant at the fourth grade that had scorers proficient in English, and all responses in the set were scored independently by two of these scorers. Similarly, the set of eighth grade student responses was sent to eighth grade participants to be independently scored by two English-proficient scorers. Agreement across countries was defined in terms of the percentage of these comparisons that were in exact agreement and was generally high—91 percent at fourth grade and 83 percent at eighth grade. Details may be found in the *TIMSS 2007 Technical Report*.

## Test Reliability

As an indication of the reliability of the measurement of student achievement, TIMSS calculated a test reliability coefficient for each country. This coefficient is the median KR-20 reliability across the 14 test booklets. Reliabilities were generally high—0.8 to 0.9 in most countries. The median of the reliability coefficients across all countries was 0.80 at fourth grade 0.84 and at eighth grade. Details may be found in the *TIMSS 2007 Technical Report*.

## Scaling the Achievement Data

The primary approach to reporting the TIMSS 2007 achievement data was based on item response theory (IRT) scaling methods.<sup>6</sup> Student mathematics and science achievement was summarized using 2- and 3-parameter IRT models for dichotomously-scored items (right or wrong), and generalized partial credit models for constructed response items with two available score points.<sup>7</sup> The IRT scaling method produces a score by averaging the responses of each student to the items that he or she took in a way that takes into account the difficulty and discriminating power of each item. The methodology used in TIMSS included refinements enabling reliable scores to be produced even though individual students responded to just one assessment booklet (each booklet contained about one-seventh of the TIMSS achievement items).

To allow more accurate estimation of summary statistics for student subpopulations, the TIMSS scaling made use of plausible-value technology: whereby five separate estimates of each student's score were generated on each scale, based on the student's responses to the items in the student's booklet, and on the student's background characteristics. The five score estimates are known as "plausible values," and the variability between them encapsulates the uncertainty inherent in the score estimation process. The IRT analysis provides a common scale on which performance can be compared across countries. In addition to providing a basis for estimating mean achievement, scale scores permit estimates of how students within countries vary and provide information on percentiles of performance.

6 For a detailed description of the TIMSS 2007 scaling, see Foy, P., Galia, J., & Li, Isaac. (2008). Scaling the TIMSS 2007 mathematics and science assessment data. In J.F. Olson, M.O. Martin, & I.V.S. Mullis (Eds.), *TIMSS 2007 technical report*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

7 TIMSS first applied the 2- and 3-parameter scaling model approach in TIMSS 1999 and has used it ever since. However, achievement scaling in TIMSS 1995 was conducted originally using a 1-parameter model. To ensure compatibility with TIMSS 1999 and subsequent cycles of TIMSS, the 1995 fourth and eighth grade data were rescaled using the 2- and 3-parameter approach. This rescaling was described in Yamamoto, K. & Kulik, E. (2000). Scaling methods and procedures for the TIMSS mathematics and science scales. In M.O. Martin, K.D. Gregory, & S. Stemler, (Eds.), *TIMSS 1999 technical report*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College. The rescaled 1995 data have been used in all trend analyses.

Overall science achievement scales were produced at both fourth and eighth grades, as were separate scales for each content domain (life science, physical science, and earth science at fourth grade and biology, chemistry, physics, and earth science at eighth grade) and each cognitive domain (knowing, applying, and reasoning at each grade level).

In order to measure trends in science achievement across assessments, the TIMSS overall science achievement scales were designed to provide reliable measures on a common scale spanning 1995, 1999, 2003, and 2007. The metric of the scales was established originally with the 1995 assessment. Treating all countries participating in TIMSS 1995 at each grade level equally, the TIMSS scale average across those countries was set to 500, and the standard deviation was set at 100. The average and standard deviation of the scale scores are arbitrary and do not affect scale interpretation. Since the countries varied in size, each country was weighted to contribute equally to the mean and standard deviation of the scale. To preserve the metric of the original 1995 scale for use with the 1999 data, the 1999 eighth grade assessment was scaled using students from countries that participated in both 1995 and 1999. All science items from 1995 and 1999 were included in this scaling, including about one-third of the items that were used in both assessments and formed the foundation for linking the 1995 and 1999 assessment data. When the link had been established, students from countries that participated in 1999 but not in 1995 were assigned scores on the TIMSS scale.

At the eighth grade, TIMSS developed the 2003 scale in the same way as in 1999, preserving the metric first with students from countries that participated in both 1999 and 2003, and then assigning scores on the basis of the scale to students tested in 2003 but not the earlier assessment. Because the 1995 student data had already been linked to the 1999 data, it was not necessary to include the 1995 data in the 1999–2003 calibration. At fourth grade, because there was no assessment in 1999, the 2003 and 1995 data were linked directly together using students from countries that participated in both assessments, and the students tested in 2003 but not 1995 were assigned scores on the basis of the scale. For TIMSS 2007, the same

general procedure was followed at both grades, linking the data first for countries that participated in both 2003 and 2007, and then assigning scores on the basis of the scale to students tested in 2007 but not 2003. Because the TIMSS booklet design changed from 2003 to 2007, TIMSS conducted a bridge study in countries that participated at both years, which involved administering some of the 2003 student booklets to a sub-sample of the 2007 student sample. To account for any effect introduced by the booklet design change, the data collected in the bridging study were included in the 2003–2007 linking analysis. More information is provided in the *TIMSS 2007 Technical Report*.

To facilitate comparisons of countries' relative performance in the content domains (for example, do students perform relatively better in biology than physics?) and in the cognitive domains (for example, do students perform relatively better on applying items than on reasoning items?) TIMSS 2007 placed student achievement in each of the content and cognitive domains on the same scale by aligning its achievement distribution with the achievement distribution of the overall science scale at each grade level. As a result, each content and cognitive scale had the same mean and standard deviation as the overall science scale, eliminating statistically any existing differences in the difficulty of the items on the scales in the interest of making relative comparisons.

To give an indication of the difficulty of the TIMSS science items at the fourth and eighth grades, Exhibit A.9 presents, for each TIMSS participant, the percentage of students responding correctly to each item, averaged across the items for each content and cognitive scale, as well as across science overall. At the fourth grade, the average percent correct in each of the content domains, life science (49%), physical science (49%), and earth science (47%), was similar to the average percent correct overall (49%). Among cognitive domains, however, students performed better, on average, on items in the knowing domain (54%) and less well on the applying (46%) and reasoning (42%) domains. The fourth grade science items were particularly difficult for Yemen, where the average percent correct across all items was just 16 percent. Because of concerns about the reliability of domain scales

based on such low-achieving students, results on the science content and cognitive scales were not reported for Yemen.

At the eighth grade, performance in the content domains—biology (41%), chemistry (39%), physics (38%), and earth science (40%)—also was similar to overall science performance (40%), and there also were differences among cognitive domains. As at fourth grade, students had highest performance (47% correct, on average) on the knowing domain items and lower performance on the items in the applying (37%) and reasoning (32%) domains. Students in Ghana and Qatar had particular difficulty with the science reasoning items, with an average of just 11 and 12 percent correct, respectively. Because of concerns about reliability, results on the science reasoning scale were not reported for Ghana and Qatar.

**Exhibit A.9 Average Percent Correct in the Science Content and Cognitive Domains**
**TIMSS2007**  
**Science 4<sup>th</sup> Grade**

Country	Average Percent Correct						
	Science	Science Content Domains			Science Cognitive Domains		
		Life Science	Physical Science	Earth Science	Knowing	Applying	Reasoning
Algeria	28 (0.7)	29 (0.7)	29 (0.7)	24 (0.8)	33 (0.8)	27 (0.7)	19 (0.6)
Armenia	48 (1.1)	50 (0.9)	49 (1.2)	45 (1.1)	54 (1.0)	46 (1.0)	39 (1.4)
Australia	57 (0.6)	57 (0.6)	56 (0.7)	57 (0.9)	63 (0.6)	52 (0.7)	50 (0.9)
Austria	56 (0.5)	56 (0.4)	56 (0.6)	57 (0.6)	62 (0.5)	53 (0.5)	48 (0.6)
Chinese Taipei	63 (0.4)	61 (0.4)	64 (0.5)	62 (0.5)	64 (0.4)	61 (0.4)	61 (0.5)
Colombia	34 (0.8)	36 (0.7)	34 (0.8)	30 (0.9)	40 (0.8)	31 (0.8)	26 (0.8)
Czech Republic	54 (0.6)	55 (0.6)	53 (0.7)	53 (0.8)	60 (0.6)	51 (0.6)	45 (0.8)
Denmark	54 (0.6)	56 (0.6)	52 (0.6)	53 (0.8)	60 (0.6)	50 (0.6)	49 (0.7)
El Salvador	32 (0.5)	36 (0.5)	31 (0.5)	27 (0.6)	40 (0.6)	29 (0.5)	22 (0.5)
England	59 (0.6)	58 (0.6)	60 (0.6)	58 (0.7)	65 (0.5)	55 (0.6)	53 (0.7)
Georgia	36 (0.7)	38 (0.6)	35 (0.7)	35 (0.9)	45 (0.7)	33 (0.7)	24 (0.7)
Germany	56 (0.4)	57 (0.4)	57 (0.5)	54 (0.6)	62 (0.4)	53 (0.5)	50 (0.6)
Hong Kong SAR	62 (0.7)	59 (0.7)	64 (0.7)	63 (0.8)	66 (0.7)	58 (0.7)	57 (0.9)
Hungary	58 (0.7)	61 (0.7)	57 (0.7)	54 (0.8)	64 (0.6)	54 (0.7)	50 (0.9)
Iran, Islamic Rep. of	39 (0.7)	41 (0.8)	41 (0.7)	34 (0.8)	45 (0.7)	37 (0.8)	30 (0.8)
Italy	58 (0.7)	62 (0.6)	55 (0.7)	55 (0.8)	63 (0.7)	57 (0.7)	49 (0.7)
Japan	60 (0.4)	57 (0.4)	66 (0.4)	57 (0.5)	63 (0.4)	57 (0.4)	60 (0.5)
Kazakhstan	58 (1.2)	58 (1.0)	59 (1.3)	57 (1.4)	65 (1.2)	56 (1.1)	48 (1.5)
Kuwait	29 (0.5)	31 (0.5)	29 (0.5)	26 (0.6)	36 (0.5)	26 (0.5)	19 (0.5)
Latvia	60 (0.5)	60 (0.5)	62 (0.6)	58 (0.7)	65 (0.5)	56 (0.6)	55 (0.7)
Lithuania	54 (0.4)	55 (0.4)	55 (0.4)	52 (0.6)	59 (0.4)	51 (0.5)	48 (0.6)
Morocco	23 (0.7)	24 (0.6)	26 (0.7)	19 (0.8)	28 (0.7)	22 (0.7)	17 (0.5)
Netherlands	56 (0.5)	59 (0.5)	53 (0.5)	54 (0.7)	60 (0.5)	52 (0.5)	50 (0.6)
New Zealand	52 (0.5)	53 (0.5)	51 (0.5)	52 (0.6)	59 (0.5)	47 (0.5)	45 (0.6)
Norway	47 (0.5)	48 (0.5)	45 (0.5)	48 (0.7)	53 (0.5)	43 (0.5)	39 (0.6)
Qatar	23 (0.2)	24 (0.2)	25 (0.2)	20 (0.2)	29 (0.2)	21 (0.2)	15 (0.2)
Russian Federation	60 (1.0)	60 (0.9)	62 (1.1)	59 (1.2)	65 (1.0)	59 (1.1)	53 (1.1)
Scotland	51 (0.4)	52 (0.5)	50 (0.5)	50 (0.5)	59 (0.4)	45 (0.5)	44 (0.6)
Singapore	69 (0.7)	69 (0.7)	70 (0.7)	63 (0.9)	73 (0.7)	66 (0.8)	61 (0.8)
Slovak Republic	57 (0.9)	58 (0.8)	55 (0.9)	57 (1.0)	63 (0.8)	54 (0.9)	47 (0.9)
Slovenia	54 (0.4)	53 (0.5)	57 (0.4)	53 (0.6)	58 (0.4)	53 (0.5)	49 (0.5)
Sweden	56 (0.6)	57 (0.5)	54 (0.6)	58 (0.7)	62 (0.5)	52 (0.6)	51 (0.7)
Tunisia	25 (0.6)	26 (0.6)	28 (0.7)	21 (0.7)	29 (0.7)	24 (0.6)	19 (0.6)
Ukraine	46 (0.5)	48 (0.5)	47 (0.5)	43 (0.6)	52 (0.5)	44 (0.5)	39 (0.6)
United States	59 (0.5)	60 (0.5)	58 (0.5)	58 (0.6)	65 (0.5)	55 (0.6)	51 (0.6)
Yemen	16 (0.5)	17 (0.5)	19 (0.5)	15 (0.5)	21 (0.6)	16 (0.5)	11 (0.4)
<b>International Avg.</b>	<b>49 (0.1)</b>	<b>49 (0.1)</b>	<b>49 (0.1)</b>	<b>47 (0.1)</b>	<b>54 (0.1)</b>	<b>46 (0.1)</b>	<b>42 (0.1)</b>
<b>Benchmarking Participants</b>							
Alberta, Canada	60 (0.7)	60 (0.7)	59 (0.8)	61 (0.9)	67 (0.6)	55 (0.8)	52 (0.9)
British Columbia, Canada	58 (0.5)	60 (0.6)	58 (0.6)	58 (0.6)	65 (0.5)	55 (0.6)	51 (0.7)
Dubai, UAE	44 (0.4)	46 (0.4)	44 (0.4)	44 (0.5)	51 (0.5)	41 (0.4)	36 (0.5)
Massachusetts, US	65 (0.8)	66 (0.8)	65 (0.8)	65 (1.2)	70 (0.7)	62 (1.0)	61 (1.0)
Minnesota, US	61 (1.2)	61 (1.2)	61 (1.4)	62 (1.3)	67 (1.1)	57 (1.3)	55 (1.6)
Ontario, Canada	58 (0.7)	59 (0.8)	58 (0.6)	57 (0.8)	64 (0.7)	54 (0.8)	53 (0.8)
Quebec, Canada	55 (0.6)	56 (0.6)	53 (0.6)	54 (0.7)	60 (0.5)	50 (0.6)	50 (0.8)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

**Exhibit A.9 Average Percent Correct in the Science Content and Cognitive Domains (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Country	Average Percent Correct							
	Science	Science Content Domains				Science Cognitive Domains		
		Biology	Chemistry	Physics	Earth Science	Knowing	Applying	Reasoning
Algeria	27 (0.2)	28 (0.3)	28 (0.3)	25 (0.3)	27 (0.4)	36 (0.3)	24 (0.2)	20 (0.3)
Armenia	44 (1.1)	45 (1.2)	42 (1.1)	44 (1.1)	40 (1.2)	52 (1.0)	42 (1.1)	31 (1.5)
Australia	48 (0.8)	50 (0.9)	44 (0.8)	44 (0.7)	51 (0.8)	52 (0.7)	44 (0.8)	46 (0.9)
Bahrain	40 (0.3)	41 (0.3)	39 (0.4)	37 (0.4)	39 (0.4)	48 (0.3)	36 (0.4)	31 (0.4)
Bosnia and Herzegovina	39 (0.6)	40 (0.6)	39 (0.6)	36 (0.7)	41 (0.7)	50 (0.7)	35 (0.6)	28 (0.5)
Botswana	24 (0.3)	24 (0.3)	24 (0.3)	24 (0.3)	22 (0.3)	32 (0.3)	20 (0.3)	15 (0.3)
Bulgaria	42 (1.1)	42 (1.1)	41 (1.2)	39 (1.0)	43 (1.1)	52 (1.1)	38 (1.1)	29 (1.1)
Chinese Taipei	59 (0.7)	59 (0.8)	63 (0.9)	56 (0.8)	57 (0.7)	66 (0.7)	56 (0.8)	50 (0.9)
Colombia	30 (0.5)	33 (0.6)	28 (0.5)	27 (0.5)	28 (0.8)	38 (0.7)	26 (0.5)	22 (0.5)
Cyprus	36 (0.3)	36 (0.4)	36 (0.4)	36 (0.4)	37 (0.4)	43 (0.4)	33 (0.3)	30 (0.4)
Czech Republic	53 (0.4)	54 (0.4)	52 (0.5)	51 (0.5)	55 (0.6)	59 (0.5)	51 (0.5)	47 (0.6)
Egypt	31 (0.5)	31 (0.5)	32 (0.5)	30 (0.5)	32 (0.6)	43 (0.6)	26 (0.5)	20 (0.4)
El Salvador	25 (0.4)	26 (0.5)	22 (0.4)	24 (0.4)	26 (0.5)	34 (0.5)	21 (0.4)	15 (0.4)
England	54 (0.9)	56 (1.0)	53 (1.0)	53 (0.9)	53 (1.1)	59 (1.0)	51 (0.9)	51 (1.1)
Georgia	32 (0.7)	33 (2.0)	32 (1.0)	30 (0.8)	30 (0.8)	43 (1.0)	27 (0.7)	19 (0.7)
Ghana	20 (0.5)	19 (0.5)	23 (0.6)	20 (0.4)	17 (0.4)	30 (0.6)	15 (0.4)	11 (0.4)
Hong Kong SAR	52 (1.0)	53 (1.0)	49 (1.1)	50 (1.0)	53 (1.1)	59 (0.9)	46 (1.0)	47 (1.3)
Hungary	53 (0.6)	54 (0.6)	52 (0.8)	52 (0.6)	54 (0.7)	57 (0.5)	53 (0.7)	45 (0.8)
Indonesia	32 (0.5)	33 (0.6)	28 (0.5)	31 (0.5)	33 (0.7)	39 (0.6)	28 (0.5)	24 (0.6)
Iran, Islamic Rep. of	37 (0.7)	36 (0.7)	36 (0.7)	38 (0.7)	40 (0.8)	46 (0.7)	33 (0.7)	29 (0.8)
Israel	40 (0.8)	41 (0.8)	39 (0.9)	38 (0.8)	39 (0.8)	45 (0.8)	37 (0.8)	35 (0.9)
Italy	44 (0.6)	47 (0.6)	39 (0.6)	41 (0.6)	47 (0.7)	51 (0.6)	41 (0.6)	36 (0.6)
Japan	57 (0.4)	58 (0.4)	55 (0.5)	57 (0.5)	53 (0.5)	60 (0.4)	53 (0.5)	54 (0.5)
Jordan	44 (0.8)	43 (0.8)	45 (0.9)	41 (0.7)	44 (0.9)	52 (0.8)	40 (0.8)	32 (0.8)
Korea, Rep. of	57 (0.4)	59 (0.4)	52 (0.5)	60 (0.5)	55 (0.6)	62 (0.4)	54 (0.5)	54 (0.5)
Kuwait	32 (0.4)	31 (0.4)	32 (0.5)	33 (0.4)	28 (0.5)	40 (0.4)	28 (0.4)	21 (0.4)
Lebanon	31 (0.9)	30 (0.9)	36 (1.1)	31 (0.9)	27 (0.9)	38 (0.9)	28 (0.9)	23 (1.0)
Lithuania	49 (0.5)	54 (0.6)	46 (0.6)	44 (0.6)	50 (0.6)	55 (0.5)	45 (0.5)	45 (0.7)
Malaysia	40 (1.1)	40 (1.2)	39 (1.1)	41 (1.1)	38 (1.1)	45 (1.0)	37 (1.2)	34 (1.1)
Malta	38 (0.2)	38 (0.3)	38 (0.3)	38 (0.3)	39 (0.3)	43 (0.3)	36 (0.2)	34 (0.3)
Norway	42 (0.5)	43 (0.5)	39 (0.5)	38 (0.5)	47 (0.5)	49 (0.4)	38 (0.5)	35 (0.6)
Oman	33 (0.5)	31 (0.5)	32 (0.5)	34 (0.5)	34 (0.6)	41 (0.5)	29 (0.5)	24 (0.5)
Palestinian Nat'l Auth.	32 (0.5)	30 (0.6)	32 (0.5)	31 (0.6)	30 (0.6)	39 (0.6)	28 (0.5)	21 (0.5)
Qatar	23 (0.1)	21 (0.2)	23 (0.2)	24 (0.2)	20 (0.2)	32 (0.2)	19 (0.2)	12 (0.2)
Romania	38 (0.6)	38 (0.7)	38 (0.8)	36 (0.7)	39 (0.8)	44 (0.7)	36 (0.6)	30 (0.8)
Russian Federation	52 (0.9)	53 (0.9)	53 (1.0)	47 (0.8)	52 (0.9)	60 (1.0)	48 (0.8)	43 (1.0)
Saudi Arabia	29 (0.3)	29 (0.4)	26 (0.4)	27 (0.3)	29 (0.5)	38 (0.3)	25 (0.4)	18 (0.3)
Scotland	44 (0.7)	45 (0.7)	43 (0.7)	42 (0.7)	45 (0.8)	49 (0.7)	40 (0.6)	40 (0.9)
Serbia	40 (0.6)	43 (0.6)	39 (0.6)	37 (0.6)	40 (0.7)	50 (0.6)	36 (0.6)	29 (0.6)
Singapore	60 (0.9)	60 (1.0)	58 (1.0)	61 (0.9)	57 (1.0)	64 (0.9)	57 (1.0)	55 (1.0)
Slovenia	53 (0.4)	53 (0.5)	55 (0.5)	48 (0.5)	56 (0.6)	59 (0.4)	50 (0.5)	48 (0.6)
Sweden	47 (0.5)	49 (0.6)	44 (0.6)	44 (0.5)	49 (0.6)	53 (0.5)	43 (0.6)	43 (0.6)
Syrian Arab Republic	36 (0.5)	39 (0.6)	35 (0.5)	33 (0.5)	34 (0.5)	48 (0.5)	31 (0.5)	24 (0.5)
Thailand	39 (0.9)	42 (0.9)	36 (0.9)	35 (0.8)	42 (1.0)	47 (0.9)	36 (0.9)	31 (0.9)
Tunisia	34 (0.3)	36 (0.4)	34 (0.4)	30 (0.4)	31 (0.4)	41 (0.4)	30 (0.4)	27 (0.5)
Turkey	37 (0.7)	39 (0.7)	34 (0.8)	34 (0.7)	38 (0.7)	45 (0.7)	32 (0.7)	30 (0.7)
Ukraine	42 (0.7)	42 (0.7)	43 (0.7)	42 (0.7)	43 (0.8)	49 (0.7)	39 (0.7)	36 (0.8)
United States	49 (0.6)	53 (0.6)	46 (0.7)	43 (0.6)	52 (0.7)	55 (0.6)	45 (0.6)	45 (0.8)
‡ Morocco	27 (0.4)	27 (0.4)	29 (0.4)	27 (0.5)	26 (0.5)	35 (0.4)	23 (0.4)	21 (0.5)
<b>International Avg.</b>	<b>40 (0.1)</b>	<b>41 (0.1)</b>	<b>39 (0.1)</b>	<b>38 (0.1)</b>	<b>40 (0.1)</b>	<b>47 (0.1)</b>	<b>37 (0.1)</b>	<b>32 (0.1)</b>
<b>Benchmarking Participants</b>								
Basque Country, Spain	45 (0.6)	46 (0.7)	38 (0.7)	42 (0.7)	50 (0.8)	50 (0.6)	42 (0.6)	37 (0.9)
British Columbia, Canada	50 (0.6)	54 (0.7)	44 (0.6)	45 (0.5)	53 (0.7)	55 (0.6)	46 (0.6)	47 (0.8)
Dubai, UAE	44 (0.5)	44 (0.6)	44 (0.6)	42 (0.6)	45 (0.7)	52 (0.6)	41 (0.6)	35 (0.7)
Massachusetts, US	57 (0.9)	60 (1.1)	54 (1.1)	50 (0.8)	61 (1.1)	61 (0.9)	53 (1.0)	55 (1.1)
Minnesota, US	53 (1.1)	58 (1.2)	47 (1.2)	45 (1.1)	57 (1.4)	58 (1.1)	49 (1.1)	50 (1.2)
Ontario, Canada	50 (0.8)	54 (0.8)	43 (0.8)	46 (0.9)	53 (0.9)	54 (0.7)	46 (0.9)	49 (1.0)
Quebec, Canada	46 (0.6)	48 (0.7)	42 (0.7)	41 (0.7)	49 (0.8)	51 (0.6)	41 (0.7)	44 (0.8)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.7).  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

### Scale Anchoring Analysis

For the scale anchoring analysis, the students' achievement results from all the participating countries were pooled, so that the benchmark descriptions refer to all students achieving at that level. Thus, in determining performance in relation to the benchmarks, it does not matter what country a student is from, only how he or she performed on the test. Considering students' science achievement scores, criteria were applied to identify the sets of items that students reaching each international benchmark were likely to answer correctly and that those at the next lower benchmark were unlikely to answer correctly.

