

# Chapter 5

## The Science Curriculum

The first part of Chapter 5 presents information about the curricular goals in the TIMSS 2003 countries, referred to as the intended curriculum. Information is provided about the science subjects offered in each country, whether the participating countries have national curricula and public examinations in science, how the curriculum is supported and monitored within each country, whether countries differentiate the curricula for students with different levels of ability, and the approaches and processes that are emphasized in the intended curriculum. The second part of the chapter presents data about 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 and how they may affect the science they have studied. Students' opportunity to learn the content, skills, and processes tested in the TIMSS 2003 science assessment depends to a large degree on the curricular goals and intentions inherent in each country's policies for science education. Just as important as what students are expected to learn, however, is what their teachers choose to teach them. The lessons provided by the teacher ultimately determine the science students are taught.

This chapter presents information about the curricular goals in science in the TIMSS 2003 countries and teachers' reports about the science content studied. Teachers' instructional programs for their classes are usually guided by an "official curriculum" that describes the science education that should be provided. The official curriculum can be communicated by means of documents or statements of various types (often called guides, guidelines, or frameworks) prepared by the education ministry or by national or regional education departments. These documents or statements, together with supporting material such as instructional guides or mandated textbooks, are referred to as the *intended curriculum*. To collect information about the intended science curriculum in each of the TIMSS 2003 countries, the National Research Coordinators (NRCs) responsible for implementing the study completed curriculum questionnaires, often with the assistance of curriculum specialists, and responded to follow-up queries.

In many cases, teachers need to interpret and adapt the intended curriculum according to their perceptions of the needs, abilities, and interests of their students, and this evolves into the *implemented curriculum*. Research has shown that the implemented curriculum, even in highly regulated educational systems, is not identical to the intended curriculum. To collect data about the implemented curriculum, the science teachers of the students tested in TIMSS 2003 completed questionnaires about whether the students had been taught the various science topics included in the assessment.

### **Which Science Subjects Are Offered Up To and Including Eighth Grade?**

One of the primary differences among science curricula of the TIMSS 2003 countries in eighth and earlier grades is that the sciences are taught as separate subjects in some countries and integrated to form a general science course in others. Exhibit 5.1 shows how science instruction is organized in these grades in the TIMSS countries. By the eighth grade, most of the continental European countries, as well as Chinese

Taipei, Indonesia, Lebanon, Morocco, and the Philippines, were teaching some or all of biology, chemistry, physics, and earth science as separate subjects (in some cases chemistry and physics or biology and earth science are combined), although not necessarily contemporaneously. Elsewhere, 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



Countries	Separate Science Courses Offered	Science Subjects and Grades Taught
Armenia	●	Biology 8; Chemistry 8; Physics 8; Earth Science 8
Australia	○	General/integrated science
Bahrain	○	General/integrated science
Belgium (Flemish)	●	Biology 8; Physics 8; Earth Science 8
Botswana	○	General/integrated science
Bulgaria	●	Biology 6,7,8; Chemistry 7,8; Physics 7,8; Earth Science 8
Chile	○	General/integrated science
Chinese Taipei	●	Biology 7; Physics/Chemistry 8
Cyprus	●	Biology 7; Chemistry 8; Physics 8; Geography 8
Egypt	○	General/integrated science
England	○	General/integrated science
Estonia	●	Biology 7,8; Geography 7,8; Chemistry 8; Physics 8
Ghana	○	General/integrated science
Hong Kong, SAR	○	General/integrated science
Hungary	●	Biology 7,8; Chemistry 7,8; Physics 7,8; Earth Science 7,8
Indonesia	●	Biology 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
Latvia	●	Biology 6-8; Chemistry 8; Physics 8
Lebanon	●	Life and Earth Sciences 7,8; Chemistry 7,8; Physics 7,8
Lithuania	●	Integrated science "Nature and man" 5,6; Geography 6,7,8; Biology 7,8; Physics 7,8; Chemistry 8
Macedonia, Rep. of	●	Natural Science 1-4; Biology 5-8; Geography 5-8; Chemistry 7,8; Physics 7,8
Malaysia	○	General/integrated science
Moldova, Rep. of	●	Biology 5-8; Geography 5-8; Physics 6-8; Chemistry 7,8
Morocco	●	Biology 8; Chemistry 8; Physics 8; Earth Science 8
Netherlands	●	General/integrated science K-6; Biology 7,8; Physics/Chemistry 7,8; Geography 7,8
New Zealand	○	General/integrated science
Norway	○	General/integrated science
Palestinian Nat'l Auth.	○	General/integrated science
Philippines	●	Integrated science 7; Biology 8
Romania	●	Geography 4-8; Biology 5-8; Physics 6-8; Chemistry 7,8
Russian Federation	●	Biology 6,7,8; Geography 6,7,8; Physics 7,8; Chemistry 8
Saudi Arabia	○	General/integrated science
Scotland	○	General/integrated science
Serbia	●	Biology 5-8; Geography 5-8; Physics 6-8; Chemistry 7,8
Singapore	○	General/integrated science
Slovak Republic	●	Biology and Environmental Science 5-8; Earth Science 5-8; Physics 6-8; Chemistry 8
Slovenia	●	General Science and Technology 7; Biology 8; Chemistry 8; Physics 8
South Africa	○	General/integrated science
Sweden	●	Integrated Science Studies K-6; either Integrated Natural Science 7,8 or Biology 7,8; Chemistry 7,8; Physics 7,8; Social Science/Geography 7,8
Syrian Arab Republic	●	Biology 7,8; Chemistry 7,8; Physics 7,8
Tunisia	○	General/integrated science
United States	○	Varies by state; usually general/integrated science
<b>Benchmarking Participants</b>		
Basque Country, Spain	○	General/integrated science
Indiana State, US	○	General/integrated science
Ontario Province, Can.	○	General/integrated science
Quebec Province, Can.	○	General/integrated science

● Country reported Yes for the particular option

○ Country reported No for the particular option

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

## Which Countries Have a National Curriculum and Public Examinations in Science?

A common feature of many countries' educational systems is that curricular decisions are made at the national level, with the ministry of education (or highest authority in the system) being primarily responsible for the major decisions governing the direction of education. Some countries, on the other hand, have less centralized systems, with such decisions made at the regional or local level. Centralized decision making can add coherence and uniformity to curriculum coverage, whereas less centralized decision making may give a school or teacher more flexibility in tailoring instruction to the needs of students.

Exhibit 5.2 shows that, of the 47 countries that participated in TIMSS 2003 at the eighth grade,<sup>1</sup> all but 3 reported that the specifications for students' curricular goals in science at this level were developed as national curricula. In Australia and the United States, curricula were determined at the state level. In Belgium (Flemish), although there was no national curriculum, there were officially defined final attainment levels, and school boards developed their own curricula based on these. Among benchmarking participants, the US state of Indiana and the Canadian provinces of Ontario and Quebec had system-wide curricula determined at the state and provincial level, respectively, while in the Basque Country of Spain, 55 percent of the curriculum was determined at the national level and 45 percent at the community level.

In the recent past, it has become common for countries' intended curricula to be updated regularly. At the time of the TIMSS 2003 testing, the official eighth-grade science curriculum in 27 of the participants had been in place for five years or less, and more than half of those were in revision. Of the 24 participants with an eighth-grade science curriculum of more than five years standing, 18 were revising it at the time of the assessment. For Australia and the United States, with less centralized educational systems, curriculum renewal varied by state and was generally an ongoing process.

1 Curriculum data are presented for the Syrian Arab Republic at the eighth grade, and for Yemen at the fourth grade, because these data are not dependent upon the countries' samples.