For example, a multiple-choice item anchored at the Advanced International Benchmark if at least 65 percent of students scoring at 625 answered the item correctly and fewer than 50 percent of students scoring at the High International Benchmark (550) answered correctly. Similarly, a multiple-choice item anchored at the High International Benchmark if at least 65 percent of students scoring at 550 answered the item correctly and fewer than 50 percent of students scoring at the Intermediate International Benchmark (475) answered it correctly. A multiple-choice item anchored at the Intermediate International Benchmark if at least 65 percent of students scoring at 475 answered correctly and fewer than 50 percent of students scoring at the Low Benchmark (400) answered it correctly. A multiple-choice item anchored at the Low Benchmark if at least 65 percent of students scoring at 400 answered correctly. Since constructed-response questions nearly eliminate guessing, the criterion for the constructed-response items was simply 50 percent at the particular benchmark. Also, the analysis was conducted based on the percentage of students receiving full credit.

The sets of items identified by the scale anchoring analysis represented the accomplishments of students reaching each successively higher benchmark, and were used by the TIMSS 2007 Science and Mathematics Item Review Committee (SMIRC) and the TIMSS 2007 Mathematics and Science Coordinators to develop the benchmark descriptions. For each benchmark, the work of the panelists involved developing a short description

for each anchor item that characterized the content knowledge and skills demonstrated by students answering it successfully. These item-by-item descriptions were then summarized by the SMIRC members to provide the more general statements of achievement at each of the benchmarks. The item-by-item descriptions and further details about the analysis can be found in the *TIMSS 2007 Technical Report*.

The descriptions of achievement at the benchmarks are based solely on student performance on the TIMSS 2007 items and do not purport to be comprehensive. There are undoubtedly other curriculum elements on which students at the various benchmarks would have been successful if they had been included in the assessment. Also, some students scoring below a benchmark may indeed know or understand some of the concepts that characterize a high level. Finally, describing science concepts or familiarity with procedures was more straightforward than describing the cognitive behavior necessary to answer the item correctly. An item may require only simple recall for a student familiar with the item's content, but necessitate problem-solving strategies from a student unfamiliar with the material. The descriptions are based on what the panelists believed to be the way the great majority of students at the fourth or eighth grade could be expected to respond to the item.

### **Estimating Standard Errors**

Because the statistics presented in this report are estimates of national performance based on samples of students – rather than on the values that could be calculated if every student in every country had answered every question – it is important to have measures for the degree of uncertainty of the estimates. The jackknife procedure was used to estimate the standard error associated with each statistic presented in this report.<sup>8</sup> As well as sampling error, the jackknife standard errors also include an error component due to variation between the five plausible values generated for each student. The use of confidence intervals (based on the standard errors) provides a way to make inferences about the population means and proportions in a manner that reflects the uncertainty associated with the sample estimates. An estimated sample statistic plus or minus two standard errors represents a 95 percent confidence interval for the corresponding population result.

8 Procedures for computing jackknifed standard errors are presented in the scaling chapter by Foy, Galia, & Li in the *TIMSS 2007 Technical Report*.



# Appendix B

*Multiple Comparisons of Average  
Achievement in Science Content and  
Cognitive Domains*

Exhibit B.1 Multiple Comparisons of Average Achievement in Life Science

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Comparison Countries																											
		Singapore	Italy	Hungary	Chinese Taipei	United States	Russian Federation	Netherlands	Latvia	England	Hong Kong SAR	Slovak Republic	Sweden	Japan	Germany	Australia	Kazakhstan	Denmark	Austria	Czech Republic	Lithuania	Slovenia	New Zealand	Scotland	Armenia	Norway	Ukraine	Iran, Islamic Rep. of	Georgia
Singapore	582 (4.1)																												
Italy	549 (3.0)	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	548 (2.8)	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chinese Taipei	541 (2.1)	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	540 (2.5)	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Federation	539 (4.1)	▼	▼											▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	536 (2.2)	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Latvia	535 (2.1)	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	532 (2.7)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong SAR	532 (3.5)	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovak Republic	532 (4.0)	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	531 (2.5)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	530 (2.0)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Germany	529 (2.0)	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	528 (3.4)	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Kazakhstan	528 (5.0)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Denmark	527 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Austria	526 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	520 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Lithuania	516 (1.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Slovenia	511 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
New Zealand	506 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Scotland	504 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Armenia	489 (5.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Norway	487 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Ukraine	482 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Iran, Islamic Rep. of	442 (4.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Georgia	427 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
El Salvador	410 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Colombia	408 (5.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Kuwait	353 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Algeria	351 (6.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Tunisia	323 (5.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Morocco	292 (6.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Qatar	291 (1.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Yemen	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<b>Benchmarking Participants</b>																													
Massachusetts, US	568 (3.5)	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Minnesota, US	545 (6.1)	▼												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Alberta, Canada	541 (3.7)	▼												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
British Columbia, Canada	538 (2.8)	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ontario, Canada	535 (3.7)	▼	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Quebec, Canada	522 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
Dubai, UAE	457 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone. A plus (+) sign indicates average achievement could not be accurately estimated.

Exhibit B.1 Multiple Comparisons of Average Achievement in Life Science (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Colombia	Kuwait	Algeria	Tunisia	Morocco	Qatar	Yemen	Benchmarking Participants	Average Scale Score	Country
⬆	⬆	⬆	⬆	⬆	⬆	+	Massachusetts, US	582 (4.1)	Singapore
⬆	⬆	⬆	⬆	⬆	⬆	+	Minnesota, US	549 (3.0)	Italy
⬆	⬆	⬆	⬆	⬆	⬆	+	Alberta, Canada	548 (2.8)	Hungary
⬆	⬆	⬆	⬆	⬆	⬆	+	British Columbia, Canada	541 (2.1)	Chinese Taipei
⬆	⬆	⬆	⬆	⬆	⬆	+	Ontario, Canada	540 (2.5)	United States
⬆	⬆	⬆	⬆	⬆	⬆	+	Quebec, Canada	539 (4.1)	Russian Federation
⬆	⬆	⬆	⬆	⬆	⬆	+	Dubai, UAE	536 (2.2)	Netherlands
⬆	⬆	⬆	⬆	⬆	⬆	+		535 (2.1)	Latvia
⬆	⬆	⬆	⬆	⬆	⬆	+		532 (2.7)	England
⬆	⬆	⬆	⬆	⬆	⬆	+		532 (3.5)	Hong Kong SAR
⬆	⬆	⬆	⬆	⬆	⬆	+		532 (4.0)	Slovak Republic
⬆	⬆	⬆	⬆	⬆	⬆	+		531 (2.5)	Sweden
⬆	⬆	⬆	⬆	⬆	⬆	+		530 (2.0)	Japan
⬆	⬆	⬆	⬆	⬆	⬆	+		529 (2.0)	Germany
⬆	⬆	⬆	⬆	⬆	⬆	+		528 (3.4)	Australia
⬆	⬆	⬆	⬆	⬆	⬆	+		528 (5.0)	Kazakhstan
⬆	⬆	⬆	⬆	⬆	⬆	+		527 (2.4)	Denmark
⬆	⬆	⬆	⬆	⬆	⬆	+		526 (2.0)	Austria
⬆	⬆	⬆	⬆	⬆	⬆	+		520 (2.9)	Czech Republic
⬆	⬆	⬆	⬆	⬆	⬆	+		516 (1.8)	Lithuania
⬆	⬆	⬆	⬆	⬆	⬆	+		511 (2.2)	Slovenia
⬆	⬆	⬆	⬆	⬆	⬆	+		506 (2.5)	New Zealand
⬆	⬆	⬆	⬆	⬆	⬆	+		504 (2.2)	Scotland
⬆	⬆	⬆	⬆	⬆	⬆	+		489 (5.9)	Armenia
⬆	⬆	⬆	⬆	⬆	⬆	+		487 (2.5)	Norway
⬆	⬆	⬆	⬆	⬆	⬆	+		482 (2.5)	Ukraine
⬆	⬆	⬆	⬆	⬆	⬆	+		442 (4.4)	Iran, Islamic Rep. of
⬆	⬆	⬆	⬆	⬆	⬆	+		427 (3.5)	Georgia
⬆	⬆	⬆	⬆	⬆	⬆	+		410 (3.6)	El Salvador
⬆	⬆	⬆	⬆	⬆	⬆	+		408 (5.2)	Colombia
⬆	⬆	⬆	⬆	⬆	⬆	+		353 (4.9)	Kuwait
⬆	⬆	⬆	⬆	⬆	⬆	+		351 (6.2)	Algeria
⬆	⬆	⬆	⬆	⬆	⬆	+		323 (5.6)	Tunisia
⬆	⬆	⬆	⬆	⬆	⬆	+		292 (6.8)	Morocco
⬆	⬆	⬆	⬆	⬆	⬆	+		291 (1.4)	Qatar
+	+	+	+	+	+	+		++	Yemen
<b>Benchmarking Participants</b>									
⬆	⬆	⬆	⬆	⬆	⬆	+	Massachusetts, US	568 (3.5)	Massachusetts, US
⬆	⬆	⬆	⬆	⬆	⬆	+	Minnesota, US	545 (6.1)	Minnesota, US
⬆	⬆	⬆	⬆	⬆	⬆	+	Alberta, Canada	541 (3.7)	Alberta, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	British Columbia, Canada	538 (2.8)	British Columbia, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	Ontario, Canada	535 (3.7)	Ontario, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	Quebec, Canada	522 (2.7)	Quebec, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	Dubai, UAE	457 (2.8)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

⬆ Average achievement significantly higher than comparison country    ⬆ Average achievement significantly lower than comparison country

Exhibit B.2 Multiple Comparisons of Average Achievement in Physical Science

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Comparison Countries																												
		Singapore	Japan	Chinese Taipei	Hong Kong SAR	Russian Federation	Latvia	England	United States	Slovenia	Hungary	Kazakhstan	Germany	Australia	Italy	Lithuania	Austria	Slovak Republic	Czech Republic	Sweden	Netherlands	Denmark	Scotland	New Zealand	Armenia	Ukraine	Norway	Iran, Islamic Rep. of	Georgia	Colombia
Singapore	585 (3.9)																													
Japan	564 (2.3)	▼																												
Chinese Taipei	559 (2.5)	▼																												
Hong Kong SAR	558 (3.5)	▼																												
Russian Federation	547 (4.6)	▼	▼	▼																										
Latvia	544 (2.4)	▼	▼	▼	▼																									
England	543 (2.7)	▼	▼	▼	▼																									
United States	534 (2.3)	▼	▼	▼	▼	▼																								
Slovenia	530 (1.6)	▼	▼	▼	▼	▼	▼																							
Hungary	529 (3.3)	▼	▼	▼	▼	▼	▼	▼																						
Kazakhstan	528 (5.8)	▼	▼	▼	▼	▼	▼	▼																						
Germany	524 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼																					
Australia	522 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Italy	521 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Lithuania	514 (1.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Austria	514 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Slovak Republic	513 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Czech Republic	511 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Sweden	508 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Netherlands	503 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Denmark	502 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Scotland	499 (1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
New Zealand	498 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Armenia	492 (5.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Ukraine	475 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Norway	469 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Iran, Islamic Rep. of	454 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Georgia	414 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Colombia	411 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				
El Salvador	392 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Algeria	377 (5.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Kuwait	345 (5.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Tunisia	340 (6.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Morocco	324 (5.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Qatar	303 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Yemen	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<b>Benchmarking Participants</b>																														
Massachusetts, US	560 (4.4)	▼																												
Minnesota, US	545 (5.4)	▼	▼	▼	▼																									
Ontario, Canada	535 (2.9)	▼	▼	▼	▼	▼																								
Alberta, Canada	535 (3.1)	▼	▼	▼	▼	▼	▼																							
British Columbia, Canada	531 (2.6)	▼	▼	▼	▼	▼	▼	▼																						
Quebec, Canada	513 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼																					
Dubai, UAE	467 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone. A plus (+) sign indicates average achievement could not be accurately estimated.

Exhibit B.2 Multiple Comparisons of Average Achievement in Physical Science (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

El Salvador	Algeria	Kuwait	Tunisia	Morocco	Qatar	Yemen	Benchmarking Participants							Average Scale Score	Country
							Massachusetts, US	Minnesota, US	Ontario, Canada	Alberta, Canada	British Columbia, Canada	Quebec, Canada	Dubai, UAE		
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	585 (3.9)	Singapore
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	564 (2.3)	Japan
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	559 (2.5)	Chinese Taipei
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	558 (3.5)	Hong Kong SAR
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	547 (4.6)	Russian Federation
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	544 (2.4)	Latvia
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	543 (2.7)	England
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	534 (2.3)	United States
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	530 (1.6)	Slovenia
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	529 (3.3)	Hungary
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	528 (5.8)	Kazakhstan
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	524 (2.5)	Germany
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	522 (3.1)	Australia
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	521 (3.1)	Italy
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	514 (1.4)	Lithuania
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	514 (2.4)	Austria
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	513 (4.6)	Slovak Republic
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	511 (2.8)	Czech Republic
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	508 (2.7)	Sweden
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	503 (2.3)	Netherlands
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	502 (2.5)	Denmark
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	499 (1.9)	Scotland
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	498 (2.5)	New Zealand
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	492 (5.1)	Armenia
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	475 (2.7)	Ukraine
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	469 (2.7)	Norway
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	454 (4.2)	Iran, Islamic Rep. of
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	414 (4.0)	Georgia
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	411 (4.9)	Colombia
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	392 (3.8)	El Salvador
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	377 (5.3)	Algeria
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	345 (5.2)	Kuwait
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	340 (6.4)	Tunisia
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	324 (5.5)	Morocco
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	303 (2.1)	Qatar
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Yemen
Benchmarking Participants															
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	560 (4.4)	Massachusetts, US
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	545 (5.4)	Minnesota, US
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	535 (2.9)	Ontario, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	535 (3.1)	Alberta, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	531 (2.6)	British Columbia, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	513 (2.6)	Quebec, Canada
⬆	⬆	⬆	⬆	⬆	⬆	+	⬆	⬆	⬆	⬆	⬆	⬆	⬆	467 (2.8)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

⬆ Average achievement significantly higher than comparison country    ⬆ Average achievement significantly lower than comparison country

Exhibit B.3 Multiple Comparisons of Average Achievement in Earth Science

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Comparison Countries																																	
		Hong Kong SAR	Singapore	Chinese Taipei	England	Russian Federation	Latvia	Sweden	Australia	Kazakhstan	United States	Austria	Slovak Republic	Japan	Italy	Germany	Netherlands	Denmark	Czech Republic	Slovenia	Hungary	New Zealand	Lithuania	Scotland	Norway	Armenia	Ukraine	Iran, Islamic Rep. of	Georgia	Colombia					
Hong Kong SAR	560 (3.2)																																		
Singapore	554 (3.3)																																		
Chinese Taipei	553 (1.9)																																		
England	538 (2.9)	▼	▼	▼																															
Russian Federation	536 (4.3)	▼	▼	▼																															
Latvia	536 (2.2)	▼	▼	▼																															
Sweden	535 (2.7)	▼	▼	▼																															
Australia	534 (3.2)	▼	▼	▼																															
Kazakhstan	534 (5.2)	▼	▼	▼																															
United States	533 (2.6)	▼	▼	▼																															
Austria	532 (1.9)	▼	▼	▼																															
Slovak Republic	530 (4.8)	▼	▼	▼																															
Japan	529 (2.7)	▼	▼	▼	▼		▼																												
Italy	526 (3.0)	▼	▼	▼	▼		▼																												
Germany	524 (2.4)	▼	▼	▼	▼		▼																												
Netherlands	524 (2.5)	▼	▼	▼	▼		▼																												
Denmark	522 (2.7)	▼	▼	▼	▼		▼																												
Czech Republic	518 (2.6)	▼	▼	▼	▼		▼																												
Slovenia	517 (2.5)	▼	▼	▼	▼		▼																												
Hungary	517 (3.5)	▼	▼	▼	▼		▼																												
New Zealand	515 (2.6)	▼	▼	▼	▼		▼																												
Lithuania	511 (2.5)	▼	▼	▼	▼		▼																												
Scotland	508 (2.5)	▼	▼	▼	▼		▼																												
Norway	497 (2.9)	▼	▼	▼	▼		▼																												
Armenia	479 (5.5)	▼	▼	▼	▼		▼																												
Ukraine	474 (3.1)	▼	▼	▼	▼		▼																												
Iran, Islamic Rep. of	433 (4.1)	▼	▼	▼	▼		▼																												
Georgia	432 (5.0)	▼	▼	▼	▼		▼																												
Colombia	401 (5.6)	▼	▼	▼	▼		▼																												
El Salvador	393 (3.3)	▼	▼	▼	▼		▼																												
Algeria	365 (5.7)	▼	▼	▼	▼		▼																												
Kuwait	363 (3.8)	▼	▼	▼	▼		▼																												
Tunisia	325 (5.8)	▼	▼	▼	▼		▼																												
Qatar	305 (2.2)	▼	▼	▼	▼		▼																												
Morocco	293 (6.2)	▼	▼	▼	▼		▼																												
Yemen	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
<b>Benchmarking Participants</b>																																			
Massachusetts, US	558 (4.4)				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Minnesota, US	547 (5.8)																																		
Alberta, Canada	544 (3.3)	▼	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
British Columbia, Canada	537 (2.7)	▼	▼	▼																															
Ontario, Canada	530 (3.2)	▼	▼	▼	▼																														
Quebec, Canada	523 (2.6)	▼	▼	▼	▼		▼																												
Dubai, UAE	471 (2.6)	▼	▼	▼	▼		▼																												

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone. A plus (+) sign indicates average achievement could not be accurately estimated.

Exhibit B.3 Multiple Comparisons of Average Achievement in Earth Science (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

El Salvador	Algeria	Kuwait	Tunisia	Qatar	Morocco	Yemen	Benchmarking Participants							Average Scale Score	Country
							Massachusetts, US	Minnesota, US	Alberta, Canada	British Columbia, Canada	Ontario, Canada	Quebec, Canada	Dubai, UAE		
▲	▲	▲	▲	▲	▲	+			▲	▲	▲	▲	▲	560 (3.2)	Hong Kong SAR
▲	▲	▲	▲	▲	▲	+			▲	▲	▲	▲	▲	554 (3.3)	Singapore
▲	▲	▲	▲	▲	▲	+			▲	▲	▲	▲	▲	553 (1.9)	Chinese Taipei
▲	▲	▲	▲	▲	▲	+	▼				▲	▲	▲	538 (2.9)	England
▲	▲	▲	▲	▲	▲	+	▼				▲	▲	▲	536 (4.3)	Russian Federation
▲	▲	▲	▲	▲	▲	+	▼	▼			▲	▲	▲	536 (2.2)	Latvia
▲	▲	▲	▲	▲	▲	+	▼	▼			▲	▲	▲	535 (2.7)	Sweden
▲	▲	▲	▲	▲	▲	+	▼	▼			▲	▲	▲	534 (3.2)	Australia
▲	▲	▲	▲	▲	▲	+	▼				▲	▲	▲	534 (5.2)	Kazakhstan
▲	▲	▲	▲	▲	▲	+	▼	▼			▲	▲	▲	533 (2.6)	United States
▲	▲	▲	▲	▲	▲	+	▼	▼			▲	▲	▲	532 (1.9)	Austria
▲	▲	▲	▲	▲	▲	+	▼	▼			▲	▲	▲	530 (4.8)	Slovak Republic
▲	▲	▲	▲	▲	▲	+	▼	▼	▼		▲	▲	▲	529 (2.7)	Japan
▲	▲	▲	▲	▲	▲	+	▼	▼	▼		▲	▲	▲	526 (3.0)	Italy
▲	▲	▲	▲	▲	▲	+	▼	▼	▼		▲	▲	▲	524 (2.4)	Germany
▲	▲	▲	▲	▲	▲	+	▼	▼	▼		▲	▲	▲	524 (2.5)	Netherlands
▲	▲	▲	▲	▲	▲	+	▼	▼	▼		▲	▲	▲	522 (2.7)	Denmark
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	518 (2.6)	Czech Republic
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	517 (2.5)	Slovenia
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	517 (3.5)	Hungary
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	515 (2.6)	New Zealand
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	511 (2.5)	Lithuania
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	508 (2.5)	Scotland
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	497 (2.9)	Norway
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	479 (5.5)	Armenia
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	474 (3.1)	Ukraine
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	433 (4.1)	Iran, Islamic Rep. of
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	432 (5.0)	Georgia
	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	401 (5.6)	Colombia
	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	393 (3.3)	El Salvador
▼				▲	▲	+	▼	▼	▼	▼	▲	▲	▲	365 (5.7)	Algeria
▼				▲	▲	+	▼	▼	▼	▼	▲	▲	▲	363 (3.8)	Kuwait
▼	▼	▼		▲	▲	+	▼	▼	▼	▼	▲	▲	▲	325 (5.8)	Tunisia
▼	▼	▼	▼			+	▼	▼	▼	▼	▲	▲	▲	305 (2.2)	Qatar
▼	▼	▼	▼			+	▼	▼	▼	▼	▲	▲	▲	293 (6.2)	Morocco
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	Yemen
Benchmarking Participants															
▲	▲	▲	▲	▲	▲	+			▲	▲	▲	▲	▲	558 (4.4)	Massachusetts, US
▲	▲	▲	▲	▲	▲	+			▲	▲	▲	▲	▲	547 (5.8)	Minnesota, US
▲	▲	▲	▲	▲	▲	+	▼				▲	▲	▲	544 (3.3)	Alberta, Canada
▲	▲	▲	▲	▲	▲	+	▼				▲	▲	▲	537 (2.7)	British Columbia, Canada
▲	▲	▲	▲	▲	▲	+	▼	▼			▲	▲	▲	530 (3.2)	Ontario, Canada
▲	▲	▲	▲	▲	▲	+	▼	▼	▼		▲	▲	▲	523 (2.6)	Quebec, Canada
▲	▲	▲	▲	▲	▲	+	▼	▼	▼	▼	▲	▲	▲	471 (2.6)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country

Exhibit B.4 Multiple Comparisons of Average Achievement in Knowing

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Singapore	Hong Kong SAR	England	Russian Federation	United States	Hungary	Latvia	Chinese Taipei	Kazakhstan	Italy	Austria	Australia	Japan	Germany	Slovak Republic	Sweden	Czech Republic	Netherlands	Denmark	Slovenia	Lithuania	Scotland	New Zealand	Armenia	Norway	Ukraine	Iran, Islamic Rep. of	Georgia	El Salvador
Singapore	587 (4.1)																													
Hong Kong SAR	546 (3.2)	▼																												
England	543 (2.9)	▼																												
Russian Federation	542 (4.8)	▼																												
United States	541 (2.3)	▼																												
Hungary	540 (3.0)	▼																												
Latvia	540 (2.2)	▼																												
Chinese Taipei	536 (2.5)	▼	▼																											
Kazakhstan	534 (5.8)	▼																												
Italy	530 (3.9)	▼	▼	▼		▼	▼	▼																						
Austria	529 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼																					
Australia	529 (3.1)	▼	▼	▼	▼	▼	▼	▼																						
Japan	528 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼																					
Germany	527 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼																					
Slovak Republic	527 (4.4)	▼	▼	▼	▼	▼	▼	▼	▼																					
Sweden	526 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼																					
Czech Republic	520 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Netherlands	518 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Denmark	516 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Slovenia	511 (1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Lithuania	511 (1.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Scotland	511 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
New Zealand	511 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Armenia	486 (5.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Norway	485 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Ukraine	476 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Iran, Islamic Rep. of	437 (4.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Georgia	434 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
El Salvador	410 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Colombia	409 (5.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Kuwait	360 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Algeria	350 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Tunisia	316 (5.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				
Qatar	304 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Morocco	291 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Yemen	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<b>Benchmarking Participants</b>																														
Massachusetts, US	566 (4.4)	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Minnesota, US	550 (5.9)	▼																												
Alberta, Canada	549 (3.5)	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
British Columbia, Canada	539 (2.5)	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Ontario, Canada	538 (3.4)	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Quebec, Canada	516 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Dubai, UAE	463 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone. A plus (+) sign indicates average achievement could not be accurately estimated.

Exhibit B.4 Multiple Comparisons of Average Achievement in Knowing (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Colombia	Kuwait	Algeria	Tunisia	Qatar	Morocco	Yemen	Benchmarking Participants	Average Scale Score	Country
▲	▲	▲	▲	▲	▲	+	Massachusetts, US	587 (4.1)	Singapore
▲	▲	▲	▲	▲	▲	+	Minnesota, US	546 (3.2)	Hong Kong SAR
▼	▼	▼	▼	▼	▼	+	Alberta, Canada	543 (2.9)	England
▲	▲	▲	▲	▲	▲	+	British Columbia, Canada	542 (4.8)	Russian Federation
▲	▲	▲	▲	▲	▲	+	Ontario, Canada	541 (2.3)	United States
▲	▲	▲	▲	▲	▲	+	Quebec, Canada	540 (3.0)	Hungary
▲	▲	▲	▲	▲	▲	+	Dubai, UAE	540 (2.2)	Latvia
▲	▲	▲	▲	▲	▲	+		536 (2.5)	Chinese Taipei
▲	▲	▲	▲	▲	▲	+		534 (5.8)	Kazakhstan
▲	▲	▲	▲	▲	▲	+		530 (3.9)	Italy
▲	▲	▲	▲	▲	▲	+		529 (2.0)	Austria
▲	▲	▲	▲	▲	▲	+		529 (3.1)	Australia
▲	▲	▲	▲	▲	▲	+		528 (2.2)	Japan
▲	▲	▲	▲	▲	▲	+		527 (2.2)	Germany
▲	▲	▲	▲	▲	▲	+		527 (4.4)	Slovak Republic
▲	▲	▲	▲	▲	▲	+		526 (2.5)	Sweden
▲	▲	▲	▲	▲	▲	+		520 (2.7)	Czech Republic
▲	▲	▲	▲	▲	▲	+		518 (2.5)	Netherlands
▲	▲	▲	▲	▲	▲	+		516 (2.9)	Denmark
▲	▲	▲	▲	▲	▲	+		511 (1.6)	Slovenia
▲	▲	▲	▲	▲	▲	+		511 (1.7)	Lithuania
▲	▲	▲	▲	▲	▲	+		511 (2.0)	Scotland
▲	▲	▲	▲	▲	▲	+		511 (2.5)	New Zealand
▲	▲	▲	▲	▲	▲	+		486 (5.2)	Armenia
▲	▲	▲	▲	▲	▲	+		485 (2.4)	Norway
▲	▲	▲	▲	▲	▲	+		476 (2.4)	Ukraine
▲	▲	▲	▲	▲	▲	+		437 (4.3)	Iran, Islamic Rep. of
▲	▲	▲	▲	▲	▲	+		434 (3.8)	Georgia
▲	▲	▲	▲	▲	▲	+		410 (3.9)	El Salvador
▲	▲	▲	▲	▲	▲	+		409 (5.5)	Colombia
▼	▼	▼	▼	▼	▼	+		360 (3.9)	Kuwait
▼	▼	▼	▼	▼	▼	+		350 (5.8)	Algeria
▼	▼	▼	▼	▼	▼	+		316 (5.9)	Tunisia
▼	▼	▼	▼	▼	▼	+		304 (2.3)	Qatar
▼	▼	▼	▼	▼	▼	+		291 (5.8)	Morocco
+	+	+	+	+	+	+		+	Yemen
Benchmarking Participants							Average Scale Score	Country	
▲	▲	▲	▲	▲	▲	+	566 (4.4)	Massachusetts, US	
▼	▼	▼	▼	▼	▼	+	550 (5.9)	Minnesota, US	
▲	▲	▲	▲	▲	▲	+	549 (3.5)	Alberta, Canada	
▼	▼	▼	▼	▼	▼	+	539 (2.5)	British Columbia, Canada	
▲	▲	▲	▲	▲	▲	+	538 (3.4)	Ontario, Canada	
▲	▲	▲	▲	▲	▲	+	516 (2.8)	Quebec, Canada	
▲	▲	▲	▲	▲	▲	+	463 (2.6)	Dubai, UAE	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country

Exhibit B.5 Multiple Comparisons of Average Achievement in Applying

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Comparison Countries																												
		Singapore	Chinese Taipei	Hong Kong SAR	Russian Federation	Japan	Italy	England	Kazakhstan	Latvia	United States	Hungary	Slovak Republic	Germany	Austria	Netherlands	Slovenia	Australia	Sweden	Czech Republic	Denmark	Lithuania	New Zealand	Scotland	Armenia	Norway	Ukraine	Iran, Islamic Rep. of	Georgia	Colombia
Singapore	579 (3.7)																													
Chinese Taipei	556 (2.1)	▼																												
Hong Kong SAR	549 (3.0)	▼																												
Russian Federation	546 (4.7)	▼																												
Japan	542 (2.7)	▼	▼																											
Italy	539 (3.1)	▼	▼	▼																										
England	536 (2.7)	▼	▼	▼																										
Kazakhstan	536 (4.9)	▼	▼	▼																										
Latvia	535 (2.4)	▼	▼	▼	▼	▼																								
United States	533 (2.8)	▼	▼	▼	▼	▼																								
Hungary	531 (3.2)	▼	▼	▼	▼	▼																								
Slovak Republic	527 (4.4)	▼	▼	▼	▼	▼	▼																							
Germany	526 (2.2)	▼	▼	▼	▼	▼	▼	▼																						
Austria	526 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼																					
Netherlands	525 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Slovenia	525 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Australia	523 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Sweden	521 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Czech Republic	516 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Denmark	515 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Lithuania	515 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
New Zealand	500 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Scotland	494 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Armenia	487 (5.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Norway	478 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Ukraine	477 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Iran, Islamic Rep. of	451 (4.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Georgia	424 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Colombia	404 (5.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
El Salvador	393 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Algeria	379 (5.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Kuwait	338 (4.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Tunisia	329 (6.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				
Morocco	311 (6.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Qatar	283 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Yemen	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<b>Benchmarking Participants</b>																														
Massachusetts, US	563 (4.4)	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Minnesota, US	544 (5.9)	▼																												
Alberta, Canada	535 (3.7)	▼	▼	▼																										
British Columbia, Canada	533 (2.4)	▼	▼	▼	▼	▼																								
Ontario, Canada	528 (3.4)	▼	▼	▼	▼	▼	▼																							
Quebec, Canada	515 (2.7)	▼	▼	▼	▼	▼	▼	▼																						
Dubai, UAE	463 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼																					

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone. A plus (+) sign indicates average achievement could not be accurately estimated.



Exhibit B.6 Multiple Comparisons of Average Achievement in Reasoning

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Chinese Taipei	Singapore	Japan	Hong Kong SAR	Latvia	Russian Federation	England	United States	Australia	Hungary	Slovenia	Sweden	Italy	Denmark	Netherlands	Germany	Lithuania	Kazakhstan	Slovak Republic	Austria	Czech Republic	New Zealand	Scotland	Armenia	Norway	Ukraine	Iran, Islamic Rep. of	Colombia	Georgia	
Chinese Taipei	571 (2.4)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Singapore	568 (3.7)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Japan	567 (2.1)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Hong Kong SAR	561 (4.4)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Latvia	551 (2.7)	▼	▼	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Russian Federation	542 (4.6)	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
England	537 (2.7)	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
United States	535 (2.6)	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Australia	530 (3.4)	▼	▼	▼	▼	▼															▲	▲	▲	▲	▲	▲	▲	▲	▲		
Hungary	529 (3.7)	▼	▼	▼	▼	▼	▼																								
Slovenia	527 (1.8)	▼	▼	▼	▼	▼	▼	▼																							
Sweden	527 (3.5)	▼	▼	▼	▼	▼	▼	▼																							
Italy	526 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼																						
Denmark	525 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼																						
Netherlands	525 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼																						
Germany	525 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼																						
Lithuania	524 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼																						
Kazakhstan	519 (5.3)	▼	▼	▼	▼	▼	▼	▼	▼																						
Slovak Republic	513 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼																					
Austria	513 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼																					
Czech Republic	510 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼																					
New Zealand	505 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Scotland	501 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Armenia	484 (5.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Norway	480 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Ukraine	478 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Iran, Islamic Rep. of	436 (4.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Colombia	409 (5.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Georgia	388 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
El Salvador	376 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Algeria	357 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Tunisia	349 (5.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Kuwait	331 (5.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Morocco	318 (5.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Qatar	293 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Yemen	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
<b>Benchmarking Participants</b>																															
Massachusetts, US	569 (6.2)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Minnesota, US	549 (6.4)	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Ontario, Canada	541 (3.1)	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Alberta, Canada	537 (4.4)	▼	▼	▼	▼																										
British Columbia, Canada	536 (2.7)	▼	▼	▼	▼																										
Quebec, Canada	528 (3.3)	▼	▼	▼	▼	▼																									
Dubai, UAE	462 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone. A plus (+) sign indicates average achievement could not be accurately estimated.

Exhibit B.6 Multiple Comparisons of Average Achievement in Reasoning (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

El Salvador	Algeria	Tunisia	Kuwait	Morocco	Qatar	Yemen	Benchmarking Participants	Average Scale Score	Country
▲	▲	▲	▲	▲	▲	+	Massachusetts, US	571 (2.4)	Chinese Taipei
▲	▲	▲	▲	▲	▲	+	Minnesota, US	568 (3.7)	Singapore
▲	▲	▲	▲	▲	▲	+	Ontario, Canada	567 (2.1)	Japan
▲	▲	▲	▲	▲	▲	+	Alberta, Canada	561 (4.4)	Hong Kong SAR
▲	▲	▲	▲	▲	▲	+	British Columbia, Canada	551 (2.7)	Latvia
▲	▲	▲	▲	▲	▲	+	Quebec, Canada	542 (4.6)	Russian Federation
▲	▲	▲	▲	▲	▲	+	Dubai, UAE	537 (2.7)	England
▲	▲	▲	▲	▲	▲	+		535 (2.6)	United States
▲	▲	▲	▲	▲	▲	+		530 (3.4)	Australia
▲	▲	▲	▲	▲	▲	+		529 (3.7)	Hungary
▲	▲	▲	▲	▲	▲	+		527 (1.8)	Slovenia
▲	▲	▲	▲	▲	▲	+		527 (3.5)	Sweden
▲	▲	▲	▲	▲	▲	+		526 (3.8)	Italy
▲	▲	▲	▲	▲	▲	+		525 (3.8)	Denmark
▲	▲	▲	▲	▲	▲	+		525 (2.3)	Netherlands
▲	▲	▲	▲	▲	▲	+		525 (2.3)	Germany
▲	▲	▲	▲	▲	▲	+		524 (2.4)	Lithuania
▲	▲	▲	▲	▲	▲	+		519 (5.3)	Kazakhstan
▲	▲	▲	▲	▲	▲	+		513 (4.9)	Slovak Republic
▲	▲	▲	▲	▲	▲	+		513 (2.3)	Austria
▲	▲	▲	▲	▲	▲	+		510 (2.9)	Czech Republic
▲	▲	▲	▲	▲	▲	+		505 (2.9)	New Zealand
▲	▲	▲	▲	▲	▲	+		501 (2.2)	Scotland
▲	▲	▲	▲	▲	▲	+		484 (5.3)	Armenia
▲	▲	▲	▲	▲	▲	+		480 (3.2)	Norway
▲	▲	▲	▲	▲	▲	+		478 (3.0)	Ukraine
▲	▲	▲	▲	▲	▲	+		436 (4.3)	Iran, Islamic Rep. of
▲	▲	▲	▲	▲	▲	+		409 (5.1)	Colombia
▲	▲	▲	▲	▲	▲	+		388 (4.9)	Georgia
▲	▲	▲	▲	▲	▲	+		376 (4.0)	El Salvador
▼	▲	▲	▲	▲	▲	+		357 (5.8)	Algeria
▼	▲	▲	▲	▲	▲	+		349 (5.3)	Tunisia
▼	▼	▼	▲	▲	▲	+		331 (5.4)	Kuwait
▼	▼	▼	▲	▲	▲	+		318 (5.4)	Morocco
▼	▼	▼	▼	▲	▲	+		293 (2.9)	Qatar
+	+	+	+	+	+	+		+	Yemen
<b>Benchmarking Participants</b>									
▲	▲	▲	▲	▲	▲	+	Massachusetts, US	569 (6.2)	
▼	▲	▲	▲	▲	▲	+	Minnesota, US	549 (6.4)	
▲	▲	▲	▲	▲	▲	+	Ontario, Canada	541 (3.1)	
▲	▲	▲	▲	▲	▲	+	Alberta, Canada	537 (4.4)	
▲	▲	▲	▲	▲	▲	+	British Columbia, Canada	536 (2.7)	
▲	▲	▲	▲	▲	▲	+	Quebec, Canada	528 (3.3)	
▲	▲	▲	▲	▲	▲	+	Dubai, UAE	462 (2.6)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country

Exhibit B.7 Multiple Comparisons of Average Achievement in Biology

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Singapore	Japan	Chinese Taipei	Korea, Rep. of	England	Hungary	Czech Republic	United States	Slovenia	Hong Kong SAR	Lithuania	Russian Federation	Australia	Sweden	Italy	Scotland	Armenia	Norway	Thailand	Jordan	Ukraine	Serbia	Bahrain	Israel	Malaysia	Bulgaria	Bosnia and Herzegovina	Turkey	Syrian Arab Republic
Singapore	564 (4.2)		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	553 (1.9)	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chinese Taipei	549 (3.4)	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea, Rep. of	548 (1.9)	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	541 (4.4)	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	534 (2.7)	▼	▼	▼	▼							▲		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	531 (2.1)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	530 (2.8)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	530 (2.3)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong SAR	527 (4.6)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Lithuania	527 (2.3)	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Federation	525 (3.6)	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	518 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	515 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Italy	502 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Scotland	495 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Armenia	490 (5.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Norway	487 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Thailand	478 (4.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Jordan	478 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ukraine	477 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Serbia	474 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bahrain	473 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Israel	472 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Malaysia	469 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bulgaria	467 (6.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bosnia and Herzegovina	464 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Turkey	462 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Syrian Arab Republic	459 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Romania	459 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Malta	453 (1.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Tunisia	452 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Iran, Islamic Rep. of	449 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Cyprus	447 (1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Colombia	434 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Indonesia	428 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Georgia	423 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Kuwait	419 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Oman	414 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Algeria	411 (1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Saudi Arabia	407 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Egypt	406 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Lebanon	405 (6.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Palestinian Nat'l Auth.	402 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
El Salvador	398 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Morocco	395 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Botswana	359 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Qatar	318 (1.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ghana	304 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
<b>Benchmarking Participants</b>																														
Massachusetts, US	563 (4.3)		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Minnesota, US	555 (5.2)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ontario, Canada	537 (3.8)	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
British Columbia, Canada	535 (3.2)	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Quebec, Canada	513 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Basque Country, Spain	498 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Dubai, UAE	485 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲

SOURCE: IEAs Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

Exhibit B.7 Multiple Comparisons of Average Achievement in Biology (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

	Romania	Malta	Tunisia	Iran, Islamic Rep. of	Cyprus	Colombia	Indonesia	Georgia	Kuwait	Oman	Algeria	Saudi Arabia	Egypt	Lebanon	Palestinian Nat'l Auth.	El Salvador	Morocco	Botswana	Qatar	Ghana	Benchmarking Participants	Average Scale Score	Country		
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	564 (4.2)	Singapore	
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	553 (1.9)	Japan
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	549 (3.4)	Chinese Taipei
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	548 (1.9)	Korea, Rep. of
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	541 (4.4)	England
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	534 (2.7)	Hungary
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	531 (2.1)	Czech Republic
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	530 (2.8)	United States
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	530 (2.3)	Slovenia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	527 (4.6)	Hong Kong SAR
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	527 (2.3)	Lithuania
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	525 (3.6)	Russian Federation
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	518 (3.4)	Australia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	515 (2.4)	Sweden
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	502 (3.0)	Italy
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	495 (3.2)	Scotland
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	490 (5.9)	Armenia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	487 (2.3)	Norway
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	478 (4.5)	Thailand
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	478 (3.8)	Jordan
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	477 (3.4)	Ukraine
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	474 (3.2)	Serbia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	473 (2.0)	Bahrain
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	472 (4.2)	Israel
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	469 (5.8)	Malaysia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	467 (6.0)	Bulgaria
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	464 (3.0)	Bosnia and Herzegovina
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	462 (3.4)	Turkey
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	459 (2.7)	Syrian Arab Republic
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	459 (3.2)	Romania
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	453 (1.7)	Malta
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	452 (2.2)	Tunisia
	▼	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	449 (3.6)	Iran, Islamic Rep. of
	▼	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	447 (1.9)	Cyprus
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	434 (3.7)	Colombia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	428 (3.1)	Indonesia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	423 (3.9)	Georgia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	419 (2.6)	Kuwait
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	414 (3.1)	Oman
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	411 (1.9)	Algeria
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	407 (2.4)	Saudi Arabia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	406 (3.4)	Egypt
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	405 (6.2)	Lebanon
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	402 (4.1)	Palestinian Nat'l Auth.
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	398 (3.0)	El Salvador
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	395 (3.5)	Morocco
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	359 (2.9)	Botswana
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	318 (1.7)	Qatar
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	304 (4.9)	Ghana
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	563 (4.3)	Massachusetts, US
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	555 (5.2)	Minnesota, US
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	537 (3.8)	Ontario, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	535 (3.2)	British Columbia, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	513 (2.9)	Quebec, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	498 (2.9)	Basque Country, Spain
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	485 (3.4)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▶ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country