At the fourth grade, Exhibit 5.2 shows that of the 26 countries that participated in TIMSS 2003 at this level, all but 3 reported having national curricula in fourth-grade science. Similar to the eighth grade, fourth-grade science curricula in Australia and the United States were determined at the state level, and school boards in Belgium (Flemish) developed their own curricula based on officially defined final attainment levels. Among benchmarkers, Indiana, Ontario, and Quebec had system-wide curricula determined at the state or provincial level, respectively.

At the time of the TIMSS 2003 assessment, the official fourth-grade science curriculum had been in place for five years or less in 20 of the participants, and nearly half of those were in revision. Of the nine participating entities with a fourth-grade science curriculum of more than five years standing, five were revising it at the time of the assessment. As at the eighth grade, curriculum renewal in Australia and the United States varied by state and was generally an ongoing process.

Public examinations with consequences for individual students are another common feature of many countries' educational systems. Although public examinations can provide information of interest to national and regional policymakers, their main purpose is to make decisions about individual students, such as promotion from one grade to another, entry to a higher school system, or graduation from secondary school. Among all TIMSS 2003 participants, 39 countries and one benchmarking entity reported having public examinations in science at one or more grades. Grade 12 was the most prevalent, with 33 countries giving students public examinations in science at this level.

## Exhibit 5.2: Intended Science Curriculum



Countries	National Curriculum	Year Curriculum Introduced	Curriculum Under Revision	Public Exams with Consequences for Individual Students	Grades Tested in Public Exams
Armenia	●	2000	○	●	10
Australia	○	Varies by state; generally ongoing process	●	●	12
Bahrain	●	2001	●	●	9,10,11,12
<sup>1</sup> Belgium (Flemish)	○	1997	○	○	-
Botswana	●	1996	●	●	7,10,12
Bulgaria	●	1997	●	●	12
Chile	●	2002	●	●	12
Chinese Taipei	●	1997	●	●	9,12
Cyprus	●	1990	●	●	12
Egypt	●	2002	●	●	5,8,10,11
England	●	2000	○	●	10,11,12
Estonia	●	1997, revised 2002	●	●	9,12
Ghana	●	1987, revised 2001	○	●	9
Hong Kong, SAR	●	2000	○	●	Biology 11,13; Chemistry 11,13; Physics 11,13; Human Biology 11,13
Hungary	●	2000	○	●	12
Indonesia	●	1994	●	●	6,9,12
Iran, Islamic Rep. of	●	2002	○	●	5,8,11,12
Israel	●	1998	○	●	11,12
<sup>2</sup> Italy	●	1979, revised 2002	○	●	5,8,13
Japan	●	2002	○	○	-
Jordan	●	1994	●	●	12
Korea, Rep. of	●	2002	○	●	9,12
Latvia	●	1997 and 2001	●	●	6,9,12
Lebanon	●	1999	●	○	-
Lithuania	●	1997, revised 2003	●	●	Biology 12; Chemistry 12; Physics 12; Geography 12
Macedonia, Rep. of	●	1994	○	●	12
Malaysia	●	1990	●	●	6,9,11,13
Moldova, Rep. of	●	2003-2004	○	●	9,11,12
Morocco	●	1992-1993	●	●	12
Netherlands	●	1998	●	●	10,11,12
New Zealand	●	1995	●	●	10,11,12
Norway	●	1997	○	○	-
Palestinian Nat'l Auth.	●	2002-2003	●	●	12
Philippines	●	2002	○	●	4,8
Romania	●	1999	●	●	12
Russian Federation	●	1998	●	●	By choice: Biology 9,11; Chemistry 9,11; Physics 9,11; Geography 9,11
Saudi Arabia	●	1999	●	●	12
Scotland	●	2000	○	●	10,11,12
Serbia	●	1984-1985	●	○	-
Singapore	●	2001	●	●	6,10,12
Slovak Republic	●	1999	●	○	-
Slovenia	●	1999 for sample of schools; 2003 for all schools	●	○	-
South Africa	●	2001 (introduced in 1998 for prior grades)	●	●	12
Sweden	●	1994, revised 2000	○	○	-
Syrian Arab Republic	●	1987 for Physics and Chemistry; 2003 for Biology	○	●	9
Tunisia	●	2000	●	●	9,12
United States	○	Varies by state; generally ongoing process	●	○	-
<b>Benchmarking Participants</b>					
Basque Country, Spain	●	1992	●	○	-
Indiana State, US	●	2000	○	○	-
Ontario Province, Can.	●	1998	○	●	3,6,9
Quebec Province, Can.	●	1987	●	○	-

● Country reported Yes for the particular option

○ Country reported No for the particular option

Background data provided by National Research Coordinators.

<sup>1</sup> Belgium (Flemish): Although there is no national curriculum there are officially defined final attainment levels (comparable to educational standards); based on the final attainment levels, school boards develop their own curricula.

<sup>2</sup> Italy: Beginning with the 2004-05 academic year, students in grade 5 will not be tested in public examinations.

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

## Exhibit 5.2: Intended Science Curriculum



Countries	National Curriculum	Year Curriculum Introduced	Curriculum Under Revision	Public Exams with Consequences for Individual Students	Grades Tested in Public Exams
Armenia	●	2000	○	●	10
Australia	○	Varies by state; generally ongoing process	●	●	12
<sup>1</sup> Belgium (Flemish)	○	2001-2002	○	○	-
Chinese Taipei	●	2002	●	●	9,12
Cyprus	●	1996	○	●	12
England	●	2000	○	●	10,11,12
Hong Kong, SAR	●	1996	●	●	Biology 11,13; Chemistry 11,13; Physics 11,13; Human Biology 11,13
Hungary	●	2000	○	●	12
Iran, Islamic Rep. of	●	1997	●	●	5,8,11,12
<sup>2</sup> Italy	●	1985, revised 2002	●	●	5,8,13
Japan	●	2002	○	○	-
Latvia	●	2001	○	●	6,9,12
Lithuania	●	1997, revised 2003	●	●	Biology 12; Chemistry 12; Physics 12; Geography 12
Moldova, Rep. of	●	1999-2000	○	●	9,11,12
Morocco	●	2002-2003	○	●	12
Netherlands	●	1998	●	●	10,11,12
New Zealand	●	1995	●	●	10,11,12
Norway	●	1997	○	○	-
Philippines	●	2002-2003	●	○	-
Russian Federation	●	1998	●	●	By choice: Biology 9,11; Chemistry 9,11; Physics 9,11; Geography 9,11
Scotland	●	2000	○	●	10,11,12
Singapore	●	2002	●	●	6,10,12
Slovenia	●	1999 for sample of schools; 2003 for all schools	●	○	-
Tunisia	●	2000	●	●	9,12
United States	○	Varies by state; generally ongoing process	●	○	-
Yemen	●	2000-2001	●	●	9,12
<b>Benchmarking Participants</b>					
Indiana State, US	●	2000	○	○	-
Ontario Province, Can.	●	1998	○	●	3,6,9
Quebec Province, Can.	●	2001	○	○	-

● Country reported Yes for the particular option  
○ Country reported No for the particular option

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

<sup>1</sup> Belgium (Flemish): Although there is no national curriculum there are officially defined final attainment levels (comparable to educational standards); based on the final attainment levels, school boards develop their own curricula.

<sup>2</sup> Italy: Beginning with the 2004-05 academic year, students in grade 5 will not be tested in public examinations.