Exhibit B.8 Multiple Comparisons of Average Achievement in Chemistry

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Chinese Taipei	Singapore	Japan	Slovenia	Hungary	Korea, Rep. of	Czech Republic	Russian Federation	England	Hong Kong SAR	United States	Lithuania	Australia	Sweden	Scotland	Jordan	Ukraine	Norway	Italy	Malaysia	Armenia	Bulgaria	Bahrain	Bosnia and Herzegovina	Israel	Serbia	Romania	Iran, Islamic Rep. of	Thailand	
Chinese Taipei	573 (4.2)		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Singapore	560 (4.1)	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Japan	551 (1.9)	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Slovenia	539 (2.5)	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Hungary	536 (3.5)	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Korea, Rep. of	536 (2.4)	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Czech Republic	535 (2.7)	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Russian Federation	535 (3.7)	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
England	534 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Hong Kong SAR	517 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
United States	510 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Lithuania	507 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Australia	505 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Sweden	499 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Scotland	497 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Jordan	491 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Ukraine	490 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Norway	483 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
Italy	481 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲		
Malaysia	479 (5.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲		
Armenia	478 (6.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲	▲		
Bulgaria	472 (6.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲	▲		
Bahrain	468 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲	▲		
Bosnia and Herzegovina	468 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲		
Israel	467 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲	▲		
Serbia	467 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	▲		
Romania	463 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲		
Iran, Islamic Rep. of	463 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	
Thailand	462 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲	
Malta	461 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Tunisia	458 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Cyprus	452 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Syrian Arab Republic	450 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Lebanon	447 (5.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Turkey	435 (5.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Indonesia	421 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Colombia	420 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Georgia	418 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Kuwait	418 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Oman	416 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Morocco	416 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Algeria	414 (1.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Palestinian Nat'l Auth.	413 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Egypt	413 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Saudi Arabia	390 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
El Salvador	377 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Botswana	371 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Ghana	342 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Qatar	322 (1.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
<b>Benchmarking Participants</b>																															
Massachusetts, US	540 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Minnesota, US	519 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
British Columbia, Canada	505 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Ontario, Canada	505 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Quebec, Canada	497 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Dubai, UAE	493 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Basque Country, Spain	472 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

Exhibit B.8 Multiple Comparisons of Average Achievement in Chemistry (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Malta	Tunisia	Cyprus	Syrian Arab Republic	Lebanon	Turkey	Indonesia	Colombia	Georgia	Kuwait	Oman	Morocco	Algeria	Palestinian Nat'l Auth.	Egypt	Saudi Arabia	El Salvador	Botswana	Ghana	Qatar	Benchmarking Participants	Average Scale Score
Chinese Taipei	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	573 (4.2)
Singapore	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	560 (4.1)
Japan	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	551 (1.9)
Slovenia	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	539 (2.5)
Hungary	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	536 (3.5)
Korea, Rep. of	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	536 (2.4)
Czech Republic	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	535 (2.7)
Russian Federation	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	535 (3.7)
England	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	534 (4.0)
Hong Kong SAR	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	517 (4.6)
United States	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	510 (2.7)
Lithuania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	507 (2.3)
Australia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	505 (3.6)
Sweden	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	499 (2.4)
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	497 (3.2)
Jordan	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	491 (4.1)
Ukraine	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	490 (3.3)
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	483 (2.2)
Italy	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	481 (2.9)
Malaysia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	479 (5.0)
Armenia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	478 (6.3)
Bulgaria	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	472 (6.1)
Bahrain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	468 (2.4)
Bosnia and Herzegovina	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	468 (2.9)
Israel	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	467 (4.6)
Serbia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	467 (3.7)
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	463 (4.0)
Iran, Islamic Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	463 (3.5)
Thailand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	462 (4.1)
Malta	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	461 (2.1)
Tunisia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	458 (2.5)
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	452 (2.5)
Syrian Arab Republic	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	450 (2.9)
Lebanon	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	447 (5.5)
Turkey	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	435 (5.2)
Indonesia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	421 (3.4)
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	420 (3.1)
Georgia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	418 (4.6)
Kuwait	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	418 (3.8)
Oman	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	416 (3.6)
Morocco	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	416 (3.0)
Algeria	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	414 (1.7)
Palestinian Nat'l Auth.	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	413 (4.2)
Egypt	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	413 (4.0)
Saudi Arabia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	390 (2.5)
El Salvador	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	377 (3.2)
Botswana	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	371 (2.4)
Ghana	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	342 (4.9)
Qatar	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	322 (1.8)
Massachusetts, US	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	540 (4.6)
Minnesota, US	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	519 (4.9)
British Columbia, Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	505 (2.7)
Ontario, Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	505 (3.4)
Quebec, Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	497 (3.1)
Dubai, UAE	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	493 (3.5)
Basque Country, Spain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	472 (3.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country

Exhibit B.9 Multiple Comparisons of Average Achievement in Physics

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Singapore	Korea, Rep. of	Japan	Chinese Taipei	England	Hungary	Czech Republic	Hong Kong SAR	Slovenia	Russian Federation	Australia	Sweden	Lithuania	Armenia	United States	Scotland	Ukraine	Italy	Malaysia	Jordan	Norway	Israel	Iran, Islamic Rep. of	Malta	Serbia	Bulgaria	Bahrain	Bosnia and Herzegovina	Romania
Singapore	575 (3.9)			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea, Rep. of	571 (2.4)			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	558 (1.9)	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chinese Taipei	554 (3.7)	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	545 (4.0)	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	541 (3.2)	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	537 (2.1)	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong SAR	528 (4.8)	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	524 (2.0)	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Federation	519 (4.0)	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	508 (4.2)	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	506 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Lithuania	505 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Armenia	503 (5.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
United States	503 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Scotland	494 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Ukraine	492 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Italy	489 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Malaysia	484 (5.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Jordan	479 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Norway	475 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Israel	472 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Iran, Islamic Rep. of	470 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Malta	470 (1.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Serbia	467 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Bulgaria	466 (5.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Bahrain	466 (1.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Bosnia and Herzegovina	463 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Romania	458 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Thailand	458 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Cyprus	458 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Syrian Arab Republic	447 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Turkey	445 (4.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Oman	443 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Kuwait	438 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Indonesia	432 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Tunisia	432 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Lebanon	431 (5.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Georgia	416 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Palestinian Nat'l Auth.	414 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Egypt	413 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Saudi Arabia	408 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Colombia	407 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Morocco	405 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Algeria	397 (2.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
El Salvador	380 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Botswana	351 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Qatar	347 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Ghana	276 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
<b>Benchmarking Participants</b>																														
Massachusetts, US	535 (5.0)	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ontario, Canada	520 (4.1)	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
British Columbia, Canada	517 (2.8)	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Minnesota, US	514 (4.8)	▼	▼	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Basque Country, Spain	493 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼																					
Quebec, Canada	492 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Dubai, UAE	489 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

Exhibit B.9 Multiple Comparisons of Average Achievement in Physics (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Thailand	Cyprus	Syrian Arab Republic	Turkey	Oman	Kuwait	Indonesia	Tunisia	Lebanon	Georgia	Palestinian Nat'l Auth.	Egypt	Saudi Arabia	Colombia	Morocco	Algeria	El Salvador	Botswana	Qatar	Ghana	Benchmarking Participants	Average Scale Score	Country
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	575 (3.9)	Singapore
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	571 (2.4)	Korea, Rep. of
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	558 (1.9)	Japan
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	554 (3.7)	Chinese Taipei
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	545 (4.0)	England
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	541 (3.2)	Hungary
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	537 (2.1)	Czech Republic
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	528 (4.8)	Hong Kong SAR
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	524 (2.0)	Slovenia
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	519 (4.0)	Russian Federation
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	508 (4.2)	Australia
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	506 (2.7)	Sweden
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	505 (2.9)	Lithuania
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	503 (5.6)	Armenia
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	503 (2.7)	United States
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	494 (3.7)	Scotland
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	492 (3.9)	Ukraine
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	489 (3.1)	Italy
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	484 (5.7)	Malaysia
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	479 (4.2)	Jordan
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	475 (3.0)	Norway
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	472 (4.6)	Israel
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	470 (3.6)	Iran, Islamic Rep. of
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	470 (1.7)	Malta
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	467 (3.0)	Serbia
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	466 (5.6)	Bulgaria
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	466 (1.5)	Bahrain
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	463 (3.1)	Bosnia and Herzegovina
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	458 (3.4)	Romania
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	458 (4.2)	Thailand
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	458 (2.8)	Cyprus
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	447 (2.7)	Syrian Arab Republic
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	445 (4.3)	Turkey
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	443 (2.9)	Oman
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	438 (2.8)	Kuwait
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	432 (3.1)	Indonesia
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	432 (2.5)	Tunisia
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	431 (5.1)	Lebanon
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	416 (5.8)	Georgia
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	414 (3.7)	Palestinian Nat'l Auth.
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	413 (3.3)	Egypt
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	408 (2.3)	Saudi Arabia
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	407 (3.5)	Colombia
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	405 (3.1)	Morocco
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	397 (2.2)	Algeria
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	380 (3.5)	El Salvador
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	351 (3.2)	Botswana
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	347 (2.1)	Qatar
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	276 (5.8)	Ghana
▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	535 (5.0)	Massachusetts, US
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	520 (4.1)	Ontario, Canada
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	517 (2.8)	British Columbia, Canada
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	514 (4.8)	Minnesota, US
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	493 (3.4)	Basque Country, Spain
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	492 (3.4)	Quebec, Canada
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	489 (3.4)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country

Exhibit B.10 Multiple Comparisons of Average Achievement in Earth Science

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Chinese Taipei	Slovenia	Singapore	Korea, Rep. of	Czech Republic	Japan	Hong Kong SAR	Hungary	England	Russian Federation	United States	Australia	Lithuania	Sweden	Italy	Norway	Scotland	Thailand	Jordan	Ukraine	Bulgaria	Iran, Islamic Rep. of	Armenia	Romania	Bosnia and Herzegovina	Turkey	Serbia	Bahrain	Malaysia
Chinese Taipei	545 (2.9)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Slovenia	542 (2.2)					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Singapore	541 (4.1)							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Korea, Rep. of	538 (2.2)								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Czech Republic	534 (2.0)	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Japan	533 (2.5)	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Hong Kong SAR	532 (4.5)	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Hungary	531 (2.9)	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
England	529 (4.3)	▼	▼	▼									▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Russian Federation	525 (3.4)	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
United States	525 (3.1)	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Australia	519 (3.8)	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Lithuania	515 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Sweden	510 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Italy	503 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Norway	502 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Scotland	498 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Thailand	488 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Jordan	484 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	
Ukraine	482 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	
Bulgaria	480 (5.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	
Iran, Islamic Rep. of	476 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	
Armenia	475 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	
Romania	471 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	
Bosnia and Herzegovina	469 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	
Turkey	466 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	
Serbia	466 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	
Bahrain	465 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	
Malaysia	463 (5.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	
Israel	462 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	
Cyprus	457 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	
Malta	456 (1.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	
Syrian Arab Republic	448 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Tunisia	447 (1.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Indonesia	442 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Oman	439 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Egypt	426 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Georgia	425 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Saudi Arabia	423 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Algeria	413 (1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Kuwait	410 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Palestinian Nat'l Auth.	408 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Colombia	407 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
El Salvador	400 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Morocco	397 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Lebanon	389 (6.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Botswana	361 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Qatar	312 (1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
Ghana	294 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			▲	▲	
<b>Benchmarking Participants</b>																														
Massachusetts, US	560 (4.0)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Minnesota, US	545 (5.5)						▲						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
British Columbia, Canada	530 (2.7)	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ontario, Canada	530 (4.3)	▼	▼										▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Basque Country, Spain	514 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Quebec, Canada	513 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Dubai, UAE	490 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼

SOURCE: IEAs Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

Exhibit B.10 Multiple Comparisons of Average Achievement in Earth Science (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Israel	Cyprus	Malta	Syrian Arab Republic	Tunisia	Indonesia	Oman	Egypt	Georgia	Saudi Arabia	Algeria	Kuwait	Palestinian Nat'l Auth.	Colombia	El Salvador	Morocco	Lebanon	Botswana	Qatar	Ghana	Benchmarking Participants	Average Scale Score	Country		
Chinese Taipei	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	545 (2.9)	Chinese Taipei		
Slovenia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	542 (2.2)	Slovenia	
Singapore	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	541 (4.1)	Singapore	
Korea, Rep. of	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	538 (2.2)	Korea, Rep. of	
Czech Republic	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	534 (2.0)	Czech Republic	
Japan	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	533 (2.5)	Japan	
Hong Kong SAR	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	532 (4.5)	Hong Kong SAR	
Hungary	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	531 (2.9)	Hungary	
England	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	529 (4.3)	England	
Russian Federation	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	525 (3.4)	Russian Federation	
United States	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	525 (3.1)	United States	
Australia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	519 (3.8)	Australia	
Lithuania	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	515 (2.5)	Lithuania	
Sweden	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	510 (3.0)	Sweden	
Italy	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	503 (3.1)	Italy	
Norway	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	502 (2.5)	Norway	
Scotland	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	498 (3.2)	Scotland	
Thailand	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	488 (3.8)	Thailand	
Jordan	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	484 (3.6)	Jordan	
Ukraine	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	482 (4.0)	Ukraine	
Bulgaria	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	480 (5.5)	Bulgaria	
Iran, Islamic Rep. of	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	476 (3.7)	Iran, Islamic Rep. of	
Armenia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	475 (5.8)	Armenia	
Romania	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	471 (3.3)	Romania	
Bosnia and Herzegovina	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	469 (3.4)	Bosnia and Herzegovina	
Turkey	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	466 (3.3)	Turkey	
Serbia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	466 (3.8)	Serbia	
Bahrain	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	465 (2.4)	Bahrain	
Malaysia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	463 (5.4)	Malaysia	
Israel	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	462 (4.1)	Israel	
Cyprus	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	457 (2.3)	Cyprus	
Malta	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	456 (1.5)	Malta	
Syrian Arab Republic	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	448 (3.2)	Syrian Arab Republic	
Tunisia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	447 (1.8)	Tunisia	
Indonesia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	442 (3.3)	Indonesia	
Oman	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	439 (2.5)	Oman	
Egypt	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	426 (3.8)	Egypt	
Georgia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	425 (4.1)	Georgia	
Saudi Arabia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	423 (2.3)	Saudi Arabia	
Algeria	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	413 (1.6)	Algeria	
Kuwait	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	410 (3.0)	Kuwait	
Palestinian Nat'l Auth.	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	408 (3.7)	Palestinian Nat'l Auth.	
Colombia	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	407 (3.9)	Colombia	
El Salvador	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	400 (2.9)	El Salvador	
Morocco	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	397 (3.8)	Morocco	
Lebanon	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	389 (6.4)	Lebanon	
Botswana	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	361 (4.0)	Botswana	
Qatar	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	312 (1.9)	Qatar	
Ghana	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	294 (5.8)	Ghana	
Benchmarking Participants																									
Massachusetts, US	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	560 (4.0)	Massachusetts, US	
Minnesota, US	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	545 (5.5)	Minnesota, US	
British Columbia, Canada	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	530 (2.7)	British Columbia, Canada	
Ontario, Canada	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	530 (4.3)	Ontario, Canada	
Basque Country, Spain	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	514 (2.8)	Basque Country, Spain	
Quebec, Canada	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	513 (3.5)	Quebec, Canada	

Exhibit B.11 Multiple Comparisons of Average Achievement in Knowing

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Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Chinese Taipei	Singapore	Korea, Rep. of	Russian Federation	Japan	Slovenia	Czech Republic	Hong Kong SAR	England	Hungary	Lithuania	United States	Sweden	Australia	Italy	Armenia	Jordan	Bulgaria	Bosnia and Herzegovina	Norway	Serbia	Scotland	Ukraine	Syrian Arab Republic	Thailand	Bahrain	Iran, Islamic Rep. of	Turkey	Malaysia
Chinese Taipei	565 (3.5)		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Singapore	554 (4.5)	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Korea, Rep. of	543 (2.0)	▼	▼		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Russian Federation	534 (4.3)	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Japan	534 (2.2)	▼	▼	▼			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Slovenia	533 (2.0)	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Czech Republic	533 (2.1)	▼	▼	▼					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Hong Kong SAR	532 (4.5)	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
England	530 (4.9)	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Hungary	524 (3.0)	▼	▼	▼		▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Lithuania	513 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
United States	512 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Sweden	505 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Australia	501 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Italy	494 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Armenia	493 (6.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									▲	▲	▲	▲	▲	▲	
Jordan	491 (4.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	
Bulgaria	489 (5.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	
Bosnia and Herzegovina	486 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	
Norway	486 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	▲	
Serbia	485 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	
Scotland	480 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								▲	▲	▲	▲	▲	▲	
Ukraine	477 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Syrian Arab Republic	474 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Thailand	473 (4.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Bahrain	469 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Iran, Islamic Rep. of	468 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Turkey	462 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Malaysia	458 (6.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Israel	456 (5.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Romania	451 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Tunisia	441 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						▲	▲	▲	▲	▲	▲	
Georgia	440 (5.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Cyprus	438 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Malta	436 (1.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Egypt	434 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Kuwait	430 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Oman	428 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Indonesia	426 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Colombia	418 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Saudi Arabia	417 (2.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Algeria	409 (1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Palestinian Nat'l Auth.	407 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Lebanon	403 (5.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Morocco	396 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
El Salvador	394 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Botswana	361 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Qatar	325 (1.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Ghana	316 (5.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
<b>Benchmarking Participants</b>																														
Massachusetts, US	545 (4.2)	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Minnesota, US	526 (4.8)	▼	▼	▼								▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
British Columbia, Canada	516 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Ontario, Canada	510 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Quebec, Canada	495 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Dubai, UAE	495 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	
Basque Country, Spain	490 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							▲	▲	▲	▲	▲	▲	

SOURCE: IEAs Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

Exhibit B.11 Multiple Comparisons of Average Achievement in Knowing (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Israel	Romania	Tunisia	Georgia	Cyprus	Malta	Egypt	Kuwait	Oman	Indonesia	Colombia	Saudi Arabia	Algeria	Palestinian Nat'l Auth.	Lebanon	Morocco	El Salvador	Botswana	Qatar	Ghana	Benchmarking Participants	Average Scale Score
Chinese Taipei	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	565 (3.5)
Singapore	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	554 (4.5)
Korea, Rep. of	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	543 (2.0)
Russian Federation	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	534 (4.3)
Japan	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	534 (2.2)
Slovenia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	533 (2.0)
Czech Republic	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	533 (2.1)
Hong Kong SAR	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	532 (4.5)
England	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	530 (4.9)
Hungary	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	524 (3.0)
Lithuania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	513 (2.4)
United States	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	512 (2.9)
Sweden	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	505 (2.3)
Australia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	501 (3.1)
Italy	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	494 (3.3)
Armenia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	493 (6.4)
Jordan	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	491 (4.5)
Bulgaria	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	489 (5.8)
Bosnia and Herzegovina	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	486 (3.7)
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	486 (2.0)
Serbia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	485 (2.8)
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	480 (3.9)
Ukraine	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	477 (3.8)
Syrian Arab Republic	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	474 (2.9)
Thailand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	473 (4.4)
Bahrain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	469 (2.1)
Iran, Islamic Rep. of	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	468 (3.9)
Turkey	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	462 (3.6)
Malaysia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	458 (6.5)
Israel	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	456 (5.0)
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	451 (4.2)
Tunisia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	441 (2.0)
Georgia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	440 (5.1)
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	438 (2.6)
Malta	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	436 (1.5)
Egypt	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	434 (3.9)
Kuwait	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	430 (2.5)
Oman	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	428 (3.5)
Indonesia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	426 (3.6)
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	418 (4.0)
Saudi Arabia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	417 (2.1)
Algeria	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	409 (1.9)
Palestinian Nat'l Auth.	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	407 (3.5)
Lebanon	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	403 (5.9)
Morocco	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	396 (3.1)
El Salvador	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	394 (3.2)
Botswana	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	361 (2.9)
Qatar	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	325 (1.7)
Ghana	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	316 (5.7)
Massachusetts, US	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	545 (4.2)
Minnesota, US	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	526 (4.8)
British Columbia, Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	516 (2.9)
Ontario, Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	510 (3.3)
Quebec, Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	495 (2.9)
Dubai, UAE	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	495 (3.3)
Basque Country, Spain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	490 (3.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▲ Average achievement significantly higher than comparison country    ▼ Average achievement significantly lower than comparison country



Exhibit B.12 Multiple Comparisons of Average Achievement in Applying (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

	Cyprus	Iran, Islamic Rep. of	Turkey	Syrian Arab Republic	Tunisia	Indonesia	Oman	Lebanon	Georgia	Colombia	Kuwait	Palestinian Nat'l Auth.	Algeria	Egypt	Saudi Arabia	Morocco	El Salvador	Botswana	Qatar	Ghana	Benchmarking Participants	Average Scale Score	Country	
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	567 (4.2)	Singapore
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	560 (3.4)	Chinese Taipei
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	555 (2.0)	Japan
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	549 (3.0)	Hungary
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	547 (2.0)	Korea, Rep. of
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	539 (1.9)	Czech Republic
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	538 (4.0)	England
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	533 (2.2)	Slovenia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	527 (3.8)	Russian Federation
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	522 (4.9)	Hong Kong SAR
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	516 (2.7)	United States
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	512 (2.2)	Lithuania
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	510 (3.2)	Australia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	509 (2.7)	Sweden
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	502 (5.4)	Armenia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	498 (2.9)	Italy
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	495 (3.1)	Scotland
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	488 (3.7)	Ukraine
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	486 (2.3)	Norway
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	485 (4.1)	Jordan
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	473 (5.9)	Malaysia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	472 (4.1)	Thailand
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	472 (4.2)	Israel
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	471 (6.1)	Bulgaria
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	470 (3.5)	Romania
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	469 (3.6)	Serbia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	468 (2.1)	Bahrain
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	463 (2.8)	Bosnia and Herzegovina
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	462 (1.6)	Malta
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	456 (2.0)	Cyprus
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	454 (3.8)	Iran, Islamic Rep. of
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	450 (3.6)	Turkey
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	445 (3.0)	Syrian Arab Republic
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	445 (2.3)	Tunisia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	425 (3.1)	Indonesia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	423 (3.2)	Oman
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	422 (5.8)	Lebanon
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	422 (4.5)	Georgia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	417 (3.1)	Colombia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	417 (2.9)	Kuwait
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	412 (4.0)	Palestinian Nat'l Auth.
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	410 (2.4)	Algeria
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	404 (3.6)	Egypt
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	403 (2.7)	Saudi Arabia
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	400 (3.3)	Morocco
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	388 (3.2)	El Salvador
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	358 (3.2)	Botswana
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	322 (1.5)	Qatar
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	291 (5.5)	Ghana
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	550 (4.0)	Massachusetts, US
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	534 (4.8)	Minnesota, US
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	522 (3.6)	Ontario, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	521 (2.8)	British Columbia, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	500 (3.1)	Quebec, Canada
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	499 (2.9)	Basque Country, Spain
	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	▶	489 (3.1)	Dubai, UAE

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

▶ Average achievement significantly higher than comparison country    ◀ Average achievement significantly lower than comparison country

Exhibit B.13 Multiple Comparisons of Average Achievement in Reasoning

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

Country	Average Scale Score	Singapore	Japan	Korea, Rep. of	England	Chinese Taipei	Slovenia	Czech Republic	Hong Kong SAR	Australia	Hungary	United States	Lithuania	Russian Federation	Sweden	Scotland	Italy	Norway	Ukraine	Malaysia	Israel	Malta	Thailand	Jordan	Bahrain	Turkey	Iran, Islamic Rep. of	Cyprus	Romania	Armenia
Singapore	564 (4.1)				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	560 (2.0)				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea, Rep. of	558 (2.0)				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	547 (4.0)	▼	▼	▼																										
Chinese Taipei	541 (3.5)	▼	▼	▼						▲																				
Slovenia	538 (2.2)	▼	▼	▼							▲																			
Czech Republic	534 (2.3)	▼	▼	▼	▼							▲																		
Hong Kong SAR	533 (5.0)	▼	▼	▼	▼																									
Australia	530 (3.6)	▼	▼	▼	▼	▼																								
Hungary	530 (3.0)	▼	▼	▼	▼	▼	▼								▲															
United States	529 (2.9)	▼	▼	▼	▼	▼	▼																							
Lithuania	527 (2.5)	▼	▼	▼	▼	▼	▼	▼																						
Russian Federation	520 (3.7)	▼	▼	▼	▼	▼	▼	▼	▼																					
Sweden	517 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼																				
Scotland	511 (3.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																			
Italy	493 (2.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																		
Norway	491 (2.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																	
Ukraine	488 (3.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼																
Malaysia	487 (4.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼															
Israel	481 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼														
Malta	473 (1.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼													
Thailand	473 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼												
Jordan	471 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼											
Bahrain	469 (2.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼										
Turkey	462 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼									
Iran, Islamic Rep. of	462 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼								
Cyprus	460 (2.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼							
Romania	460 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼						
Armenia	459 (6.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Tunisia	458 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼					
Serbia	455 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼				
Bosnia and Herzegovina	452 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Bulgaria	448 (6.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼			
Syrian Arab Republic	440 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Indonesia	438 (3.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Oman	428 (3.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Colombia	428 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Lebanon	420 (5.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Algeria	414 (1.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Morocco	413 (3.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Kuwait	411 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Palestinian Nat'l Auth.	396 (3.8)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Egypt	395 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Saudi Arabia	395 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Georgia	394 (4.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
El Salvador	384 (3.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Botswana	362 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		
Qatar	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
Ghana	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
<b>Benchmarking Participants</b>																														
Massachusetts, US	564 (4.0)				▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Minnesota, US	545 (5.3)	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
Ontario, Canada	542 (4.0)	▼	▼	▼						▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	
British Columbia, Canada	535 (3.0)	▼	▼	▼	▼																									
Quebec, Canada	523 (3.1)	▼	▼	▼	▼	▼																								
Basque Country, Spain	499 (3.3)	▼	▼	▼	▼	▼	▼																							
Dubai, UAE	483 (3.3)	▼	▼	▼	▼	▼	▼	▼																						

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

Note: 5% of these comparisons would be statistically significant by chance alone.