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



## How Do Countries Support and Monitor Curriculum Implementation?

Education systems use different ways to achieve the best match between the intended and the implemented curriculum. The use of public examinations as a mechanism to support and monitor implementation of the intended curriculum is prevalent among many countries, as noted above. Another way to help ensure alignment is to develop instructional materials, such as textbooks, instructional guides, and ministry notes, tailored to the curriculum. In addition, countries can also monitor curriculum implementation by means of national assessments based on student samples, and by systems of school inspection or audit. The different methods used by the TIMSS 2003 countries are shown in Exhibit 5.3, first for countries that participated at the eighth grade and then for those at the fourth grade.

Of the methods for supporting and monitoring curriculum implementation shown in Exhibit 5.3, at the eighth grade, 11 participants reported using all 7, and an additional 25 used 5 or 6. The most widely used methods were instructional or pedagogical guides (47 participants) and ministry notes and directives (40 participants). Also commonly used were a system of school inspection or audit (38 participants), mandated or recommended textbooks (38 participants), curricular evaluation during or after implementation (35 participants), and the use of specifically developed or recommended instructional activities (33 participants). The least widely used method was national assessments based on student samples (21 participants).

At the fourth grade, three participants reported using all seven methods shown in Exhibit 5.3 to support and monitor curriculum implementation, and 21 participants used five or six. The most widely used methods were instructional or pedagogical guides (28 participants), ministry notes and directives (23 participants), and specifically developed or recommended instructional activities (23 participants). The use of curriculum evaluation during or after implementation as a means of monitoring the fourth-grade science curriculum was reported

by 22 participants. A system of school inspection or audit was used by 21 participants and mandated or recommended textbooks also by 21 participants. Similar to the eighth grade, the least widely used method at the fourth grade was national assessment based on student samples (10 participants).

An additional method countries often use to support curriculum implementation is to provide science teachers with specific preparation in how to teach the intended curriculum as part of their pre-service and/or in-service education. These data are given in Exhibit 6.5 of the next chapter.

Exhibit 5.3: Methods Used to Support or Monitor Implementation of the Intended Science Curriculum

Countries	Mandated or Recommended Textbook(s)	Instructional or Pedagogical Guide	Ministry Notes and Directives	Curriculum Evaluation During or After Implementation	Specifically Developed or Recommended Instructional Activities	National Assessments Based on Student Samples	A System of School Inspection or Audit
Armenia	●	●	●	○	●	○	○
Australia	○	●	●	●	●	○	○
Bahrain	●	●	●	●	●	○	○
Belgium (Flemish)	○	●	●	●	●	○	●
Botswana	●	●	●	●	●	○	●
Bulgaria	●	●	●	○	○	○	●
Chile	●	●	●	●	●	●	○
Chinese Taipei	●	●	●	○	●	○	●
Cyprus	●	●	●	○	○	○	●
Egypt	●	●	●	●	●	●	●
England	○	●	●	●	●	○	●
Estonia	●	○	●	●	●	●	●
Ghana	●	●	○	●	●	●	●
Hong Kong, SAR	●	●	●	○	●	○	●
Hungary	●	●	●	●	○	○	○
Indonesia	●	●	●	●	●	●	●
Iran, Islamic Rep. of	●	●	●	●	●	○	●
Israel	●	●	●	●	●	●	●
Italy	○	●	●	●	○	●	●
Japan	●	●	●	●	●	●	●
Jordan	●	●	●	●	●	●	●
Korea, Rep. of	●	●	●	○	○	●	●
Latvia	●	○	●	●	●	○	●
Lebanon	○	●	●	●	●	○	●
Lithuania	●	●	●	●	●	●	●
Macedonia, Rep. of	●	●	○	○	●	●	●
Malaysia	●	●	●	●	●	●	●
Moldova, Rep. of	●	●	●	●	●	●	●
Morocco	●	●	●	○	●	○	●
Netherlands	○	●	●	●	○	○	●
New Zealand	○	○	○	●	○	○	●
Norway	●	●	○	●	●	●	○
Palestinian Nat'l Auth.	○	●	●	●	●	●	●
Philippines	●	●	●	●	●	●	●
Romania	●	●	●	○	●	○	●
Russian Federation	●	●	●	●	●	○	●
Saudi Arabia	●	●	●	●	●	○	●
Scotland	○	●	○	●	●	●	●
Serbia	●	●	●	●	●	●	●
Singapore	●	●	○	○	○	○	○
Slovak Republic	●	●	○	○	○	○	●
Slovenia	●	●	●	●	●	○	○
South Africa	○	●	●	○	○	○	○
Sweden	○	●	○	○	○	○	●
Syrian Arab Republic	-	-	-	-	-	-	-
Tunisia	●	●	●	○	○	○	●
United States	●	●	○	●	●	●	○
<b>Benchmarking Participants</b>							
Basque Country, Spain	○	●	●	○	○	●	●
Indiana State, US	●	●	○	○	●	○	●
Ontario Province, Can.	●	●	●	●	●	○	○
Quebec Province, Can.	●	●	●	○	●	○	○

● Country reported Yes for the particular option  
○ Country reported No for the particular option

Background data provided by National Research Coordinators.

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

Exhibit 5.3: Methods Used to Support or Monitor Implementation of the Intended Science Curriculum

Countries	Mandated or Recommended Textbook(s)	Instructional or Pedagogical Guide	Ministry Notes and Directives	Curriculum Evaluation During or After Implementation	Specifically Developed or Recommended Instructional Activities	National Assessments Based on Student Samples	A System of School Inspection or Audit
Armenia	●	●	●	●	●	○	○
Australia	○	●	●	●	●	●	●
Belgium (Flemish)	○	●	●	●	●	○	●
Chinese Taipei	●	●	●	○	●	○	●
Cyprus	●	●	●	●	●	○	●
England	○	●	●	●	●	○	●
Hong Kong, SAR	●	●	●	○	●	○	●
Hungary	○	●	●	●	○	○	○
Iran, Islamic Rep. of	●	●	●	●	●	○	●
Italy	○	●	●	●	○	●	●
Japan	●	●	●	●	●	●	●
Latvia	●	○	●	●	●	○	●
Lithuania	●	●	●	●	○	●	●
Moldova, Rep. of	●	●	●	●	●	●	●
Morocco	●	●	●	○	●	○	●
Netherlands	○	●	○	○	○	●	○
New Zealand	○	●	○	●	●	○	●
Norway	●	●	○	●	○	●	○
Philippines	●	●	●	●	●	●	●
Russian Federation	●	●	●	●	●	○	●
Scotland	○	●	○	●	●	●	●
Singapore	●	●	●	●	●	○	●
Slovenia	●	●	●	●	●	○	○
Tunisia	●	●	●	○	●	○	●
United States	●	●	○	●	●	●	○
Yemen	●	●	●	●	○	○	●
<b>Benchmarking Participants</b>							
Indiana State, US	●	●	○	○	●	○	●
Ontario Province, Can.	●	●	●	●	●	○	○
Quebec Province, Can.	●	●	●	●	●	○	○

● Country reported Yes for the particular option

○ Country reported No for the particular option

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

## How Much Instructional Time is Intended for Science?

Many countries designate in their intended curriculum the percentage of total instructional time that should be devoted to science and other subjects at different grade levels. The percentage of instructional time designated for science in the intended curriculum for grades 2, 4, 6, and 8 is shown in Exhibit 5.4 for all TIMSS 2003 participants.<sup>2</sup> These data provide a good estimate of students' intended instructional time for science across the primary and middle school years. The general pattern across countries shows that the percentage of time increases or remains the same from grade 2 to grade 4, from grade 4 to grade 6, and from grade 6 to grade 8, with the largest increase usually between grades 6 and 8. Interestingly, the reverse pattern holds for mathematics, with proportionally less instructional time designated at the higher than at the lower grades.<sup>3</sup> Where decreases occurred in the percentage of instructional time designated for science, they generally were between grades 2 and 4. Not all countries conformed to this general pattern, however. The percentage of total instructional time specified for science ranged from 4 to 20 percent at second grade, from 4 to 28 percent at fourth grade, from 5 to 28 percent at sixth grade, and from 7 to 32 percent at eighth grade. Schools' and teachers' reports of the percentage of instructional time actually devoted to science at grades 4 and 8, shown in Exhibit 7.3, generally correspond with the intended percentages reported in Exhibit 5.4, although slightly more so at eighth grade than at fourth grade.