A plus (+) sign indicates average achievement could not be accurately estimated.





# Appendix C

## *The Test-Curriculum Matching Analysis: Science*

TIMSS went to great lengths to ensure that comparisons of student achievement across countries would be as fair and equitable as possible. The *TIMSS 2007 Assessment Frameworks* were designed to specify the important aspects of science that participating countries agreed should be the focus of an international assessment of science achievement, and the assessment items were developed through a collaborative process with national representatives to faithfully represent the specifications in the frameworks and field tested extensively in participating countries. Finalizing the TIMSS 2007 assessments involved a series of reviews by representatives of the participating countries, experts in science, and testing specialists. At the end of this process, the National Research Coordinators from each country formally approved the TIMSS 2007 assessments, thus accepting them as being sufficiently fair to compare their students' science achievement with that of students from other countries.

Although the assessments were developed to represent an agreed-upon framework and were intended to have as much in common across countries as possible, it was unavoidable that the match between the TIMSS 2007 assessment (or test) and the science curriculum would not be the same in all countries. To restrict test items to just those topics included in the curricula of all participating countries and covered in the same sequence would severely limit test coverage and restrict the research questions that the study is designed to address. The tests, therefore, inevitably have some items measuring topics unfamiliar to some students in some countries.

The Test-Curriculum Matching Analysis (TCMA) was conducted to investigate the extent to which the TIMSS 2007 science assessment was relevant to each country's curriculum. The TCMA also investigates the impact on a country's performance of including only achievement items that were judged to be relevant to its own curriculum.<sup>1</sup>

To gather data about the extent to which the TIMSS 2007 tests were relevant to the curricula of the TIMSS countries and benchmarking participants, national coordinators were asked to examine each achievement item and indicate whether the item was in their country's intended curriculum at the grade tested (fourth or eighth grade). The national coordinator was asked to choose persons very familiar with the curriculum at these grades to make this determination. In some countries, the curriculum was prescribed for a range of grades and was not explicit about what was to be covered by the end of fourth or eighth grades. For example, in Sweden the curriculum specifies the curricular goals to be achieved by the end of the fifth and ninth grades, but does not provide a grade by grade specification. In such situations, coordinators were asked to make the best judgment possible.<sup>2</sup> Since an item might be in the curriculum for some but not all students in a country, coordinators were asked to consider an item included if it was in the intended curriculum for more than 50 percent of the students. All TIMSS 2007 participants took part in the TCMA analysis except Algeria, Armenia, El Salvador, Kuwait, Latvia, Lithuania, and the Ukraine at fourth grade and Algeria, Armenia, Bulgaria, El Salvador, Kuwait, Lithuania, Saudi Arabia, and the Ukraine at eighth grade.

Exhibits C.1 and C.2 present the TCMA results for the TIMSS 2007 science test at fourth and eighth grades. Exhibit C.1 shows the average percent correct on the science items judged appropriate by each country. Exhibit C.2 shows the standard errors corresponding to the percentages presented in Exhibit C.1.

In Exhibit C.1, the bottom row of the exhibit shows the number of items, in terms of score points, identified as appropriate in each country. At the fourth grade, the maximum number of score points in the assessment was 189 points.<sup>3</sup> Reading along the bottom row, it can be seen that only

1 Because there may also be curriculum areas covered in some countries that are not covered by the TIMSS 2007 tests, the TCMA does not provide complete information about how well the tests cover the curricula of the countries.

2 Exhibit 6 of the *TIMSS 2007 Encyclopedia* provides information on the grade-to-grade structure of the curriculum for each TIMSS 2007 participant.

3 The TIMSS 2007 fourth grade science assessment contained 174 items yielding 194 score points. However, following item review, some items were deleted and response categories were combined for a number of items, resulting in data for reporting on 171 items and 189 score points. Similarly, following item review, the 214 items and 240 score points in the eighth grade assessment were reduced to 210 items and 231 score points.

six participants—Singapore, Chinese Taipei, the Russian Federation, Japan, Tunisia, and the state of Massachusetts—judged less than half of the science items included in their curricula, although interestingly, five of the six were among the highest performers on the TIMSS 2007 assessment. Two countries, Australia and Colombia, and 2 benchmarking participants, Minnesota and Dubai, judged 100 percent of the items (all 189 score points) to be included in their curricula. A further 11 countries and 3 benchmarking participants judged 75 percent or more (142 score points) to be appropriate.

At the eighth grade, the percentage of items judged appropriate was somewhat higher; with 5 countries and 2 benchmarking participants accepting 100 percent of the items (all 231 score points) and a further 24 countries and 4 benchmarking participants judging 75 percent or more (173 score points) to be appropriate. Only Cyprus with 115 score points had less than half the score points judged appropriate.

Since most countries indicated that some items were not included in their intended curriculum at the grade tested, the data were analyzed to determine whether the inclusion of these items had any effect on the international performance comparisons.<sup>4</sup>

The first column of data in Exhibit C.1 shows the average percent correct on all test items for each participant, together with its standard error. Subsequent columns show the performance of each participant on those items judged appropriate by the participant listed at the head of the column. Participants are presented in order of their performance based on average percent correct on all items, from highest to lowest. To interpret this exhibit, choosing a country and reading across its row provides the average percent correct for the students in that country on the items selected by each of the countries listed along the top of the exhibit. For example, at the fourth grade, Singapore, where the average percent correct was 78 percent on its own set of items, had 71 percent correct on the items selected by Chinese Taipei, 71 percent on the items selected by Hong Kong SAR, 74 percent on the items selected by the Russian Federation, and so forth. The column for a country listed at the top shows how each of the other participants performed on the set of items selected as appropriate for that country's students. Using the

4 It should be noted that the science achievement presented in Exhibit C.1 is based on average percent correct, which is different from the average scale scores that are presented in Chapter 1.

set of items selected by England as an example, 69 percent of these items, on average, were answered correctly by students in Singapore, 63 percent by students in Chinese Taipei, 62 percent by students in Hong Kong SAR, 61 percent by students in the Russian Federation, 61 percent by those in Japan, and so forth. The shaded diagonal element in the exhibit shows how each country performed on the set of items that it selected based on its own curriculum. Thus, English students averaged 60 percent correct on the set of items identified by England for the analysis.

For each country's selected items, the international averages across participating countries are presented in the lower part of the exhibit. These show that the selection of items by the participating countries varied somewhat in average difficulty, ranging at the fourth grade from 49 percent correct for those chosen by Singapore to 56 percent correct for those chosen by the Russian Federation. Similarly at the eighth grade, the average percent correct ranged from 40 percent for those items chosen by Singapore, Cyprus, Georgia, Ontario, and Quebec to 43 percent for those chosen by the Russian Federation and the Palestinian National Authority.

Comparing the diagonal element for a country with the overall average percent correct shows the difference between performance on the set of items chosen as appropriate for that country and performance on the test as a whole. In general, countries performed better on their own item sets than on the items overall, although usually not by much. Singapore had one of the greatest differences. The average percent correct for Singapore across all fourth-grade science items was 68 percent. The diagonal element shows that Singaporean students had a greater average percent correct (78 percent) across the set of items selected as appropriate for Singapore than they did overall. However, most participants had a difference of one or two percentage points between the two performance measures. In addition to Singapore with a difference of 10 percentage points, other exceptions included the Russian Federation (a difference of 8 points); Japan and Tunisia (6 points); and Slovenia, Iran, and Alberta (5 points). At the eighth grade, the differences were generally less; the largest being in Japan (6 percentage points), and the Russian Federation (5 percentage points).

It is clear that the selection of items does not have a major effect on the relative performance among TIMSS participants. Participants that had relatively high or low performance across all the science items also had relatively high or low performance on each of the various sets of items selected for the TCMA. For example, at the eighth grade, Singapore had the highest average percent correct not only on the test as a whole, but also on all of the different item selections (with some ties), with Chinese Taipei, Korea, and Japan next in order of performance on practically all selections of items. Although there are some changes in the ordering of countries based on the items selected for the TCMA, most of these differences are within the boundaries of sampling error.<sup>5</sup>

Even when countries performed better on the items judged by them to be included in their curriculum than they did overall, their performance relative to other participants was little changed. As an example, consider the 127 score points selected by Malta at the eighth grade. The students in Malta did better on these items (42% correct) than on the test as a whole (38% correct). However, most other countries also did better on these particular items, with an international average of 42 percent correct compared with 41 percent correct overall. In general, the TIMSS participants that performed as well or better than Malta on the overall test also performed as well or better on the items selected by Malta.

The TCMA results provide evidence that the TIMSS 2007 science assessment provides a reasonable basis for comparing achievement of the participating countries and benchmarking entities. This result is not unexpected, since making the assessment as fair as possible was a major consideration in test development. The fact that the majority of countries indicated that most items were appropriate for their students means that the different average percent correct estimates were based on many of the same items. Insofar as countries rejected items that would be difficult for their students, these items tended to be difficult for students in other countries as well. The analysis shows that omitting such items tends to improve the results for that country, but also tends to improve the results for all other countries, so that the overall pattern of relative performance is largely unaffected.

5 Small differences in performance between adjacent countries shown in this exhibit usually are not statistically significant. The standard errors for the average percent correct statistics based on the TIMSS 2007 sample are provided in Exhibit C.2. For any sample average shown in Exhibit C.1, it can be said with 95 percent confidence that the corresponding value in the population falls between the sample estimate plus or minus two standard errors.

**Exhibit C.1 Average Percent Correct for Test-Curriculum Matching Analysis – Science**

**TIMSS2007**  
**Science** **4<sup>th</sup> Grade**

Based on Subset of Items Specially Identified by Each Country as Addressing its Curriculum (See Exhibit C.2 for corresponding standard errors)

Instructions: Read **across** the row to compare that country's performance based on the test items included by each of the countries across the top. Read **down** the column under a country name to compare the performance of the country down the left on the items included by the country listed on the top. Read along the **diagonal** to compare performance for each different country based on its own decisions about the test items to include.

Country	Average Percent Correct on All Items	Singapore	Chinese Taipei	Hong Kong SAR	Russian Federation	Japan	England	United States	Kazakhstan	Italy	Hungary	Slovak Republic	Australia	Germany	Austria	Sweden	Netherlands	Slovenia	Denmark	Czech Republic	New Zealand	Scotland	Norway	Iran, Islamic Rep. of	Georgia	Colombia	Tunisia	Qatar	
Singapore	68 (0.7)	78	71	71	74	77	69	69	69	69	70	68	69	70	68	70	71	68	69	71	71	70	72	70	68	73	70		
Chinese Taipei	62 (0.4)	62	65	62	67	65	63	62	63	62	63	64	62	62	63	63	65	65	64	63	63	63	64	64	64	62	67	61	
Hong Kong SAR	61 (0.7)	63	63	62	67	63	62	62	62	61	62	63	61	61	61	62	63	64	62	61	63	63	63	63	64	61	66	60	
Russian Federation	60 (1.0)	60	60	60	68	62	61	61	62	61	61	62	60	60	61	61	63	64	61	62	62	62	62	62	63	60	67	60	
Japan	60 (0.4)	61	65	59	64	66	61	61	61	60	61	61	60	61	62	61	62	63	61	61	60	59	62	61	63	60	66	60	
England	59 (0.6)	57	59	58	65	61	60	59	60	58	59	60	59	58	60	59	61	62	60	59	60	60	60	60	62	61	59	64	59
United States	59 (0.5)	57	59	59	66	58	59	60	60	59	59	60	59	59	59	58	62	62	60	60	61	60	60	62	60	59	62	59	
Kazakhstan	58 (1.2)	59	59	59	65	62	58	59	60	59	59	60	58	58	59	59	61	61	59	60	61	59	60	60	61	58	63	59	
Italy	58 (0.7)	58	58	58	66	58	57	59	60	60	59	59	58	58	59	57	61	61	59	60	60	59	59	60	60	58	65	57	
Hungary	58 (0.7)	58	59	57	66	60	58	58	60	58	59	59	58	58	59	59	61	61	59	60	59	58	60	60	60	58	64	58	
Slovak Republic	57 (0.9)	56	57	55	65	59	56	57	59	57	57	60	57	56	57	57	60	60	58	58	59	58	59	59	58	57	62	56	
Australia	57 (0.6)	53	56	56	63	56	56	57	58	57	57	57	56	56	57	56	59	59	58	57	58	57	57	58	58	57	61	55	
Germany	56 (0.4)	53	56	56	63	56	57	57	57	57	58	56	56	57	56	59	59	58	57	56	59	59	58	57	57	58	58	56	55
Austria	56 (0.5)	53	54	56	63	55	56	57	57	56	56	58	56	56	57	56	59	59	58	57	57	56	57	58	58	56	61	55	
Sweden	56 (0.6)	51	56	54	63	55	56	57	57	56	56	57	56	55	57	57	59	59	57	56	57	55	58	56	57	56	62	54	
Netherlands	56 (0.5)	50	54	54	61	50	55	56	56	56	56	56	55	56	55	58	59	57	56	56	54	56	56	56	56	56	56	59	55
Slovenia	54 (0.4)	54	56	54	61	57	56	55	56	55	55	57	54	55	56	55	57	59	56	55	56	56	56	56	56	56	54	61	54
Denmark	54 (0.5)	49	52	54	60	52	55	55	55	55	54	55	54	54	54	54	57	57	56	55	54	53	56	54	56	54	58	53	
Czech Republic	54 (0.6)	54	53	54	61	56	54	54	56	55	54	57	54	54	55	54	58	57	55	56	56	55	55	55	56	54	60	54	
New Zealand	52 (0.5)	48	52	51	58	51	52	52	53	52	52	53	52	52	52	51	54	55	53	53	53	52	53	54	53	52	57	51	
Scotland	51 (0.4)	48	51	50	58	50	51	51	52	51	51	52	51	51	51	50	53	54	52	52	53	52	52	52	52	51	56	50	
Norway	47 (0.5)	41	45	46	53	43	47	47	48	46	47	47	47	46	47	46	49	50	48	47	47	46	48	47	49	47	51	46	
Iran, Islamic Rep. of	39 (0.7)	41	41	39	46	42	40	40	40	39	40	42	39	39	40	39	42	42	40	41	42	42	40	44	41	39	44	40	
Georgia	36 (0.7)	35	34	37	42	34	36	37	37	37	37	36	36	37	36	39	39	37	37	39	36	38	38	38	39	36	41	36	
Colombia	34 (0.7)	35	32	34	39	32	34	34	34	33	34	35	34	34	34	33	35	36	34	34	36	35	34	36	35	34	37	33	
Tunisia	25 (0.6)	26	24	25	29	25	26	25	26	25	26	26	25	25	26	24	27	27	25	26	26	26	26	27	27	25	31	25	
Qatar	23 (0.2)	26	22	24	26	26	25	24	24	25	24	24	23	24	24	22	25	24	24	24	25	23	24	26	25	23	26	24	
Morocco	23 (0.6)	24	21	24	25	23	24	23	24	24	24	24	23	24	24	22	25	24	23	24	24	23	24	25	25	23	26	23	
Yemen	17 (0.5)	17	15	18	17	16	17	17	17	18	17	17	17	17	17	15	18	17	16	17	17	16	17	19	18	17	17	16	
<b>International Avg.</b>	<b>50 (0.1)</b>	<b>49</b>	<b>50</b>	<b>50</b>	<b>56</b>	<b>51</b>	<b>50</b>	<b>50</b>	<b>51</b>	<b>50</b>	<b>50</b>	<b>51</b>	<b>50</b>	<b>50</b>	<b>51</b>	<b>50</b>	<b>53</b>	<b>53</b>	<b>51</b>	<b>51</b>	<b>51</b>	<b>51</b>	<b>51</b>	<b>52</b>	<b>52</b>	<b>50</b>	<b>55</b>	<b>50</b>	
<b>Benchmarking Participants</b>																													
Massachusetts, US	65 (0.8)	62	66	64	72	64	65	66	66	65	65	66	65	65	66	65	68	68	66	66	66	66	66	67	66	65	68	65	
Minnesota, US	61 (1.2)	58	61	61	67	60	62	62	62	61	61	62	61	61	62	61	64	64	62	62	62	62	62	63	62	61	64	60	
Alberta, Canada	60 (0.7)	58	61	60	67	61	60	61	61	60	60	61	60	60	61	60	63	62	61	61	62	61	61	61	61	60	63	58	
British Columbia, Canada	59 (0.5)	57	59	58	66	59	59	59	60	59	59	60	59	58	59	58	62	61	60	60	61	60	60	61	60	59	63	57	
Ontario, Canada	58 (0.7)	56	59	58	65	59	59	59	59	58	59	60	58	58	59	58	61	61	59	59	60	60	59	60	60	60	58	62	57
Quebec, Canada	54 (0.5)	51	55	54	63	53	55	55	56	54	55	56	54	54	55	55	57	57	56	56	57	57	56	56	56	54	61	54	
Dubai, UAE	45 (0.4)	46	44	45	50	47	46	45	46	45	45	46	45	45	45	44	47	47	45	45	47	46	46	49	47	45	48	44	
<b>Number of Items (Score Points) Identified*</b>	<b>189</b>	<b>70</b>	<b>91</b>	<b>120</b>	<b>94</b>	<b>51</b>	<b>131</b>	<b>174</b>	<b>149</b>	<b>148</b>	<b>184</b>	<b>143</b>	<b>189</b>	<b>158</b>	<b>160</b>	<b>139</b>	<b>132</b>	<b>157</b>	<b>157</b>	<b>149</b>	<b>133</b>	<b>112</b>	<b>151</b>	<b>116</b>	<b>133</b>	<b>189</b>	<b>67</b>	<b>130</b>	

SOURCE: IEA's Trends in International Science and Science Study (TIMSS) 2007

\* Of the 174 items in the Science test, some extended-response items were scored on a two-point scale, resulting in 194 total score points. Following item review, some items

were deleted and response categories were combined for a number of items, resulting in 171 items and 189 score points.

**Exhibit C.1 Average Percent Correct for Test-Curriculum Matching Analysis – Science (Continued)**

**TIMSS2007**  
Science **4<sup>th</sup>**  
Grade

Based on Subset of Items Specially Identified by Each Country as Addressing its Curriculum (See Exhibit C.2 for corresponding standard errors)

Instructions: Read **across** the row to compare that country's performance based on the test items included by each of the countries across the top. Read **down** the column under a country name to compare the performance of the country down the left on the items included by the country listed on the top. Read along the **diagonal** to compare performance for each different country based on its own decisions about the test items to include.