2 Some of the countries that teach science as separate subjects at eighth grade provided the percentages individually for each subject, rather than as a total.

3 Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., and Chrostowski, S.J., (2004), *TIMSS 2003 International Mathematics Report: Findings from IEA's Trends in International Mathematics and Science Study at the Eighth and Fourth Grades*, Chestnut Hill, MA: Boston College.

Exhibit 5.4: Percentage of Total Instructional Time Intended for Science



Countries	Grade 2	Grade 4	Grade 6	Grade 8
Armenia	○	1 hour per week	5 hours per week	Biology, Chemistry, Physics, Earth Science 2 hours each per week
Australia	○	○	○	○
Bahrain	-	10	10	13
Belgium (Flemish)	5	10	15	○
Botswana	12	8	10	13
Bulgaria	5	6	12	Biology 5.8; Chemistry 5.8; Physics 5.8; Earth Science 5.8
Chile	8	10	10	7
Chinese Taipei	12	12	12	Physics/Chemistry 12
Cyprus	5	5	5	Chemistry 2.8; Physics 5.7; Earth Science 5.7
Egypt	-	9	11	11
England	○	○	○	○
Estonia	-	9	8	Biology 5.2; Chemistry 6.25; Physics 6.25; Geography 5.2
Ghana	-	13	13	10
Hong Kong, SAR	5	5	5	10-15
Hungary	5	9	8	Biology 5.4; Chemistry 5.5; Physics 5.4; Earth Science 5.4
Indonesia	-	20	20	Biology 7.5; Physics 7.5
Iran, Islamic Rep. of	11	11	14.3	14.3
Israel	-	10	-	10.3
Italy	10	15	20	20
Japan	○	10	10	11
Jordan	10	12	12	15
Korea, Rep. of	-	10.3	9.3	11.8
Latvia	8	7	6	17
Lebanon	-	15	15	Life and Earth Sciences 5; Chemistry 5; Physics 5
Lithuania	20	20	10	Biology 4; Chemistry 8; Physics 8; Geography 8
Macedonia, Rep. of	-	10	6.5	Biology 7.6; Chemistry 7.6; Physics 7.6; Geography 7.6
Malaysia	-	13	13	13
Moldova, Rep. of	4.3	4	14	25
Morocco	6	6	6	14
Netherlands	○	○	○	Biology 6; Physics/Chemistry 6; Geography 3
New Zealand	○	○	○	○
Norway	5	5	8	10
Palestinian Nat'l Auth.	13	10	14	Environment and Hygiene 5.6; Technology and Applied Sciences 5.6
Philippines	○	-	-	Biology 20

○ Country reported that the national curriculum does not specify the percentage of total instructional time intended for science

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

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

## Exhibit 5.4: Percentage of Total Instructional Time Intended for Science

SCIENCE  
Grade 4

Countries	Grade 2	Grade 4	Grade 6	Grade 8
Romania	-	5-9	12-14	Biology 3-7; Chemistry 7; Physics 7; Geography 7
Russian Federation	5	5	14	Biology 6.25; Chemistry 6.25; Physics 6.25; Geography 6.25
Saudi Arabia	7	7	10	12
Scotland	5	5	5	10
Serbia	-	10	24	Biology 8; Chemistry 8; Physics 8; Geography 8
Singapore	-	8	10	14
Slovak Republic	-	Biology and Env. Science 7.1; Chemistry 7.1; Physics 7.1; Earth Science 7.1	Biology and Env. Science 7.1; Chemistry 7.1; Physics 7.1; Earth Science 7.1	Biology and Env. Science 7.1; Chemistry 7.1; Physics 7.1; Earth Science 7.1
Slovenia	9	13	6	Biology 5; Chemistry 7; Physics 7
South Africa	-	15	15	15
<sup>1</sup> Sweden	-	12	12	12
Syrian Arab Republic	-	15	15	20
Tunisia	10	5	7	8
United States	○	○	○	○
Yemen	6.8	-	-	-
<b>Benchmarking Participants</b>				
Basque Country, Spain	-	5	5	6.6
Indiana State, US	150 min/wk	180 min/wk	180 min/wk	200 min/wk
Ontario Province, Can.	○	○	○	○
Quebec Province, Can.	○	-	-	11

○ Country reported that the national curriculum does not specify the percentage of total instructional time intended for science

Background data provided by National Research Coordinators.

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

<sup>1</sup> Sweden: Figure shown represents an average across the nine years of compulsory school.

## Do Countries Differentiate the Intended Science Curriculum for Students with Different Levels of Ability?

The challenge of maximizing opportunity to learn for students with widely varying abilities is met differently in different countries. Exhibit 5.5 indicates how countries addressed this issue in organizing the intended science curriculum, first for countries that participated at the eighth grade and then for those at the fourth grade.

The most common approach at the eighth grade, reported by 39 participants, was to have the same intended curriculum for all students with no grouping of students. Nine countries reported having one curriculum for all students, but at different difficulty levels for groups of students with different ability levels. Four countries – Belgium (Flemish), the Netherlands, the Russian Federation, and Singapore – had different curricula for different groups of students according to their ability level.

At the fourth grade, all participants reported having just one science curriculum for all students, and in most cases with no grouping by ability level. Five countries, Australia, England, New Zealand, Scotland, and the United States, had just one curriculum for all students, but provide different levels of difficulty for students of differing ability levels.



Exhibit 5.5: The Way the Intended Science Curriculum Addresses the Issue of Students with Different Levels of Ability

Countries	One Curriculum for All Students with No Grouping	One Curriculum for All Students, but Different Groups of Students Have Different Difficulty Levels	Different Curricula for Different Groups of Students According to Ability Level
Armenia	●	○	○
Australia	○	●	○
Bahrain	●	○	○
Belgium (Flemish)	○	●	○
Botswana	●	○	○
Bulgaria	●	○	○
Chile	●	○	○
Chinese Taipei	●	○	○
Cyprus	●	○	○
Egypt	●	○	○
England	○	●	○
Estonia	●	○	○
Ghana	●	○	○
Hong Kong, SAR	○	●	○
Hungary	●	○	○
Indonesia	●	○	○
Iran, Islamic Rep. of	●	○	○
Israel	○	●	○
Italy	●	○	○
Japan	●	○	○
Jordan	●	○	○
Korea, Rep. of	●	○	○
Latvia	●	○	○
Lebanon	●	○	○
Lithuania	●	○	○
Macedonia, Rep. of	●	○	○
Malaysia	●	○	○
Moldova, Rep. of	●	○	○
Morocco	●	○	○
Netherlands	○	○	●
New Zealand	○	●	○
Norway	●	○	○
Palestinian Nat'l Auth.	●	○	○
Philippines	○	●	○
Romania	●	○	○
Russian Federation	●	○	○
Saudi Arabia	●	○	○
Scotland	○	●	○
Serbia	○	●	○
Singapore	○	○	●
Slovak Republic	●	○	○
Slovenia	●	○	○
South Africa	●	○	○
Sweden	●	○	○
Syrian Arab Republic	●	○	○
Tunisia	●	○	○
United States	○	●	○
<b>Benchmarking Participants</b>			
Basque Country, Spain	●	○	○
Indiana State, US	●	○	○
Ontario Province, Can.	●	○	○
Quebec Province, Can.	●	○	○

● Country reported Yes for the particular option

○ Country reported No for the particular option

Background data provided by National Research Coordinators.