		Benchmarking Participants								Country
Morocco	Yemen	Massachusetts, US	Minnesota, US	Alberta, Canada	British Columbia, Canada	Ontario, Canada	Quebec, Canada	Dubai, UAE	Average Percent Correct on All Items	
70	69	72	68	71	69	69	69	68	68 (0.7)	Singapore
62	61	63	62	66	62	62	62	62	62 (0.4)	Chinese Taipei
61	61	61	61	65	61	61	60	61	61 (0.7)	Hong Kong SAR
61	60	61	60	64	60	61	61	60	60 (1.0)	Russian Federation
59	58	58	60	65	60	60	58	60	60 (0.4)	Japan
59	59	60	59	63	59	59	59	59	59 (0.6)	England
60	59	61	59	63	59	59	59	59	59 (0.5)	United States
59	59	60	58	62	58	59	58	58	58 (1.2)	Kazakhstan
60	59	61	58	61	58	59	59	58	58 (0.7)	Italy
60	58	57	58	62	58	59	58	58	58 (0.7)	Hungary
58	57	58	57	60	57	57	57	57	57 (0.9)	Slovak Republic
57	56	58	57	61	57	57	56	57	57 (0.6)	Australia
57	56	56	56	60	56	56	56	56	56 (0.4)	Germany
56	56	55	56	60	56	56	56	56	56 (0.5)	Austria
56	56	55	56	60	56	56	56	56	56 (0.6)	Sweden
55	55	53	56	60	55	56	54	56	56 (0.5)	Netherlands
54	55	55	54	58	54	54	54	54	54 (0.4)	Slovenia
54	54	54	54	58	54	54	54	54	54 (0.5)	Denmark
55	54	56	54	58	54	55	55	54	54 (0.6)	Czech Republic
52	52	53	52	56	52	52	52	52	52 (0.5)	New Zealand
51	51	53	51	55	51	51	51	51	51 (0.4)	Scotland
46	47	46	47	50	46	46	46	47	47 (0.5)	Norway
41	41	42	39	42	40	40	40	39	39 (0.7)	Iran, Islamic Rep. of
37	37	37	36	39	36	36	37	36	36 (0.7)	Georgia
34	34	35	34	37	34	34	34	34	34 (0.7)	Colombia
26	26	26	25	27	25	25	25	25	25 (0.6)	Tunisia
25	24	27	23	26	24	23	25	23	23 (0.2)	Qatar
24	24	26	23	25	24	23	24	23	23 (0.6)	Morocco
17	17	19	17	18	17	17	17	17	17 (0.5)	Yemen
51	50	51	50	54	50	50	50	50	50 (0.1)	<b>International Avg.</b>
<b>Benchmarking Participants</b>										
66	64	66	65	70	66	65	65	65	65 (0.8)	Massachusetts, US
61	61	62	61	65	61	61	61	61	61 (1.2)	Minnesota, US
61	60	62	60	65	60	60	60	60	60 (0.7)	Alberta, Canada
59	59	61	59	63	59	59	59	59	59 (0.5)	British Columbia, Canada
59	59	60	58	63	59	59	58	58	58 (0.7)	Ontario, Canada
55	54	55	54	58	54	55	54	54	54 (0.5)	Quebec, Canada
46	46	48	45	48	45	44	46	45	45 (0.4)	Dubai, UAE
121	102	74	189	149	163	156	126	189	189	Number of Items (Score Points) Identified*

SOURCE: IEA's Trends in International Science and Science Study (TIMSS) 2007

( ) Standard errors appear in parentheses.

**Exhibit C.1 Average Percent Correct for Test-Curriculum Matching Analysis – Science (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Based on Subset of Items Specially Identified by Each Country as Addressing its Curriculum (See Exhibit C.2 for corresponding standard errors)

Instructions: Read **across** the row to compare that country's performance based on the test items included by each of the countries across the top. Read **down** the column under a country name to compare the performance of the country down the left on the items included by the country listed on the top. Read along the **diagonal** to compare performance for each different country based on its own decisions about the test items to include.

Country	Average Percent Correct on All Items	Singapore	Chinese Taipei	Korea, Rep. of	Japan	England	Hungary	Czech Republic	Slovenia	Russian Federation	Hong Kong SAR	United States	Australia	Sweden	Italy	Scotland	Jordan	Norway	Serbia	Israel	Malaysia	Bahrain	Thailand	Bosnia and Herzegovina	Malta	Romania	Iran, Islamic Rep. of	Turkey	Syrian Arab Republic	Cyprus	
Singapore	60 (0.9)	61	60	61	61	61	60	60	60	62	61	60	60	60	60	62	60	60	59	60	60	61	60	60	61	60	60	60	60	60	58
Chinese Taipei	58 (0.8)	59	59	59	60	59	58	59	60	61	60	59	58	59	58	60	59	60	58	58	59	59	58	59	61	59	58	59	59	59	59
Korea, Rep. of	57 (0.4)	57	58	59	58	58	57	57	58	58	58	57	57	57	57	58	57	58	57	57	58	58	57	57	59	57	57	57	57	55	
Japan	56 (0.4)	57	56	57	62	57	56	56	57	59	58	57	56	56	56	56	56	58	56	56	57	57	56	56	58	57	56	56	57	54	
England	54 (1.0)	54	54	54	55	55	54	54	56	56	56	55	54	55	54	55	54	55	54	54	54	54	54	54	54	54	54	54	54	52	
Hungary	53 (0.6)	52	54	54	53	53	53	53	54	55	54	54	53	54	53	54	53	55	53	54	54	53	53	53	56	53	53	53	53	53	
Czech Republic	53 (0.4)	52	53	53	53	53	53	53	55	56	54	54	53	53	53	54	53	55	53	53	53	53	53	53	54	53	53	52	53	52	
Slovenia	53 (0.4)	52	53	53	52	53	52	53	56	55	54	54	53	53	53	53	53	55	53	53	53	53	53	53	55	52	53	52	53	53	
Russian Federation	51 (0.9)	51	52	52	51	52	51	52	53	56	52	52	51	51	51	53	52	53	51	52	52	52	51	52	53	52	51	52	52	50	
Hong Kong SAR	51 (1.0)	51	51	52	53	52	51	52	53	53	54	52	52	52	51	53	52	53	51	51	52	52	51	52	54	52	51	51	52	51	
United States	49 (0.6)	47	50	49	47	49	49	49	51	50	50	49	49	49	49	49	49	50	49	49	49	49	49	49	51	49	49	49	49	46	
Australia	47 (0.8)	46	48	48	47	48	47	48	50	49	48	48	48	48	47	48	47	49	47	47	47	47	47	47	50	47	47	47	48	46	
Sweden	47 (0.5)	45	47	48	47	48	47	47	49	49	48	48	47	48	47	48	46	49	47	47	47	47	47	47	48	47	47	47	47	45	
Italy	44 (0.6)	42	45	44	42	44	44	44	45	47	45	44	44	44	44	44	44	45	44	44	44	45	44	45	45	44	44	44	44	42	
Scotland	44 (0.7)	43	44	44	44	44	44	44	46	45	45	44	44	44	44	44	44	45	43	43	44	43	44	44	46	43	44	44	44	43	
Jordan	43 (0.8)	43	44	43	45	44	43	43	45	47	43	43	43	44	43	44	44	45	43	43	44	45	43	44	46	44	43	44	44	44	
Norway	42 (0.4)	39	42	42	42	42	42	42	44	44	43	42	42	43	42	41	41	44	42	42	42	42	42	42	42	43	41	42	41	42	
Serbia	40 (0.6)	39	41	40	40	40	40	40	41	44	41	40	40	40	40	41	40	41	40	40	40	41	40	41	42	40	40	40	40	38	
Israel	40 (0.8)	39	40	39	39	40	40	40	42	42	41	40	40	40	40	41	40	42	40	40	40	41	40	40	42	40	40	40	40	40	
Malaysia	40 (1.1)	41	40	41	41	41	40	40	41	42	41	40	40	40	40	42	40	41	39	40	41	41	40	40	41	40	40	40	40	39	
Bahrain	40 (0.3)	39	40	40	41	41	39	40	41	43	40	40	40	40	40	40	41	41	40	40	40	41	40	40	41	40	40	41	40	39	
Thailand	39 (0.9)	38	40	40	38	40	39	40	41	43	40	40	40	40	39	40	40	40	39	40	40	40	39	40	41	39	39	39	39	38	
Bosnia and Herzegovina	39 (0.6)	38	40	39	38	39	39	39	40	44	40	39	39	39	39	40	40	40	39	39	39	39	41	39	40	40	39	40	39	38	
Malta	38 (0.2)	38	39	39	39	39	38	38	40	40	39	39	38	39	38	39	38	39	38	38	39	39	38	39	42	38	38	39	39	38	
Romania	38 (0.6)	37	38	38	38	38	38	39	41	38	38	37	38	38	39	38	39	38	38	38	39	38	38	39	38	39	38	38	38	38	
Iran, Islamic Rep. of	37 (0.7)	36	38	37	38	37	37	38	38	41	38	38	37	38	37	37	38	38	37	37	37	38	37	38	39	37	37	38	37	37	
Turkey	37 (0.7)	36	37	37	36	37	37	37	38	39	37	37	37	37	37	38	37	38	37	37	37	38	37	37	37	37	37	37	37	35	
Syrian Arab Republic	36 (0.5)	35	36	36	37	37	36	36	37	40	36	36	36	36	36	36	37	38	36	36	36	38	36	37	39	36	36	36	36	34	
Cyprus	36 (0.3)	36	36	36	36	37	36	36	37	38	37	36	36	37	36	37	36	38	36	36	36	37	36	37	37	36	36	36	36	37	
Tunisia	33 (0.3)	33	34	34	35	34	33	33	35	36	34	34	34	34	33	34	34	35	33	34	34	35	33	34	35	33	33	33	34	33	
Oman	32 (0.5)	32	33	33	34	33	32	32	34	35	33	32	32	33	32	33	33	33	32	33	33	34	32	33	34	33	32	33	32	33	
Georgia	32 (0.7)	32	32	31	31	32	32	32	33	36	32	32	31	32	32	34	32	33	32	32	32	33	32	33	32	32	32	32	32	31	
Indonesia	31 (0.5)	31	32	32	31	32	31	31	32	34	32	32	31	32	31	33	31	32	31	32	32	33	31	32	32	31	31	32	32	30	
Egypt	31 (0.5)	31	31	31	32	32	31	31	32	34	31	31	31	31	31	32	32	31	31	31	31	31	33	31	32	32	31	31	32	31	
Lebanon	31 (0.9)	32	32	30	32	32	31	31	32	35	31	31	30	31	31	32	31	32	31	32	32	33	31	32	34	31	31	32	31	32	
Palestinian Nat'l Auth.	31 (0.5)	31	31	31	32	32	31	31	32	33	31	31	31	32	31	31	32	31	31	31	31	31	33	31	32	33	31	31	32	31	
Colombia	30 (0.5)	29	30	29	29	30	30	30	31	32	31	30	30	30	30	31	30	31	30	30	30	30	30	30	32	29	30	30	30	28	
Morocco	27 (0.4)	27	27	27	29	28	27	27	29	30	28	27	27	28	27	28	28	29	28	28	28	29	27	28	27	27	27	27	28	29	
Botswana	24 (0.2)	25	23	24	25	24	24	23	24	26	24	24	23	24	24	25	24	24	24	24	24	25	24	25	24	24	24	24	24	23	
Qatar	22 (0.1)	23	22	22	23	22	22	23	25	22	22	22	22	22	22	23	23	22	22	22	22	22	22	23	22	22	22	23	22	23	
Ghana	20 (0.4)	21	20	20	21	20	20	19	21	22	20	20	19	20	20	22	20	19	20	20	20	20	21	20	21	20	20	20	20	20	
<b>International Avg.</b>	<b>41 (0.1)</b>	<b>40</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>42</b>	<b>43</b>	<b>42</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>42</b>	<b>41</b>	<b>42</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>42</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>41</b>	<b>40</b>		
<b>Benchmarking Participants</b>																															
Massachusetts, US	57 (0.9)	55	57	57	55	57	56	57	59	58	58	57	57	57	57	57	57	58	56	57	57	56	57	56	58	57	57	56	57	54	
Minnesota, US	53 (1.1)	50	53	53	51	52	52	53	55	54	54	53	53	53	53	52	53	54	52	53	53	52	53	52	54	52	53	52	53	49	
British Columbia, Canada	50 (0.6)	48	51	50	48	50	50	50	52	51	51	50	51	50	50	50	49	51	49	50	51	49	50	50	53	49	50	50	50	47	
Ontario, Canada	50 (0.8)	48	51	50	48	50	50	50	52	51	51	50	51	50	50	50	49	51	49	50	51	49	50	50	52	49	50	50	50	47	
Quebec, Canada	45 (0.6)	43	46	46	44	45	45	46	48	47	47	46	46	46	45	45	45	47	45	45	46	45	45	46	47	45	45	45	45	44	
Basque Country, Spain	44 (0.6)	42	45	45	43	44	44	44	46	46	46	45	44	44	44	44	44	47	44	44	44	45	44	45	45	44	44	44	44	43	
Dubai, UAE	44 (0.5)	44	44	44	45	44	44	44	45	47	45	44	44	44	44	44	45	45	44	44	44	44	45	44	45	46	44	44	45	44	44
Number of Items (Score Points) Identified*	231	171	211	195	122	199	229	219	199	147	199	211	219	213	231	145	201	167	227	205	208	191	231	215	127	216	231	195	219	115	

**Exhibit C.1 Average Percent Correct for Test-Curriculum Matching Analysis – Science (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Based on Subset of Items Specially Identified by Each Country as Addressing its Curriculum (See Exhibit C.2 for corresponding standard errors)

Instructions: Read **across** the row to compare that country's performance based on the test items included by each of the countries across the top. Read **down** the column under a country name to compare the performance of the country down the left on the items included by the country listed on the top. Read along the **diagonal** to compare performance for each different country based on its own decisions about the test items to include.

												Benchmarking Participants								Country
Tunisia	Oman	Georgia	Indonesia	Egypt	Lebanon	Palestinian Nat'l Auth.	Colombia	Morocco	Botswana	Qatar	Ghana	Massachusetts, US	Minnesota, US	British Columbia, Canada	Ontario, Canada	Quebec, Canada	Basque Country, Spain	Dubai, UAE	Average Percent Correct on All Items	
61	60	61	61	61	60	62	60	62	63	61	60	62	60	59	59	59	59	60	60 (0.9)	Singapore
60	59	58	59	60	58	61	58	60	61	59	58	59	58	59	57	58	58	58	58 (0.8)	Chinese Taipei
58	57	55	58	58	57	59	57	57	60	57	57	56	57	57	55	57	57	57	57 (0.4)	Korea, Rep. of
59	57	58	57	57	56	58	56	58	59	57	56	57	56	57	55	56	56	56	56 (0.4)	Japan
55	54	53	55	54	54	55	54	55	55	57	55	54	54	54	54	54	54	54	54 (1.0)	England
55	53	52	54	54	53	55	53	54	54	53	53	52	53	52	52	53	53	53	53 (0.6)	Hungary
54	53	52	54	52	53	55	53	55	53	53	53	53	53	52	52	53	53	53	53 (0.4)	Czech Republic
54	53	52	53	53	53	54	53	54	54	53	53	53	53	52	53	53	53	53	53 (0.4)	Slovenia
53	52	51	53	54	51	54	51	54	51	54	52	51	51	51	51	51	51	51	51 (0.9)	Russian Federation
51	52	51	53	53	51	53	51	53	54	52	51	52	51	51	50	51	51	51	51 (1.0)	Hong Kong SAR
49	49	47	50	48	49	49	49	49	51	49	49	49	49	49	49	49	49	49	49 (0.6)	United States
47	47	46	49	46	47	47	47	47	49	48	47	47	47	48	48	47	47	47	47 (0.8)	Australia
47	45	48	47	47	48	47	47	48	49	47	47	46	47	47	46	47	47	47	47 (0.5)	Sweden
44	44	43	45	44	44	45	44	46	45	44	44	44	44	44	43	44	44	44	44 (0.6)	Italy
44	44	42	45	44	44	44	44	44	45	44	43	44	44	43	43	43	44	44	44 (0.7)	Scotland
45	44	43	44	45	43	46	43	45	45	44	43	43	43	41	44	43	43	43	43 (0.8)	Jordan
41	42	40	43	41	42	43	42	42	43	42	42	41	42	42	41	42	42	42	42 (0.4)	Norway
41	41	39	41	42	40	43	40	42	41	40	40	40	40	39	39	40	40	40	40 (0.6)	Serbia
42	40	38	41	41	40	41	40	41	41	40	40	39	40	40	39	40	40	40	40 (0.8)	Israel
41	40	39	41	41	40	42	40	41	43	40	40	41	40	40	38	39	40	40	40 (1.1)	Malaysia
40	40	39	41	42	40	42	40	42	42	41	40	40	40	40	38	39	39	40	40 (0.3)	Bahrain
40	39	38	40	40	39	41	39	41	42	40	39	39	39	39	39	39	39	39	39 (0.9)	Thailand
40	39	39	40	42	39	42	39	42	40	40	39	39	39	38	39	39	39	39	39 (0.6)	Bosnia and Herzegovina
38	39	37	39	39	38	40	38	38	40	39	38	37	38	38	38	38	38	38	38 (0.2)	Malta
40	38	38	39	39	38	40	38	40	39	38	38	37	38	38	36	37	38	38	38 (0.6)	Romania
38	38	37	38	37	37	39	37	39	39	38	37	37	37	37	37	37	37	37	37 (0.7)	Iran, Islamic Rep. of
37	37	37	38	38	37	39	37	37	38	37	37	37	37	35	37	37	37	37	37 (0.7)	Turkey
37	36	36	37	38	36	39	36	39	37	37	36	36	36	35	36	36	36	36	36 (0.5)	Syrian Arab Republic
37	36	36	37	37	36	38	36	37	38	37	36	36	36	35	36	36	36	36	36 (0.3)	Cyprus
35	34	33	35	35	33	36	33	35	37	34	33	33	33	32	33	33	33	33	33 (0.3)	Tunisia
33	33	32	33	34	32	35	32	32	35	33	32	32	32	31	33	32	32	32	32 (0.5)	Oman
34	32	32	33	35	32	35	32	35	33	32	32	32	32	30	32	32	32	32	32 (0.7)	Georgia
32	32	31	33	33	31	33	31	33	33	34	31	31	31	30	31	31	31	31	31 (0.5)	Indonesia
31	32	31	32	33	31	34	31	32	32	32	31	31	31	29	31	31	31	31	31 (0.5)	Egypt
33	32	31	32	33	31	35	31	33	32	32	31	31	31	29	31	31	31	31	31 (0.9)	Lebanon
32	32	30	32	33	31	34	31	32	33	32	31	31	31	29	31	31	31	31	31 (0.5)	Palestinian Nat'l Auth.
30	30	29	31	31	30	31	30	31	31	30	30	30	30	29	29	30	29	30	30 (0.5)	Colombia
28	28	27	29	29	27	30	27	29	28	28	27	28	27	28	26	27	27	27	27 (0.4)	Morocco
24	24	23	25	26	24	26	24	24	27	24	24	25	24	24	22	23	24	24	24 (0.2)	Botswana
23	23	22	23	24	22	25	22	23	23	23	22	23	22	21	22	22	22	22	22 (0.1)	Qatar
21	20	20	20	22	20	22	20	20	21	20	20	21	20	20	18	20	20	20	20 (0.4)	Ghana
42	41	40	42	42	41	43	41	42	42	41	41	41	41	41	40	40	41	41	41 (0.1)	International Avg.
												Benchmarking Participants								
57	56	55	58	55	57	57	57	57	59	57	57	58	57	57	57	57	57	57	57 (0.9)	Massachusetts, US
53	52	51	54	51	53	52	53	53	55	53	53	52	53	53	52	53	53	53	53 (1.1)	Minnesota, US
49	50	47	51	49	50	50	50	50	52	50	50	50	50	51	50	50	50	50	50 (0.6)	British Columbia, Canada
49	49	47	51	49	50	50	50	49	53	50	50	50	50	51	50	50	50	50	50 (0.8)	Ontario, Canada
45	45	44	47	46	45	46	45	46	47	45	45	45	45	46	45	45	45	45	45 (0.6)	Quebec, Canada
44	44	43	46	44	44	45	44	45	45	44	44	44	44	44	43	44	44	44	44 (0.6)	Basque Country, Spain
45	45	43	45	46	44	46	44	45	46	45	44	44	44	44	43	44	44	44	44 (0.5)	Dubai, UAE
139	209	152	217	148	231	177	231	125	143	200	230	125	231	218	192	182	229	231	231	Number of Items (Score Points) Identified*

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

( ) Standard errors appear in parentheses.

Exhibit C.2 Standard Errors for the Test-Curriculum Matching Analysis – Science

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read **across** the row to compare that country's performance based on the test items included by each of the countries across the top. Read **down** the column under a country name to compare the performance of the country down the left on the items included by the country listed on the top. Read along the **diagonal** to compare performance for each different country based on its own decisions about the test items to include.

Country	Average Percent Correct on All Items	Singapore	Chinese Taipei	Hong Kong SAR	Russian Federation	Japan	England	United States	Kazakhstan	Italy	Hungary	Slovak Republic	Australia	Germany	Austria	Sweden	Netherlands	Slovenia	Denmark	Czech Republic	New Zealand	Scotland	Norway	Iran, Islamic Rep. of	Georgia	Colombia	Tunisia	Qatar
Singapore	68 (0.7)	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Chinese Taipei	62 (0.4)	0.4	0.5	0.4	0.4	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Hong Kong SAR	61 (0.7)	0.8	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7
Russian Federation	60 (1.0)	1.1	1.1	1.0	0.9	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Japan	60 (0.4)	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
England	59 (0.6)	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.6
United States	59 (0.5)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Kazakhstan	58 (1.2)	1.2	1.2	1.1	1.1	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.2	1.2	1.1	1.2	1.2	1.2	1.2	1.2	1.1	1.2
Italy	58 (0.7)	0.7	0.7	0.7	0.7	0.8	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Hungary	58 (0.7)	0.7	0.8	0.7	0.7	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Slovak Republic	57 (0.9)	0.9	0.9	0.9	1.0	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Australia	57 (0.6)	0.6	0.7	0.6	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Germany	56 (0.4)	0.4	0.5	0.4	0.5	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.4	0.5	0.4	0.5	0.4
Austria	56 (0.5)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sweden	56 (0.6)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.5
Netherlands	56 (0.5)	0.5	0.5	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
Slovenia	54 (0.4)	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Denmark	54 (0.5)	0.6	0.6	0.6	0.6	0.7	0.5	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.5
Czech Republic	54 (0.6)	0.6	0.7	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
New Zealand	52 (0.5)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Scotland	51 (0.4)	0.5	0.5	0.4	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.5
Norway	47 (0.5)	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Iran, Islamic Rep. of	39 (0.7)	0.8	0.8	0.7	0.8	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.8	0.7
Georgia	36 (0.7)	0.6	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8
Colombia	34 (0.7)	0.8	0.8	0.8	0.9	0.9	0.8	0.7	0.8	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8
Tunisia	25 (0.6)	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.8
Qatar	23 (0.2)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Morocco	23 (0.6)	0.7	0.6	0.7	0.7	0.8	0.6	0.6	0.6	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.7	0.7	0.7	0.7	0.6	0.6	0.7	0.6
Yemen	17 (0.5)	0.6	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5
International Avg.	50 (0.1)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Benchmarking Participants</b>																												
Massachusetts, US	65 (0.8)	0.9	0.8	0.8	0.8	1.1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8
Minnesota, US	61 (1.2)	1.2	1.3	1.2	1.3	1.1	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.3	1.2	1.3	1.3	1.3	1.3	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.4	1.2
Alberta, Canada	60 (0.7)	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
British Columbia, Canada	59 (0.5)	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5
Ontario, Canada	58 (0.7)	0.7	0.8	0.8	0.8	0.8	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Quebec, Canada	54 (0.5)	0.6	0.6	0.5	0.6	0.6	0.5	0.6	0.6	0.6	0.5	0.6	0.5	0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.5	0.6	0.5
Dubai, UAE	45 (0.4)	0.5	0.5	0.5	0.5	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.5	0.4
Number of Items (Score Points) Identified*	189	70	91	120	94	51	131	174	149	148	184	143	189	158	160	139	132	157	157	149	133	112	151	116	133	189	67	130

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

\* Of the 174 items in the Science test, some extended-response items were scored on a two-point scale, resulting in 194 total score points. Following item review, some items

were deleted and response categories were combined for a number of items, resulting in 171 items and 189 score points.