Exhibit 5.5: The Way the Intended Science Curriculum Addresses the Issue of Students with Different Levels of Ability

Countries	One Curriculum for All Students with No Grouping	One Curriculum for All Students, but Different Groups of Students Have Different Difficulty Levels	Different Curricula for Different Groups of Students According to Ability Level
Armenia	●	○	○
Australia	○	●	○
Belgium (Flemish)	●	○	○
Chinese Taipei	●	○	○
Cyprus	●	○	○
England	○	●	○
Hong Kong, SAR	●	○	○
Hungary	●	○	○
Iran, Islamic Rep. of	●	○	○
Italy	●	○	○
Japan	●	○	○
Latvia	●	○	○
Lithuania	●	○	○
Moldova, Rep. of	●	○	○
Morocco	●	○	○
Netherlands	●	○	○
New Zealand	○	●	○
Norway	●	○	○
Philippines	●	○	○
Russian Federation	●	○	○
Scotland	○	●	○
Singapore	●	○	○
Slovenia	●	○	○
Tunisia	●	○	○
United States	○	●	○
Yemen	●	○	○
<b>Benchmarking Participants</b>			
Indiana State, US	●	○	○
Ontario Province, Can.	●	○	○
Quebec Province, Can.	●	○	○

● Country reported Yes for the particular option  
○ Country reported No for the particular option

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

## What Approaches and Processes Do Countries Emphasize in their Intended Science Curriculum?

Exhibit 5.6 indicates the relative emphasis given to various aspects of science instruction in the intended curriculum of participating countries, for both eighth and fourth grade. At the eighth grade, “a lot of emphasis” was most commonly placed on understanding science concepts (34 participants) and knowing basic science facts (35 participants). Considerable emphasis also was placed on writing explanations about what was observed and why it happened (20 participants).

Less emphasis was placed internationally on experimental work, with conducting experiments or investigations emphasized a lot in the curricula of 16 participants, formulating hypotheses or predictions to be tested in the curricula of 12 participants, and designing and planning experiments or investigations in the curricula of 9 participants.

Understanding human impact on the environment was given a lot of emphasis in the intended eighth-grade curriculum of 16 participants, and learning about technology and its impact on society in that of 9 participants. Learning about the nature of science and inquiry received a lot of emphasis in 10 participating entities.

Relative to the other approaches and processes, participants reported placing less emphasis on integrating science with other subjects and incorporating the experiences of different ethnic/cultural groups. Only four participants (Botswana, Israel, Italy, and South Africa) reported placing a lot of emphasis on integrating science, and just two countries – South Africa and Sweden – reported placing a lot of emphasis on the multicultural approach in the intended curriculum.

In the intended science curriculum at the fourth grade, most emphasis was placed on understanding science concepts (15 participants emphasized a lot), knowing basic science facts (13 participants), and writing explanations about what was observed and why it happened (13 participants). Conducting experiments or investigations was given a lot of emphasis in 11 participating entities. Designing and

Exhibit 5.6: Emphasis on Approaches and Processes in the Intended Science Curriculum



Countries	Knowing Basic Science Facts	Understanding Science Concepts	Writing Explanations About What Was Observed and Why it Happened	Formulating Hypotheses or Predictions To Be Tested	Designing and Planning Experiments or Investigations	Conducting Experiments or Investigations
Armenia	●	○	○	○	○	○
Australia	●	●	●	○	●	●
Bahrain	●	●	●	●	○	●
Belgium (Flemish)	●	○	○	○	○	○
Botswana	●	●	○	○	●	●
Bulgaria	○	○	○	○	●	○
Chile	●	●	○	●	○	●
Chinese Taipei	●	●	○	○	○	○
Cyprus	●	○	○	○	○	○
Egypt	●	●	●	●	●	●
England	●	●	○	○	●	●
Estonia	●	○	○	○	○	○
Ghana	●	●	●	○	○	○
Hong Kong, SAR	●	●	○	○	○	○
Hungary	●	○	○	○	○	○
Indonesia	○	○	○	○	○	○
Iran, Islamic Rep. of	○	○	○	○	○	○
Israel	○	●	○	○	○	○
Italy	●	●	●	●	●	●
Japan	●	●	●	●	●	●
Jordan	●	●	○	○	○	○
Korea, Rep. of	●	●	●	○	○	○
Latvia	○	○	○	○	○	○
Lebanon	○	○	○	○	○	○
Lithuania	●	●	○	○	○	○
Macedonia, Rep. of	○	●	○	○	○	○
Malaysia	●	●	○	○	○	○
Moldova, Rep. of	●	○	○	○	○	○
Morocco	○	●	○	○	○	○
Netherlands	○	○	○	○	○	○
New Zealand	○	●	●	●	●	●
Norway	○	○	○	○	○	○
Palestinian Nat'l Auth.	○	●	○	○	○	○
Philippines	○	●	●	●	○	○
Romania	●	●	○	○	○	○
Russian Federation	●	●	○	○	○	○
Saudi Arabia	●	●	●	○	○	○
Scotland	●	●	●	○	○	○
Serbia	●	●	○	○	○	○
Singapore	●	●	●	○	○	○
Slovak Republic	●	●	●	○	○	○
Slovenia	○	●	●	○	○	○
South Africa	○	○	○	○	○	○
Sweden	●	●	○	●	●	●
Syrian Arab Republic	●	○	●	○	○	○
Tunisia	○	○	○	○	○	○
United States	●	●	●	●	●	●
<b>Benchmarking Participants</b>						
Basque Country, Spain	●	●	○	○	○	○
Indiana State, US	●	●	●	●	●	●
Ontario Province, Can.	○	●	●	●	●	●
Quebec Province, Can.	●	●	●	●	○	○

- A Lot of Emphasis
- Some Emphasis
- Very Little Emphasis
- No Emphasis

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

Exhibit 5.6: Emphasis on Approaches and Processes in the Intended Science Curriculum