Exhibit C.2 Standard Errors for the Test-Curriculum Matching Analysis – Science (Continued)

TIMSS2007  
Science 4<sup>th</sup> Grade

Instructions: Read **across** the row to compare that country's performance based on the test items included by each of the countries across the top. Read **down** the column under a country name to compare the performance of the country down the left on the items included by the country listed on the top. Read along the **diagonal** to compare performance for each different country based on its own decisions about the test items to include.

Morocco	Yemen	Benchmarking Participants								Average Percent Correct on All Items	Country
		Massachusetts, US	Minnesota, US	Alberta, Canada	British Columbia, Canada	Ontario, Canada	Quebec, Canada	Dubai, UAE			
0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.7	68 (0.7)	Singapore	
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	62 (0.4)	Chinese Taipei	
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	61 (0.7)	Hong Kong SAR	
1.0	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	60 (1.0)	Russian Federation	
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	60 (0.4)	Japan	
0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	59 (0.6)	England	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	59 (0.5)	United States	
1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	58 (1.2)	Kazakhstan	
0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	58 (0.7)	Italy	
0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	58 (0.7)	Hungary	
0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.9	57 (0.9)	Slovak Republic	
0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.6	57 (0.6)	Australia	
0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.5	0.4	56 (0.4)	Germany	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	56 (0.5)	Austria	
0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	56 (0.6)	Sweden	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	56 (0.5)	Netherlands	
0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	54 (0.4)	Slovenia	
0.6	0.6	0.6	0.5	0.6	0.5	0.5	0.5	0.5	54 (0.5)	Denmark	
0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	54 (0.6)	Czech Republic	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	52 (0.5)	New Zealand	
0.5	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	51 (0.4)	Scotland	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	47 (0.5)	Norway	
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	39 (0.7)	Iran, Islamic Rep. of	
0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	36 (0.7)	Georgia	
0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.8	0.7	34 (0.7)	Colombia	
0.6	0.7	0.6	0.6	0.7	0.6	0.6	0.6	0.6	25 (0.6)	Tunisia	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	23 (0.2)	Qatar	
0.7	0.7	0.7	0.6	0.7	0.6	0.6	0.7	0.6	23 (0.6)	Morocco	
0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	17 (0.5)	Yemen	
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	50 (0.1)	International Avg.	
Benchmarking Participants											
0.7	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.8	65 (0.8)	Massachusetts, US	
1.3	1.2	1.1	1.2	1.3	1.3	1.3	1.3	1.2	61 (1.2)	Minnesota, US	
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	60 (0.7)	Alberta, Canada	
0.5	0.6	0.6	0.5	0.6	0.5	0.6	0.6	0.5	59 (0.5)	British Columbia, Canada	
0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	58 (0.7)	Ontario, Canada	
0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.5	54 (0.5)	Quebec, Canada	
0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	45 (0.4)	Dubai, UAE	
121	102	74	189	149	163	156	126	189	189	Number of Items (Score Points) Identified*	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

(1) Standard errors for the average percent of correct responses on all items appear in parentheses. The matrix contains standard errors corresponding to the average

percent correct responses based on TCMA subset of items, as displayed in Exhibit C.1.



Exhibit C.2 Standard Errors for the Test-Curriculum Matching Analysis – Science (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Instructions: Read **across** the row to compare that country's performance based on the test items included by each of the countries across the top. Read **down** the column under a country name to compare the performance of the country down the left on the items included by the country listed on the top. Read along the **diagonal** to compare performance for each different country based on its own decisions about the test items to include.

Tunisia	Oman	Georgia	Indonesia	Egypt	Lebanon	Palestinian Nat'l Auth.	Colombia	Morocco	Botswana	Qatar	Ghana	Benchmarking Participants								Average Percent Correct on All Items	Country
Massachusetts, US	Minnesota, US	British Columbia, Canada	Ontario, Canada	Quebec, Canada	Basque Country, Spain	Dubai, UAE															
1.0	0.9	1.0	0.9	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.9	60 (0.9)	Singapore	
0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	58 (0.8)	Chinese Taipei	
0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	57 (0.4)	Korea, Rep. of	
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	56 (0.4)	Japan	
1.0	0.9	0.9	1.0	0.9	1.0	0.9	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	54 (1.0)	England	
0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	53 (0.6)	Hungary	
0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	53 (0.4)	Czech Republic	
0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.3	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.5	0.4	0.4	53 (0.4)	Slovenia	
0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9	51 (0.9)	Russian Federation	
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	51 (1.0)	Hong Kong SAR	
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.7	0.6	0.6	0.6	49 (0.6)	United States	
0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	47 (0.8)	Australia	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	47 (0.5)	Sweden	
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	44 (0.6)	Italy	
0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	44 (0.7)	Scotland	
0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	43 (0.8)	Jordan	
0.5	0.5	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.5	0.4	0.4	0.5	0.5	0.4	0.4	42 (0.4)	Norway	
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	40 (0.6)	Serbia	
0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	40 (0.8)	Israel	
1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	40 (1.1)	Malaysia	
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	40 (0.3)	Bahrain	
0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	39 (0.9)	Thailand	
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	39 (0.6)	Bosnia and Herzegovina	
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	38 (0.2)	Malta	
0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.7	0.6	0.6	0.7	0.7	0.6	0.6	38 (0.6)	Romania	
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	37 (0.7)	Iran, Islamic Rep. of	
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	37 (0.7)	Turkey	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	36 (0.5)	Syrian Arab Republic	
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	36 (0.3)	Cyprus	
0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	33 (0.3)	Tunisia	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	32 (0.5)	Oman	
0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.9	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	32 (0.7)	Georgia	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	31 (0.5)	Indonesia	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	31 (0.5)	Egypt	
0.9	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.8	0.9	0.9	0.9	31 (0.9)	Lebanon	
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	31 (0.5)	Palestinian Nat'l Auth.	
0.6	0.5	0.6	0.6	0.5	0.5	0.6	0.5	0.7	0.6	0.6	0.5	0.6	0.5	0.5	0.6	0.5	0.5	0.5	30 (0.5)	Colombia	
0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.4	27 (0.4)	Morocco	
0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.2	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	24 (0.2)	Botswana	
0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	22 (0.1)	Qatar	
0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4	0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.4	20 (0.4)	Ghana	
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	41 (0.1)	International Avg.	
												Benchmarking Participants									
1.0	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0	1.0	1.0	0.9	1.0	0.9	1.0	1.0	1.0	0.9	0.9	57 (0.9)	Massachusetts, US	
1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	53 (1.1)	Minnesota, US	
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	50 (0.6)	British Columbia, Canada	
0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	50 (0.8)	Ontario, Canada	
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.7	0.6	0.6	0.6	45 (0.6)	Quebec, Canada	
0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	44 (0.6)	Basque Country, Spain	
0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.5	0.5	0.6	0.5	0.5	0.6	0.5	0.5	0.5	44 (0.5)	Dubai, UAE	
139	209	152	217	148	231	177	231	125	143	200	230	125	231	218	192	182	229	231	231	Number of Items (Score Points) Identified*	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

( ) Standard errors for the average percent of correct responses on all items appear in parentheses. The matrix contains standard errors corresponding to the average

percent correct responses based on TCMA subset of items, as displayed in Exhibit C.1.



# Appendix D

*Percentiles and Standard Deviations of  
Science Achievement*

## Exhibit D.1 Percentiles of Achievement in Science

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
Algeria	183 (9.8)	220 (10.0)	286 (7.7)	356 (5.7)	424 (6.6)	483 (6.8)	517 (6.8)
Armenia	294 (9.8)	336 (8.6)	406 (5.2)	481 (5.6)	558 (7.1)	640 (15.2)	690 (13.4)
Australia	384 (9.0)	423 (3.7)	478 (4.4)	532 (3.5)	583 (2.6)	626 (1.4)	651 (4.8)
Austria	388 (4.4)	423 (4.8)	477 (3.3)	530 (2.5)	580 (2.5)	620 (4.1)	644 (3.5)
Chinese Taipei	423 (6.5)	457 (3.0)	508 (2.0)	560 (2.6)	609 (2.4)	653 (2.2)	679 (3.0)
Colombia	237 (6.9)	271 (7.9)	335 (9.7)	404 (5.2)	467 (6.1)	522 (4.9)	556 (5.5)
Czech Republic	386 (8.9)	416 (3.5)	467 (4.4)	517 (3.9)	567 (3.8)	610 (5.1)	635 (4.3)
Denmark	383 (6.5)	417 (9.9)	468 (2.6)	521 (3.7)	570 (5.1)	610 (1.6)	636 (4.7)
El Salvador	232 (4.3)	267 (6.2)	327 (5.7)	393 (4.5)	454 (3.4)	507 (3.4)	538 (4.6)
England	403 (6.4)	438 (3.7)	491 (6.0)	545 (2.9)	596 (3.6)	641 (4.8)	666 (6.3)
Georgia	273 (8.6)	306 (7.3)	361 (5.2)	420 (5.8)	477 (4.4)	524 (5.2)	552 (7.9)
Germany	393 (7.6)	427 (4.3)	479 (4.2)	533 (2.5)	582 (1.6)	623 (4.2)	647 (6.0)
Hong Kong SAR	437 (4.6)	466 (4.5)	511 (3.7)	558 (4.2)	601 (3.6)	637 (4.1)	659 (4.2)
Hungary	383 (9.4)	425 (6.1)	485 (3.8)	545 (3.8)	595 (3.4)	637 (6.3)	661 (4.7)
Iran, Islamic Rep. of	267 (7.1)	304 (5.5)	371 (6.5)	441 (5.3)	506 (5.3)	558 (3.4)	587 (3.3)
Italy	395 (5.0)	429 (6.3)	484 (5.2)	538 (3.0)	590 (2.9)	636 (3.8)	664 (4.4)
Japan	428 (7.0)	459 (3.4)	505 (3.1)	551 (1.6)	595 (1.4)	633 (3.4)	655 (3.2)
Kazakhstan	400 (11.2)	433 (9.2)	486 (7.1)	539 (7.1)	585 (5.4)	623 (3.7)	646 (5.0)
Kuwait	137 (8.8)	182 (8.0)	261 (6.5)	355 (5.2)	440 (5.0)	505 (5.9)	538 (3.2)
Latvia	428 (5.4)	454 (4.5)	499 (2.0)	546 (2.5)	589 (2.4)	625 (3.3)	645 (4.0)
Lithuania	401 (5.2)	428 (3.3)	473 (2.8)	518 (2.0)	559 (3.2)	595 (2.2)	615 (4.2)
Morocco	98 (9.9)	139 (7.5)	209 (6.4)	295 (6.3)	383 (8.4)	465 (9.4)	508 (10.7)
Netherlands	421 (6.3)	445 (3.6)	484 (3.6)	525 (2.8)	565 (3.9)	598 (4.1)	617 (5.0)
New Zealand	344 (4.9)	382 (4.7)	447 (3.7)	510 (3.3)	568 (2.9)	614 (3.1)	643 (2.6)
Norway	343 (8.8)	374 (7.7)	429 (4.0)	483 (3.9)	530 (3.3)	570 (3.4)	593 (5.2)
Qatar	75 (6.8)	121 (3.8)	201 (4.0)	296 (2.5)	391 (3.2)	464 (2.0)	502 (2.1)
Russian Federation	407 (7.6)	443 (4.9)	495 (6.6)	549 (4.0)	601 (4.2)	646 (4.9)	672 (8.8)
Scotland	367 (6.1)	400 (3.7)	452 (2.5)	506 (2.7)	552 (2.1)	593 (4.1)	619 (4.3)
Singapore	418 (7.0)	464 (7.0)	531 (6.0)	592 (4.7)	652 (4.4)	701 (5.0)	727 (3.9)
Slovak Republic	376 (13.9)	416 (8.3)	476 (4.7)	534 (4.4)	584 (2.8)	627 (4.0)	652 (6.9)
Slovenia	383 (6.2)	416 (1.7)	471 (3.7)	524 (3.2)	571 (2.8)	610 (2.7)	634 (2.7)
Sweden	400 (3.3)	429 (4.0)	478 (4.0)	527 (4.2)	575 (3.0)	617 (2.4)	642 (4.0)
Tunisia	68 (9.6)	119 (14.0)	214 (7.3)	329 (7.5)	428 (6.0)	497 (4.6)	533 (5.1)
Ukraine	327 (6.6)	364 (5.1)	421 (4.6)	480 (3.0)	532 (3.0)	576 (4.2)	601 (4.2)
United States	392 (4.9)	427 (4.3)	484 (3.2)	543 (2.8)	597 (3.4)	643 (2.8)	668 (3.2)
Yemen	5 (0.0)	20 (8.3)	94 (8.3)	187 (8.3)	287 (8.3)	379 (8.6)	430 (9.5)
<b>Benchmarking Participants</b>							
Alberta, Canada	415 (7.7)	446 (6.9)	495 (5.9)	547 (4.0)	593 (3.3)	633 (3.8)	657 (5.8)
British Columbia, Canada	409 (5.3)	442 (5.5)	491 (4.2)	540 (2.8)	586 (2.0)	627 (2.9)	650 (4.7)
Dubai, UAE	267 (7.6)	312 (8.4)	390 (5.2)	469 (3.7)	537 (3.3)	589 (3.3)	620 (3.3)
Massachusetts, US	451 (10.8)	483 (7.9)	526 (4.3)	574 (4.6)	618 (6.4)	657 (4.8)	679 (5.3)
Minnesota, US	411 (11.2)	446 (10.2)	503 (7.5)	558 (6.0)	607 (5.8)	647 (6.2)	671 (5.7)
Ontario, Canada	396 (8.1)	432 (5.7)	487 (3.0)	541 (4.6)	590 (4.7)	632 (3.6)	657 (5.2)
Quebec, Canada	405 (6.8)	430 (5.3)	474 (3.6)	519 (3.5)	563 (3.4)	601 (2.2)	623 (9.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Note: Percentiles are defined in terms of percentages of students at or below a point on the scale.

Exhibit D.1 Percentiles of Achievement in Science (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	5th Percentile	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile	95th Percentile
Algeria	305 (2.9)	327 (2.6)	366 (1.9)	409 (2.3)	451 (2.1)	488 (1.4)	511 (3.6)
Armenia	325 (7.0)	366 (7.0)	426 (4.7)	486 (5.3)	544 (5.5)	612 (13.7)	662 (24.0)
Australia	378 (5.7)	410 (6.0)	462 (4.4)	517 (3.3)	569 (4.2)	617 (6.2)	644 (9.3)
Bahrain	318 (3.5)	351 (3.8)	409 (2.3)	472 (2.3)	530 (1.5)	575 (2.4)	600 (3.9)
Bosnia and Herzegovina	329 (4.0)	359 (5.5)	414 (4.2)	470 (2.8)	521 (4.2)	565 (3.8)	589 (3.4)
Botswana	181 (7.4)	220 (4.9)	287 (4.2)	361 (3.5)	425 (2.7)	478 (3.0)	509 (7.1)
Bulgaria	287 (11.3)	330 (16.9)	403 (8.0)	478 (5.7)	543 (4.1)	595 (6.8)	627 (12.3)
Chinese Taipei	400 (7.7)	439 (6.4)	506 (6.2)	571 (4.9)	624 (4.2)	665 (3.3)	690 (4.7)
Colombia	290 (9.1)	319 (4.7)	366 (3.9)	418 (4.1)	469 (5.2)	514 (3.9)	540 (4.7)
Cyprus	303 (6.8)	339 (3.7)	397 (2.3)	458 (3.0)	511 (2.1)	556 (3.1)	582 (3.6)
Czech Republic	419 (3.8)	447 (2.3)	492 (2.3)	540 (2.4)	587 (2.6)	630 (3.4)	655 (2.8)
Egypt	240 (6.5)	275 (5.6)	338 (5.0)	412 (4.6)	481 (4.8)	537 (4.3)	564 (3.3)
El Salvador	274 (6.4)	298 (4.9)	340 (2.7)	386 (3.4)	434 (4.7)	477 (3.4)	504 (4.5)
England	393 (14.3)	427 (6.9)	486 (7.3)	546 (5.2)	602 (5.1)	649 (4.9)	675 (6.2)
Georgia	277 (16.1)	309 (7.3)	364 (6.4)	426 (5.5)	481 (6.7)	527 (4.4)	550 (4.7)
Ghana	124 (8.3)	163 (8.0)	229 (6.8)	303 (5.2)	378 (6.2)	445 (8.6)	483 (10.3)
Hong Kong SAR	376 (11.4)	419 (11.2)	483 (8.8)	541 (5.1)	586 (3.3)	625 (4.4)	648 (6.6)
Hungary	408 (5.0)	437 (5.2)	488 (5.3)	543 (2.7)	592 (2.9)	635 (3.5)	658 (4.2)
Indonesia	302 (7.1)	330 (4.8)	377 (4.0)	428 (4.5)	479 (3.8)	520 (3.9)	546 (4.5)
Iran, Islamic Rep. of	329 (4.5)	355 (4.0)	403 (4.5)	457 (4.5)	513 (5.3)	566 (5.2)	597 (10.0)
Israel	288 (8.3)	329 (6.0)	402 (8.0)	477 (5.9)	540 (6.4)	591 (4.3)	622 (9.0)
Italy	361 (6.9)	393 (5.3)	445 (3.1)	498 (2.7)	549 (2.4)	590 (3.4)	615 (6.9)
Japan	418 (5.4)	454 (4.3)	507 (2.5)	559 (2.5)	606 (2.2)	648 (3.1)	672 (3.4)
Jordan	308 (5.3)	349 (5.3)	416 (4.7)	491 (4.1)	554 (5.9)	601 (5.0)	627 (5.3)
Korea, Rep. of	420 (4.4)	452 (4.2)	505 (3.1)	559 (1.8)	606 (1.9)	646 (2.1)	670 (3.3)
Kuwait	263 (6.2)	298 (4.8)	358 (4.5)	423 (3.0)	481 (2.4)	530 (3.2)	557 (3.8)
Lebanon	255 (9.9)	284 (7.2)	344 (6.4)	415 (7.8)	484 (6.2)	539 (5.7)	569 (7.0)
Lithuania	382 (6.0)	414 (6.8)	466 (3.0)	522 (2.0)	574 (1.9)	616 (3.9)	640 (3.8)
Malaysia	319 (6.6)	357 (9.9)	416 (5.9)	475 (5.5)	530 (6.3)	581 (7.6)	608 (10.4)
Malta	251 (3.7)	298 (2.9)	386 (2.3)	468 (1.3)	537 (2.5)	595 (2.3)	627 (2.2)
Morocco	274 (7.8)	301 (3.5)	348 (3.2)	401 (4.4)	456 (3.8)	504 (4.0)	532 (6.2)
Norway	360 (6.5)	389 (5.6)	438 (3.0)	491 (3.2)	539 (2.2)	578 (1.7)	600 (3.2)
Oman	253 (7.7)	293 (5.3)	360 (3.2)	429 (4.2)	492 (2.0)	541 (3.3)	568 (1.7)
Palestinian Nat'l Auth.	213 (9.5)	255 (8.1)	327 (4.2)	411 (4.0)	486 (3.3)	543 (4.4)	574 (4.5)
Qatar	101 (4.3)	146 (4.5)	229 (3.0)	327 (2.7)	414 (2.1)	480 (2.3)	511 (3.1)
Romania	307 (8.9)	345 (6.3)	405 (5.9)	467 (6.8)	524 (4.7)	572 (4.5)	597 (5.6)
Russian Federation	397 (6.8)	427 (6.6)	477 (4.0)	532 (4.4)	584 (3.4)	627 (5.1)	653 (7.2)
Saudi Arabia	272 (7.8)	300 (5.6)	351 (4.3)	405 (1.7)	459 (2.6)	503 (3.4)	529 (4.5)
Scotland	358 (6.2)	388 (5.4)	441 (5.0)	499 (3.9)	553 (4.1)	597 (5.1)	623 (3.6)
Serbia	318 (7.4)	359 (6.6)	419 (3.9)	477 (3.1)	529 (3.3)	571 (2.5)	596 (8.0)
Singapore	374 (9.0)	421 (7.9)	500 (7.2)	578 (4.8)	644 (3.1)	694 (3.0)	720 (4.4)
Slovenia	414 (3.7)	442 (3.2)	491 (2.5)	541 (2.0)	587 (1.8)	628 (3.3)	651 (4.0)
Sweden	373 (4.9)	405 (4.1)	460 (4.5)	515 (2.5)	564 (1.7)	608 (2.6)	633 (3.3)
Syrian Arab Republic	326 (4.9)	355 (5.1)	402 (3.6)	454 (3.6)	505 (3.9)	546 (3.0)	569 (4.3)
Thailand	334 (5.4)	363 (5.7)	414 (5.9)	470 (4.1)	526 (5.8)	578 (5.6)	609 (10.7)
Tunisia	346 (3.1)	367 (2.2)	404 (2.3)	445 (2.8)	486 (2.9)	524 (2.3)	545 (6.1)
Turkey	308 (4.2)	336 (4.3)	390 (4.6)	451 (4.0)	518 (4.6)	577 (4.0)	610 (5.1)
Ukraine	338 (7.0)	374 (7.3)	433 (4.5)	491 (3.1)	543 (3.5)	588 (3.3)	613 (5.2)
United States	378 (4.8)	410 (3.5)	464 (3.2)	524 (3.2)	578 (2.9)	623 (2.6)	649 (1.5)
<b>Benchmarking Participants</b>							
Basque Country, Spain	372 (7.5)	403 (4.1)	452 (4.1)	501 (3.4)	548 (3.4)	587 (3.9)	609 (5.4)
British Columbia, Canada	402 (5.1)	432 (4.1)	481 (3.1)	530 (2.8)	574 (2.2)	612 (4.1)	636 (4.7)
Dubai, UAE	326 (8.8)	361 (6.2)	426 (4.8)	495 (4.4)	555 (6.4)	605 (6.2)	634 (5.8)
Massachusetts, US	416 (8.1)	449 (7.8)	505 (6.2)	562 (5.4)	612 (5.3)	653 (5.2)	677 (5.7)
Minnesota, US	412 (9.7)	444 (7.4)	492 (7.4)	542 (5.1)	588 (5.9)	627 (9.3)	651 (6.7)
Ontario, Canada	410 (9.2)	437 (6.1)	481 (3.8)	528 (2.9)	574 (3.7)	614 (5.1)	637 (6.2)
Quebec, Canada	392 (8.9)	419 (4.2)	462 (3.1)	508 (3.2)	553 (2.7)	593 (5.0)	617 (4.8)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Note: Percentiles are defined in terms of percentages of students at or below a point on the scale.