Countries	Learning About the Nature of Science and Inquiry	Integrating Science with Other Subjects	Learning About Technology and its Impact on Society	Understanding Human Impact on the Environment	Incorporating the Experiences of Different Ethnic/Cultural Groups
Armenia	●	○	◐	●	◐
Australia	●	◐	●	●	◐
Bahrain	●	●	●	◐	○
Belgium (Flemish)	◐	◐	●	●	○
Botswana	●	●	●	●	○
Bulgaria	●	●	◐	◐	○
Chile	◐	◐	●	●	○
Chinese Taipei	◐	◐	◐	●	○
Cyprus	◐	○	●	◐	○
Egypt	●	●	●	●	◐
England	●	◐	●	●	◐
Estonia	●	●	◐	●	◐
Ghana	●	●	◐	●	◐
Hong Kong, SAR	●	●	●	●	◐
Hungary	◐	○	◐	◐	○
Indonesia	●	◐	●	●	○
Iran, Islamic Rep. of	●	●	●	●	○
Israel	●	●	●	●	◐
Italy	●	●	●	●	○
Japan	●	●	●	●	○
Jordan	●	◐	●	●	○
Korea, Rep. of	◐	◐	●	●	○
Latvia	●	●	●	●	○
Lebanon	●	◐	●	◐	◐
Lithuania	●	●	●	●	◐
Macedonia, Rep. of	◐	●	◐	●	◐
Malaysia	●	◐	◐	●	◐
Moldova, Rep. of	●	●	●	●	○
Morocco	◐	●	●	●	●
Netherlands	◐	●	●	●	◐
New Zealand	●	●	●	●	●
Norway	●	◐	●	●	◐
Palestinian Nat'l Auth.	●	◐	●	●	◐
Philippines	●	◐	●	●	◐
Romania	○	◐	●	●	○
Russian Federation	◐	●	●	●	○
Saudi Arabia	●	●	●	●	○
Scotland	◐	●	●	●	◐
Serbia	◐	●	◐	◐	◐
Singapore	◐	●	◐	◐	●
Slovak Republic	●	●	●	●	●
Slovenia	◐	●	●	◐	◐
South Africa	●	●	●	●	●
Sweden	●	◐	◐	●	●
Syrian Arab Republic	◐	○	○	◐	◐
Tunisia	◐	○	◐	◐	○
United States	●	◐	◐	●	◐
<b>Benchmarking Participants</b>					
Basque Country, Spain	◐	●	◐	●	◐
Indiana State, US	●	●	●	●	◐
Ontario Province, Can.	◐	●	●	●	●
Quebec Province, Can.	●	◐	●	●	○



Background data provided by National Research Coordinators.

Exhibit 5.6: Emphasis on Approaches and Processes in the Intended Science Curriculum

Countries	Knowing Basic Science Facts	Understanding Science Concepts	Writing Explanations About What Was Observed and Why it Happened	Designing and Planning Experiments or Investigations	Conducting Experiments or Investigations	Integrating Science with Other Subjects
Armenia	●	●	◐	◐	◐	●
Australia	◐	●	●	●	●	◐
Belgium (Flemish)	●	◐	○	○	◐	◐
Chinese Taipei	●	◐	●	◐	●	◐
Cyprus	◐	●	●	○	●	●
England	●	●	●	●	●	●
Hong Kong, SAR	◐	◐	◐	◐	◐	●
Hungary	●	◐	◐	◐	◐	◐
Iran, Islamic Rep. of	◐	◐	●	◐	●	●
Italy	●	●	●	●	●	●
Japan	●	●	●	●	●	●
Latvia	◐	◐	●	◐	◐	◐
Lithuania	◐	◐	●	●	●	●
Moldova, Rep. of	●	●	●	●	●	◐
Morocco	◐	●	●	●	◐	◐
Netherlands	◐	◐	○	◐	○	○
New Zealand	◐	◐	●	●	●	●
Norway	◐	◐	●	◐	●	●
Philippines	●	●	◐	◐	◐	◐
Russian Federation	◐	◐	◐	◐	●	●
Scotland	●	●	●	●	●	●
Singapore	●	●	●	●	●	●
Slovenia	◐	●	●	●	●	●
Tunisia	◐	◐	●	◐	◐	○
United States	●	●	●	●	◐	◐
Yemen	◐	◐	◐	◐	○	◐
<b>Benchmarking Participants</b>						
Indiana State, US	●	●	●	◐	●	●
Ontario Province, Can.	◐	●	●	◐	●	●
Quebec Province, Can.	◐	◐	●	●	●	●



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

## Exhibit 5.6: Emphasis on Approaches and Processes in the Intended Science Curriculum

SCIENCE  
Grade 4

Countries	Learning About Technology and its Impact on Society	Understanding Human Impact on the Environment	Incorporating the Experiences of Different Ethnic/Cultural Groups		
Armenia	○	●	●	● A Lot of Emphasis	
Australia	○	●	○		
Belgium (Flemish)	○	●	○		● Some Emphasis
Chinese Taipei	○	●	○		
Cyprus	○	●	○	○ Very Little Emphasis	
England	●	○	○		
Hong Kong, SAR	●	●	○		
Hungary	○	○	○	○ No Emphasis	
Iran, Islamic Rep. of	●	●	○		
Italy	●	●	●		
Japan	○	○	○		
Latvia	○	●	○		
Lithuania	○	●	○		
Moldova, Rep. of	●	●	○		
Morocco	○	●	●		
Netherlands	●	●	○		
New Zealand	●	●	●		
Norway	○	●	○		
Philippines	○	○	○		
Russian Federation	○	○	○		
Scotland	●	●	○		
Singapore	○	○	●		
Slovenia	●	○	○		
Tunisia	○	○	○		
United States	○	○	○		
Yemen	○	○	○		
<b>Benchmarking Participants</b>					
Indiana State, US	●	●	○		
Ontario Province, Can.	●	●	●		
Quebec Province, Can.	●	●	○		

Background data provided by National Research Coordinators.

planning experiments or investigations, integrating science with other subjects, understanding human impact on the environment, and learning about technology and its impact on the environment were among the approaches receiving less emphasis in the intended curriculum, while incorporating the experiences of different ethnic/cultural groups was emphasized least in the fourth-grade science curriculum.

### Are the TIMSS Science Topics Included In the Intended Curriculum?

The ability of policymakers to make sound judgments about relative strengths and weaknesses of science education in their systems depends on achievement measures being based, as closely as possible, on what students in their systems have actually been taught. *The TIMSS Assessment Frameworks and Specifications: 2003* served as the basis for the TIMSS 2003 science assessment.<sup>4</sup> It delineates the science content and skills to be assessed at both the eighth and fourth grades, and represents a consensus among the countries participating in TIMSS 2003 about the science that students at these grades should be expected to have learned. Content and topic areas are elaborated in the frameworks, with each topic area presented as a comprehensive list of objectives specific to the target grades (eighth or fourth grades) covered in a majority of participating countries. However, the frameworks do not consist solely of content and behaviors included in the intended curricula of most participating countries. The aim was to ensure that goals of science education regarded as important in a significant number of countries be included. Hence, not all topics included in the TIMSS 2003 assessment are in all participating countries' intended curriculum, and consequently the curricula of some countries align more closely than others with the TIMSS frameworks.<sup>5</sup>

National Research Coordinators were asked to indicate whether each of the TIMSS 2003 science topics was included in their countries' intended curricula through the target grade (eighth or fourth grade),

4 Mullis, I.V.S., Martin, M.O., Smith, T.A., Garden, R.A., Gregory, K.D., Gonzalez, E.J., Chrostowski, S.J., and O'Connor, K.M. (2003), *TIMSS Assessment Frameworks and Specifications 2003 (2nd ed.)*, Chestnut Hill, MA: Boston College.

5 For a full description of the TIMSS 2003 test development effort, please see Smith Neidorf, T.A. and Garden, R. (2004), "Developing the TIMSS 2003 Mathematics and Science Assessment and Scoring Guides" in M.O. Martin, I.V.S. Mullis, and S.J. Chrostowski (eds.), *TIMSS 2003 Technical Report*, Chestnut Hill, MA: Boston College.



and if so, whether the topics were intended to be taught to “all or almost all students” or “only the more able students.”

Exhibit 5.7 shows that, for most countries, a great deal of the science content addressed by the TIMSS 2003 assessment was included in their intended curricula. On average, across participants at the eighth grade, 71 percent of the assessment topics were intended for all or almost all students, and a further 4 percent for only the more able students. In only eight countries were less than half of the topics included in the eighth-grade curriculum: Belgium (Flemish), Botswana, Cyprus, Indonesia, Lebanon, Morocco, South Africa, and Tunisia. Coverage of the TIMSS science topics was particularly sparse in South Africa and Tunisia, with just 16 and 7 percent of the topics, respectively, in the intended curriculum for all or almost all students.