## Exhibit D.2 Standard Deviations of Achievement in Science

TIMSS2007  
Science 4<sup>th</sup> Grade

Country	Overall		Girls		Boys	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Algeria	354 (6.0)	102 (3.3)	359 (6.5)	102 (3.5)	349 (6.0)	101 (3.5)
Armenia	484 (5.7)	119 (3.9)	493 (7.3)	119 (4.9)	476 (5.2)	118 (3.7)
Australia	527 (3.3)	80 (2.0)	525 (4.0)	76 (2.4)	530 (3.5)	84 (2.3)
Austria	526 (2.5)	77 (1.3)	519 (2.7)	76 (1.5)	532 (2.9)	78 (1.7)
Chinese Taipei	557 (2.0)	77 (1.3)	556 (2.3)	73 (1.5)	558 (2.4)	81 (1.7)
Colombia	400 (5.4)	97 (2.7)	393 (5.5)	93 (2.8)	408 (6.0)	101 (3.2)
Czech Republic	515 (3.1)	76 (1.5)	511 (3.7)	72 (1.7)	518 (3.4)	78 (2.1)
Denmark	517 (2.9)	77 (1.8)	514 (3.2)	74 (2.6)	520 (3.6)	80 (2.4)
El Salvador	390 (3.4)	93 (1.7)	383 (4.5)	92 (2.7)	396 (4.6)	94 (2.8)
England	542 (2.9)	80 (1.8)	543 (3.1)	78 (1.8)	540 (3.4)	83 (2.4)
Georgia	418 (4.6)	85 (2.1)	423 (4.7)	82 (2.9)	413 (5.1)	86 (2.2)
Germany	528 (2.4)	79 (1.5)	520 (2.6)	78 (2.1)	535 (2.9)	80 (1.7)
Hong Kong SAR	554 (3.5)	68 (1.5)	553 (3.6)	65 (1.6)	556 (4.3)	71 (2.5)
Hungary	536 (3.3)	85 (2.0)	535 (4.4)	83 (2.6)	538 (3.6)	87 (2.6)
Iran, Islamic Rep. of	436 (4.3)	97 (2.1)	443 (5.6)	93 (2.8)	429 (6.0)	101 (2.7)
Italy	535 (3.2)	81 (1.8)	529 (3.2)	80 (2.0)	541 (3.7)	82 (2.2)
Japan	548 (2.1)	70 (1.1)	548 (2.5)	68 (1.5)	547 (2.4)	72 (1.7)
Kazakhstan	533 (5.6)	74 (2.6)	533 (5.5)	74 (3.0)	532 (6.3)	75 (2.9)
Kuwait	348 (4.4)	123 (2.5)	379 (4.6)	111 (2.8)	315 (7.3)	127 (2.9)
Latvia	542 (2.3)	67 (1.7)	545 (2.8)	64 (2.4)	539 (3.0)	69 (1.9)
Lithuania	514 (2.4)	65 (1.1)	516 (2.7)	63 (1.6)	512 (2.9)	67 (1.8)
Morocco	297 (5.9)	124 (3.6)	302 (6.4)	122 (3.5)	292 (6.8)	126 (4.8)
Netherlands	523 (2.6)	60 (1.5)	518 (3.0)	60 (1.7)	528 (2.8)	59 (1.9)
New Zealand	504 (2.6)	90 (1.6)	506 (2.8)	85 (1.6)	502 (3.5)	95 (2.3)
Norway	477 (3.5)	77 (1.8)	475 (3.8)	77 (2.7)	478 (4.2)	76 (2.1)
Qatar	294 (2.6)	129 (1.6)	307 (2.9)	128 (2.4)	281 (2.8)	130 (1.4)
Russian Federation	546 (4.8)	81 (2.5)	548 (5.1)	77 (2.8)	544 (5.0)	84 (3.3)
Scotland	500 (2.3)	76 (1.5)	500 (3.0)	72 (1.8)	501 (2.4)	80 (2.0)
Singapore	587 (4.1)	93 (2.3)	587 (4.3)	87 (2.4)	587 (4.4)	98 (2.5)
Slovak Republic	526 (4.8)	87 (4.8)	521 (5.2)	88 (6.1)	530 (4.8)	87 (4.0)
Slovenia	518 (1.9)	76 (1.3)	518 (2.4)	74 (2.0)	518 (2.4)	78 (1.5)
Sweden	525 (2.9)	74 (1.3)	526 (2.7)	71 (1.6)	524 (3.7)	76 (1.6)
Tunisia	318 (5.9)	141 (2.1)	335 (6.4)	135 (2.9)	304 (6.2)	145 (2.3)
Ukraine	474 (3.1)	83 (1.6)	475 (3.4)	79 (2.1)	473 (3.5)	86 (2.3)
United States	539 (2.7)	84 (1.4)	536 (3.0)	82 (1.7)	541 (3.1)	86 (1.5)
Yemen	197 (7.2)	130 (2.5)	209 (9.9)	130 (3.4)	188 (8.1)	129 (3.3)
<b>Benchmarking Participants</b>						
Alberta, Canada	543 (3.8)	74 (1.8)	540 (3.7)	71 (1.8)	545 (4.6)	76 (2.3)
British Columbia, Canada	537 (2.7)	73 (1.6)	538 (2.9)	71 (1.8)	536 (3.1)	74 (2.2)
Dubai, UAE	460 (2.8)	107 (2.3)	473 (4.5)	97 (2.5)	448 (4.9)	115 (3.2)
Massachusetts, US	571 (4.3)	69 (1.8)	566 (4.3)	68 (2.6)	576 (4.7)	70 (2.9)
Minnesota, US	551 (6.1)	80 (4.3)	549 (6.9)	77 (3.7)	554 (6.3)	82 (5.9)
Ontario, Canada	536 (3.7)	78 (2.5)	532 (4.1)	75 (2.6)	539 (4.3)	81 (3.2)
Quebec, Canada	517 (2.7)	67 (1.5)	516 (3.1)	67 (1.8)	518 (3.5)	67 (2.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

## Exhibit D.2 Standard Deviations of Achievement in Science (Continued)

TIMSS2007  
Science 8<sup>th</sup> Grade

Country	Overall		Girls		Boys	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Algeria	408 (1.7)	63 (1.0)	408 (1.9)	64 (1.5)	408 (2.2)	62 (1.0)
Armenia	488 (5.8)	101 (4.5)	492 (7.1)	101 (5.2)	484 (5.2)	102 (4.2)
Australia	515 (3.6)	80 (2.1)	505 (5.1)	75 (2.6)	524 (5.4)	84 (3.2)
Bahrain	467 (1.7)	86 (1.1)	499 (1.9)	70 (1.2)	437 (2.6)	89 (1.7)
Bosnia and Herzegovina	466 (2.8)	79 (1.6)	464 (3.4)	78 (2.0)	467 (2.9)	81 (2.0)
Botswana	355 (3.1)	99 (1.2)	365 (3.7)	95 (1.7)	343 (3.6)	103 (1.9)
Bulgaria	470 (5.9)	103 (3.6)	477 (6.2)	100 (4.1)	464 (6.8)	105 (4.5)
Chinese Taipei	561 (3.7)	89 (1.6)	559 (3.7)	83 (1.8)	563 (4.4)	95 (2.1)
Colombia	417 (3.5)	77 (1.8)	400 (4.4)	72 (2.0)	435 (3.7)	77 (2.3)
Cyprus	452 (2.0)	85 (1.2)	460 (2.8)	79 (1.6)	444 (2.4)	90 (1.6)
Czech Republic	539 (1.9)	71 (1.1)	534 (2.2)	71 (1.5)	543 (2.4)	71 (1.5)
Egypt	408 (3.6)	99 (1.5)	417 (4.8)	97 (2.0)	400 (4.6)	101 (2.1)
El Salvador	387 (2.9)	70 (1.9)	377 (3.7)	69 (2.7)	399 (4.1)	69 (2.5)
England	542 (4.5)	85 (2.6)	537 (4.6)	84 (2.7)	546 (5.8)	87 (3.1)
Georgia	421 (4.8)	83 (2.4)	432 (4.8)	79 (2.1)	410 (5.2)	86 (3.2)
Ghana	303 (5.4)	108 (2.9)	288 (5.9)	108 (3.5)	316 (5.6)	107 (2.9)
Hong Kong SAR	530 (4.9)	81 (3.0)	533 (4.5)	74 (3.2)	528 (6.6)	87 (3.6)
Hungary	539 (2.9)	77 (1.8)	533 (3.5)	74 (2.3)	545 (3.3)	78 (2.1)
Indonesia	427 (3.4)	74 (2.0)	426 (3.8)	75 (2.4)	428 (3.6)	74 (2.1)
Iran, Islamic Rep. of	459 (3.6)	81 (2.1)	466 (4.6)	80 (2.9)	453 (5.4)	82 (3.0)
Israel	468 (4.3)	101 (2.2)	472 (4.9)	96 (3.0)	463 (5.2)	106 (2.3)
Italy	495 (2.8)	78 (2.0)	491 (3.3)	76 (2.6)	499 (3.1)	79 (2.0)
Japan	554 (1.9)	77 (1.5)	552 (2.8)	76 (2.4)	556 (2.5)	78 (1.6)
Jordan	482 (4.0)	98 (1.9)	499 (5.8)	90 (2.2)	466 (5.5)	102 (2.5)
Korea, Rep. of	553 (2.0)	76 (1.1)	549 (2.7)	72 (1.3)	557 (2.5)	79 (1.5)
Kuwait	418 (2.8)	89 (1.6)	441 (3.4)	78 (1.2)	391 (4.2)	94 (2.2)
Lebanon	414 (5.9)	97 (2.9)	410 (6.2)	97 (3.1)	417 (6.7)	97 (3.6)
Lithuania	519 (2.5)	78 (1.8)	518 (3.2)	77 (1.9)	519 (2.7)	80 (2.3)
Malaysia	471 (6.0)	88 (3.6)	475 (6.4)	84 (3.7)	466 (6.7)	93 (4.1)
Malta	457 (1.4)	114 (1.3)	456 (1.8)	109 (1.6)	458 (2.2)	118 (1.8)
Morocco	402 (2.9)	79 (2.1)	403 (3.7)	79 (2.1)	401 (3.6)	78 (3.0)
Norway	487 (2.2)	73 (1.3)	487 (2.4)	71 (1.6)	486 (3.0)	76 (1.8)
Oman	423 (3.0)	96 (1.8)	452 (3.6)	83 (2.0)	391 (4.6)	98 (2.1)
Palestinian Nat'l Auth.	404 (3.5)	111 (1.9)	422 (4.5)	106 (2.8)	386 (5.1)	113 (2.3)
Qatar	319 (1.7)	126 (1.4)	354 (2.3)	110 (1.9)	284 (2.3)	131 (1.6)
Romania	462 (3.9)	88 (2.2)	466 (4.1)	84 (3.1)	458 (4.6)	91 (2.4)
Russian Federation	530 (3.9)	78 (1.6)	527 (4.3)	75 (1.7)	533 (4.2)	80 (2.2)
Saudi Arabia	403 (2.4)	78 (1.7)	426 (2.9)	70 (1.5)	383 (3.9)	79 (2.3)
Scotland	496 (3.4)	81 (1.8)	493 (3.5)	79 (1.8)	498 (4.2)	83 (2.2)
Serbia	470 (3.2)	85 (1.9)	472 (3.7)	82 (2.6)	469 (3.8)	88 (2.1)
Singapore	567 (4.4)	104 (3.0)	571 (4.7)	99 (3.4)	563 (5.2)	109 (3.3)
Slovenia	538 (2.2)	72 (1.4)	536 (2.6)	69 (1.4)	539 (2.7)	75 (1.7)
Sweden	511 (2.6)	78 (1.5)	512 (3.0)	76 (1.8)	510 (2.8)	80 (1.7)
Syrian Arab Republic	452 (2.9)	75 (1.6)	448 (3.3)	73 (1.9)	457 (4.2)	76 (2.2)
Thailand	471 (4.3)	83 (2.8)	480 (4.5)	78 (2.8)	462 (4.9)	87 (3.0)
Tunisia	445 (2.1)	60 (1.0)	436 (2.3)	60 (1.4)	455 (2.6)	59 (1.2)
Turkey	454 (3.7)	92 (1.7)	457 (4.0)	89 (2.3)	452 (4.0)	94 (1.8)
Ukraine	485 (3.5)	84 (1.9)	484 (3.9)	80 (2.3)	486 (3.6)	88 (2.0)
United States	520 (2.9)	82 (1.1)	514 (3.0)	79 (1.4)	526 (3.2)	85 (1.4)
<b>Benchmarking Participants</b>						
Basque Country, Spain	498 (3.0)	72 (1.6)	490 (3.6)	68 (1.8)	505 (3.9)	75 (2.2)
British Columbia, Canada	526 (2.7)	71 (1.7)	523 (2.9)	68 (2.1)	529 (3.3)	73 (2.0)
Dubai, UAE	489 (2.8)	94 (1.6)	495 (5.1)	88 (2.5)	483 (6.1)	99 (2.8)
Massachusetts, US	556 (4.6)	79 (3.5)	551 (5.1)	79 (4.2)	561 (5.0)	80 (3.8)
Minnesota, US	539 (4.8)	72 (2.9)	535 (4.3)	69 (3.1)	542 (6.1)	74 (3.5)
Ontario, Canada	526 (3.6)	69 (2.4)	521 (3.8)	67 (2.5)	531 (4.3)	71 (2.8)
Quebec, Canada	507 (3.1)	69 (2.4)	503 (3.3)	66 (2.2)	511 (4.1)	72 (3.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

(1) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.



# Appendix E

*Mongolia—Science Achievement*

## Exhibit E.1 Mongolia – Selected Science Achievement Results\*

TIMSS2007  
Science 4<sup>th</sup> Grade

Distribution of Science Achievement									
Mean Achievement	Years of Formal Schooling**	Average Age at Time of Testing	5th Percentile (Scale Score)	10th Percentile (Scale Score)	25th Percentile (Scale Score)	50th Percentile (Scale Score)	75th Percentile (Scale Score)	90th Percentile (Scale Score)	95th Percentile (Scale Score)
421 (4.0)	4	11	270 (9.1)	304 (4.0)	363 (4.9)	428 (4.6)	483 (4.7)	529 (4.6)	554 (2.9)

Science Achievement by Gender		
Mean Achievement	Girls' Mean	Boys' Mean
421 (4.0)	424 (4.4)	419 (4.4)

Average Achievement in Science Content Domains by Gender			
Content Domain	Girls' Mean	Boys' Mean	Overall Mean
Life Science	437 (4.1)	432 (4.2)	434 (3.6)
Physical Science	435 (3.7)	432 (4.8)	433 (3.9)
Earth Science	414 (4.1) ▲	403 (4.3)	408 (3.6)

Average Achievement in Science Cognitive Domains by Gender			
Cognitive Domain	Girls' Mean	Boys' Mean	Overall Mean
Knowing	412 (4.1)	409 (5.0)	411 (4.1)
Applying	450 (3.6) ▲	443 (4.3)	446 (3.7)
Reasoning	434 (3.9)	444 (4.2)	439 (3.1)

Percentages of Students Reaching International Benchmarks in Science			
Advanced International Benchmark (625)	High International Benchmark (550)	Intermediate International Benchmark (475)	Low International Benchmark (400)
0 (0.2)	6 (0.6)	29 (2.0)	62 (2.0)

▲ Significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

\* Because characteristics of their samples and data are not completely known, selected achievement results for Mongolia at the fourth and eighth grades are presented in Appendix E.

\*\* Represents years of schooling counting from the first year of ISCED Level 1.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit E.1 **Mongolia – Selected Science Achievement Results\* (Continued)**

**TIMSS2007**  
Science **8<sup>th</sup>** Grade

Distribution of Science Achievement									
Mean Achievement	Years of Formal Schooling**	Average Age at Time of Testing	5th Percentile (Scale Score)	10th Percentile (Scale Score)	25th Percentile (Scale Score)	50th Percentile (Scale Score)	75th Percentile (Scale Score)	90th Percentile (Scale Score)	95th Percentile (Scale Score)
449 (2.9)	8	15	322 (6.2)	351 (5.0)	401 (2.9)	453 (2.6)	501 (3.2)	541 (2.8)	563 (3.8)

Science Achievement by Gender		
Mean Achievement	Girls' Mean	Boys' Mean
449 (2.9)	450 (2.9)	449 (3.6)

Average Achievement in Science Content Domains by Gender			
Content Domain	Girls' Mean	Boys' Mean	Overall Mean
Biology	459 (3.0) ▲	451 (3.4)	455 (2.9)
Chemistry	452 (3.9)	444 (4.6)	448 (3.6)
Physics	450 (2.8)	458 (2.9) ●	454 (2.5)
Earth Science	432 (4.5)	437 (3.9)	434 (3.2)

Average Achievement in Science Cognitive Domains by Gender			
Cognitive Domain	Girls' Mean	Boys' Mean	Overall Mean
Knowing	426 (2.8)	426 (4.7)	426 (3.3)
Applying	459 (3.2)	462 (3.2)	461 (2.8)
Reasoning	463 (4.1) ▲	455 (3.6)	459 (3.5)

Percentages of Students Reaching International Benchmarks in Science			
Advanced International Benchmark (625)	High International Benchmark (550)	Intermediate International Benchmark (475)	Low International Benchmark (400)
0 (0.1)	8 (0.9)	38 (1.8)	76 (1.5)

▲ Significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2007

\* Because characteristics of their samples and data are not completely known, selected achievement results for Mongolia at the fourth and eighth grades are presented in Appendix E.

\*\* Represents years of schooling counting from the first year of ISCED Level 1.

( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.



# Appendix F

## *Organizations and Individuals Responsible for TIMSS 2007*

### **Introduction**

TIMSS 2007 was a collaborative effort involving hundreds of individuals around the world. This appendix recognizes the individuals and organizations for their contributions. Given the work on TIMSS 2007 has spanned approximately five years and has involved so many people and organizations, this list may not include all who contributed. Any omission is inadvertent.

Of the first importance, TIMSS 2007 is deeply indebted to the students, teachers, and school principals who contributed their time and effort to the study.

### **Management and Coordination**

TIMSS is a major undertaking of IEA, and together with PIRLS, comprises the core of IEA's regular cycle of studies. PIRLS, which regularly assesses reading at the fourth grade, complements the TIMSS assessments.

The TIMSS & PIRLS International Study Center at Boston College has responsibility for the overall direction and management of the TIMSS and PIRLS projects. Headed by Drs. Michael O. Martin and Ina V.S. Mullis, the study center is located in the Lynch School of Education. In carrying out the project, the TIMSS & PIRLS International Study Center worked closely with the IEA Secretariat in Amsterdam, which provided guidance overall and was responsible for verification of all translations produced by the participating countries. The IEA Data Processing and Research Center in Hamburg was

responsible for processing and verifying the internal consistency and accuracy of the data submitted by the participants. Statistics Canada in Ottawa was responsible for school and student sampling activities. Educational Testing Service (ETS) in Princeton, New Jersey provided psychometric methodology recommendations addressing calibration, scaling, and survey design changes implemented in TIMSS 2007, and assisted in executing the item calibration analyses and made available software for scaling the achievement data.

The Project Management Team, comprised of the Directors and Senior Management from the TIMSS & PIRLS International Study Center, the IEA Secretariat, the IEA Data Processing and Research Center, Statistics Canada, and ETS met twice a year throughout the study to discuss the study's progress, procedures, and schedule. In addition, the Directors of the TIMSS & PIRLS International Study Center met with members of IEA's Technical Executive Group twice yearly to review technical issues.

Dr. Graham Ruddock from the National Foundation for Educational Research in England (NFER) was the TIMSS 2007 Mathematics Coordinator and Dr. Christine O'Sullivan from K-12 Consulting was the TIMSS 2007 Science Coordinator. Together with the Science and Mathematics Item Review Committee, a panel of internationally recognized experts in mathematics and science research, curriculum, instructions, and assessments, they provided excellent guidance throughout TIMSS 2007.

To work with the international team and coordinate within-country activities, each participating country designated one or two individuals to be the TIMSS National Research Coordinator or Co-Coordinators, known as the NRCs. The NRCs had the complicated and challenging task of implementing the TIMSS 2007 study in their countries in accordance with TIMSS guidelines and procedures. The quality of the TIMSS 2007 assessment and data depends on the work of the NRCs and their colleagues in carrying out the very complex sampling, data collection, and scoring tasks involved. In addition, the Questionnaire Development Group, comprised of NRCs, provided advice on questionnaire development.

Continuing the tradition of truly exemplary work established in previous TIMSS assessments, the TIMSS 2007 NRCs (often the same NRCs as in previous assessments), performed their many tasks with dedication, competence, energy, and goodwill, and have been commended by the IEA Secretariat, the TIMSS & PIRLS International Study Center, the IEA Data Processing and Research Center, and Statistics Canada for their commitment to the project and the high quality of their work.

### **Funding**

A project of this magnitude requires considerable financial support. IEA's major funding partners for TIMSS 2007 included the World Bank, the U.S. Department of Education through the National Center for Education Statistics, the United Nations Development Programme (UNDP) and those countries that contributed by way of fees. The financial support provided by Boston College and NFER also is gratefully acknowledged.

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