It is noteworthy that in most countries, those topics included in the curriculum were intended for all students. Only in Hong Kong SAR, New Zealand, Scotland, South Africa, Sweden, the Basque Country, and Quebec were more than 10 percent of science topics intended only for the more able students.

Each of the five content areas in the TIMSS eighth-grade science assessment – life science, chemistry, physics, earth science, and environmental science – was included in the intended curriculum in about equal proportions (65-75%), on average. In life science, 73 percent of the topics, on average, were included in participants’ intended curriculum for all or almost all students. At least 10 of the 12 life science topics were included in the curriculum of about half of the participants (25). Participants with relatively low coverage (no more than half of the 12 topics) included Botswana, Bulgaria, Cyprus, Indonesia, Iran, Lebanon, Morocco, Slovenia, Tunisia, and Quebec.

Chemistry had fewer topics than life science (8 vs. 12) but a proportionally similar level of inclusion in the intended curriculum – 70 percent of topics, on average. Ten participants included all eight chemistry topics in their curricula, and a further 13 participants included seven of the eight topics. None of the chemistry topics were

included in the intended curriculum in Belgium (Flemish), Indonesia, and Tunisia.

Of the physics topics in the TIMSS assessment, three-fourths, on average, were included in the intended curricula of the participating countries and benchmarking entities for all or almost all students. All 10 physics topics were in the curricula of 17 participants, and 9 of the 10 in that of a further 5 participants. Similar to chemistry, none of the physics topics were included in the curricula of Belgium (Flemish) or Tunisia.

Earth science had, by a small margin, the fewest topics in the participants' intended curricula – 66 percent, on average. All 11 earth science topics were included in the curricula of 10 of the participating entities, and a further 8 participants had at least 10 of the 11 topics in their curricula. Fewer than half of the 11 topics were intended to be taught in Belgium (Flemish), Botswana, Chile, Chinese Taipei, Cyprus, Indonesia, Iran, Korea, Malaysia, Morocco, South Africa, and Tunisia.

Environmental science had just three topics in the assessment, and about two of the three, on average, were included in the participants' curricula for most students. About half of the participants included all three topics in their intended curriculum. In contrast, seven participants – Botswana, Chinese Taipei, Cyprus, Iran, Korea, Lebanon, and Tunisia – included no environmental science topics in their intended curricula.

Unlike mathematics, where the relationship between inclusion in the intended curriculum and student achievement was moderately positive,<sup>6</sup> in science this relationship was not as straightforward. The six highest performing countries in science, with the exception of Korea, had relatively high percentages (about 70%) of the science topics in their intended curricula, and there were several examples of lower-performing countries with few topics in their curricula – Botswana, Indonesia, Lebanon, South Africa, and Tunisia. However, although among the top-performing countries only Korea and Hong Kong, SAR had less than 70 percent of the topics in their curricula, there were some low-performing countries (such as Ghana and the Philippines) with many

6 Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., and Chrostowski, S.J., (2004), *TIMSS 2003 International Mathematics Report: Findings from IEA's Trends in International Mathematics and Science Study at the Eighth and Fourth Grades*, Chestnut Hill, MA: Boston College.

topics in their intended curricula. Belgium (Flemish) is unusual in that it had low coverage of the TIMSS science topics in its intended curriculum (just 23%) but still performed above the international mean. It appears that having at least moderate coverage of the science topics is a prerequisite for high performance, but that high coverage in the intended curriculum does not of itself lead to high student achievement.

At fourth grade, Exhibit 5.7 shows that internationally, on average, 56 percent of the TIMSS 2003 science topics were included in the intended curricula for all or almost all students, and a further 4 percent for only the more able students. More than 70 percent of the science topics were included in the intended curriculum for all or almost all students in Armenia, England, Lithuania, Italy, Moldova, Norway, the United States, and Ontario.

At the fourth grade even more than at the eighth, those topics that were included in the curriculum were intended for all students. Only Armenia, Belgium (Flemish), Cyprus, Morocco, New Zealand, Scotland, and Quebec had any science topics intended only for the more able students.

Life science, with 10 topics, had the highest percentage of topics included in participants' intended curricula at the fourth grade (60% for most students and 7% for the top track only). Eleven participants had 8 or more of the 10 topics included. However, there were also eleven participants with no more than half of the life science topics included in their intended curricula at this grade level.

Physical science, which at the fourth grade incorporates topics from both physics and chemistry, was next in terms of inclusion in the intended curriculum, with 57 percent of its topics, on average, intended for most students and a further 4 percent for the top track only. Almost one-third of the participants included 10 or more of the 13 physical science topics in their intended curricula for most students. About the same proportion, however, included no more than half of the topics, mostly the same participants with low levels of inclusion overall.

Exhibit 5.7: Summary of TIMSS Science Topics in the Intended Curriculum



Countries	Percentage of TIMSS Science Topics Intended to be Taught Up to and Including Eighth Grade*								
	Overall (44 topics)			Life Science (12 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
Armenia	91	5	5	67	17	17	100	0	0
Australia	55	0	45	58	0	42	50	0	50
Bahrain	91	0	9	100	0	0	88	0	13
Belgium (Flemish)	23	7	70	67	17	17	0	0	100
Botswana	30	0	70	50	0	50	13	0	88
Bulgaria	75	0	25	33	0	67	88	0	13
Chile	64	0	36	92	0	8	75	0	25
Chinese Taipei	70	0	30	100	0	0	88	0	13
Cyprus	23	2	75	8	8	83	38	0	63
Egypt	86	0	14	83	0	17	100	0	0
England	84	0	16	92	0	8	88	0	13
Estonia	100	0	0	100	0	0	100	0	0
Ghana	95	0	5	100	0	0	88	0	13
Hong Kong, SAR	64	16	20	67	17	17	25	38	38
Hungary	91	0	9	100	0	0	100	0	0
Indonesia	48	0	52	50	0	50	0	0	100
Iran, Islamic Rep. of	61	0	39	42	0	58	100	0	0
Israel	77	0	23	67	0	33	75	0	25
Italy	98	0	2	100	0	0	100	0	0
Japan	73	0	27	58	0	42	88	0	13
Jordan	100	0	0	100	0	0	100	0	0
Korea, Rep. of	52	0	48	58	0	42	38	0	63
Latvia	82	0	18	58	0	42	100	0	0
Lebanon	41	0	59	33	0	67	63	0	38
Lithuania	98	0	2	100	0	0	88	0	13
Macedonia, Rep. of	89	0	11	83	0	17	100	0	0
Malaysia	59	0	41	67	0	33	75	0	25
Moldova, Rep. of	98	0	2	100	0	0	88	0	13
Morocco	43	7	50	50	0	50	75	0	25
Netherlands	73	9	18	92	0	8	75	25	0
New Zealand	57	27	16	58	25	17	50	38	13
Norway	80	0	20	92	0	8	63	0	38
Palestinian Nat'l Auth.	86	0	14	92	0	8	75	0	25
Philippines	70	5	25	100	0	0	38	13	50
Romania	82	0	18	92	0	8	100	0	0
Russian Federation	86	0	14	75	0	25	88	0	13
Saudi Arabia	75	0	25	92	0	8	50	0	50
Scotland	75	18	7	83	17	0	88	13	0
Serbia	98	0	2	100	0	0	88	0	13
Singapore	77	0	23	58	0	42	88	0	13
Slovak Republic	82	5	14	67	0	33	75	25	0
Slovenia	77	0	23	50	0	50	88	0	13
South Africa	16	32	52	25	42	33	13	38	50
Sweden	77	11	11	92	0	8	63	38	0
Syrian Arab Republic	57	7	36	67	25	8	38	0	63
Tunisia	7	0	93	25	0	75	0	0	100
United States	95	2	2	100	0	0	75	13	13
<b>International Avg.</b>	<b>71</b>	<b>4</b>	<b>25</b>	<b>73</b>	<b>4</b>	<b>23</b>	<b>70</b>	<b>5</b>	<b>25</b>
<b>Benchmarking Participants</b>									
Basque Country, Spain	48	27	25	50	17	33	38	25	38
Indiana State, US	93	0	7	100	0	0	63	0	38
Ontario Province, Can.	84	0	16	83	0	17	50	0	50
Quebec Province, Can.	50	11	39	42	8	50	50	0	50

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

See Exhibits 5.9 through 5.13 for data on individual topics.

\* Percentages may not add to 100 due to rounding.

Exhibit 5.7: Summary of TIMSS Science Topics in the Intended Curriculum



Countries	Percentage of TIMSS Science Topics Intended to be Taught Up to and Including Eighth Grade*								
	Physics (10 topics)			Earth Science (11 topics)			Environmental Science (3 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
Armenia	100	0	0	100	0	0	100	0	0
Australia	60	0	40	55	0	45	33	0	67
Bahrain	100	0	0	73	0	27	100	0	0
Belgium (Flemish)	0	0	100	0	9	91	67	0	33
Botswana	40	0	60	18	0	82	0	0	100
Bulgaria	100	0	0	91	0	9	67	0	33
Chile	50	0	50	36	0	64	67	0	33
Chinese Taipei	70	0	30	45	0	55	0	0	100
Cyprus	60	0	40	0	0	100	0	0	100
Egypt	100	0	0	64	0	36	100	0	0
England	100	0	0	64	0	36	67	0	33
Estonia	100	0	0	100	0	0	100	0	0
Ghana	90	0	10	100	0	0	100	0	0
Hong Kong, SAR	60	20	20	82	0	18	100	0	0
Hungary	90	0	10	91	0	9	33	0	67
Indonesia	80	0	20	45	0	55	67	0	33
Iran, Islamic Rep. of	100	0	0	36	0	64	0	0	100
Israel	70	0	30	91	0	9	100	0	0
Italy	100	0	0	100	0	0	67	0	33
Japan	80	0	20	82	0	18	33	0	67
Jordan	100	0	0	100	0	0	100	0	0
Korea, Rep. of	100	0	0	27	0	73	0	0	100
Latvia	100	0	0	73	0	27	100	0	0
Lebanon	30	0	70	55	0	45	0	0	100
Lithuania	100	0	0	100	0	0	100	0	0
Macedonia, Rep. of	90	0	10	82	0	18	100	0	0
Malaysia	70	0	30	18	0	82	100	0	0
Moldova, Rep. of	100	0	0	100	0	0	100	0	0
Morocco	70	0	30	0	0	100	0	100	0
Netherlands	70	10	20	45	9	45	100	0	0
New Zealand	60	20	20	73	18	9	0	67	33
Norway	60	0	40	91	0	9	100	0	0
Palestinian Nat'l Auth.	100	0	0	73	0	27	100	0	0
Philippines	30	0	70	91	9	0	100	0	0
Romania	90	0	10	64	0	36	33	0	67
Russian Federation	90	0	10	91	0	9	100	0	0
Saudi Arabia	80	0	20	64	0	36	100	0	0
Scotland	60	30	10	82	9	9	33	33	33
Serbia	100	0	0	100	0	0	100	0	0
Singapore	90	0	10	73	0	27	100	0	0
Slovak Republic	80	0	20	100	0	0	100	0	0
Slovenia	80	0	20	91	0	9	100	0	0
South Africa	20	30	50	0	9	91	33	67	0
Sweden	80	10	10	64	9	27	100	0	0
Syrian Arab Republic	30	0	70	73	0	27	100	0	0
Tunisia	0	0	100	0	0	100	0	0	100
United States	100	0	0	100	0	0	100	0	0
<b>International Avg.</b>	<b>75</b>	<b>3</b>	<b>22</b>	<b>66</b>	<b>2</b>	<b>32</b>	<b>69</b>	<b>6</b>	<b>26</b>
<b>Benchmarking Participants</b>									
Basque Country, Spain	30	40	30	55	36	9	100	0	0
Indiana State, US	100	0	0	100	0	0	100	0	0
Ontario Province, Can.	100	0	0	91	0	9	100	0	0
Quebec Province, Can.	30	20	50	73	18	9	67	0	33

Background data provided by National Research Coordinators.

See Exhibits 5.9 through 5.13 for data on individual topics.

\* Percentages may not add to 100 due to rounding.

Exhibit 5.7: Summary of TIMSS Science Topics in the Intended Curriculum



Countries	Percentage of TIMSS Science Topics Intended to be Taught Up to and Including Fourth Grade*								
	Overall (32 topics)			Life Science (10 topics)			Physical Science (13 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
Armenia	78	16	6	100	0	0	77	15	8
Australia	63	0	38	80	0	20	77	0	23
Belgium (Flemish)	31	22	47	20	50	30	31	15	54
Chinese Taipei	38	0	63	40	0	60	54	0	46
Cyprus	63	6	31	60	20	20	77	0	23
England	75	0	25	70	0	30	77	0	23
Hong Kong, SAR	53	0	47	40	0	60	62	0	38
Hungary	50	0	50	90	0	10	46	0	54
Iran, Islamic Rep. of	59	0	41	50	0	50	62	0	38
Italy	69	0	31	80	0	20	46	0	54
Japan	50	0	50	40	0	60	69	0	31
Latvia	41	0	59	50	0	50	15	0	85
Lithuania	88	0	13	90	0	10	100	0	0
Moldova, Rep. of	94	0	6	100	0	0	85	0	15
Morocco	3	41	56	10	90	0	0	31	69
Netherlands	69	0	31	100	0	0	46	0	54
New Zealand	59	25	16	70	10	20	54	38	8
Norway	78	0	22	100	0	0	62	0	38
Philippines	59	0	41	50	0	50	62	0	38
Russian Federation	56	0	44	40	0	60	46	0	54
Scotland	50	6	44	50	10	40	62	8	31
Singapore	38	0	63	30	0	70	62	0	38
Slovenia	63	0	38	80	0	20	69	0	31
Tunisia	0	0	100	0	0	100	0	0	100
United States	78	0	22	80	0	20	77	0	23
Yemen	59	0	41	50	0	50	69	0	31
<b>International Avg.</b>	<b>56</b>	<b>4</b>	<b>39</b>	<b>60</b>	<b>7</b>	<b>33</b>	<b>57</b>	<b>4</b>	<b>39</b>
<b>Benchmarking Participants</b>									
Indiana State, US	44	0	56	50	0	50	38	0	62
Ontario Province, Can.	78	0	22	100	0	0	85	0	15
Quebec Province, Can.	41	3	56	30	10	60	54	0	46

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators.

See Exhibits 5.14 through 5.16 for data on individual topics.

\* Percentages may not add to 100 due to rounding.

## Exhibit 5.7: Summary of TIMSS Science Topics in the Intended Curriculum

SCIENCE  
Grade 4

Countries	Percentage of TIMSS Science Topics Intended to be Taught Up to and Including Fourth Grade*		
	Earth Science (9 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
Armenia	56	33	11
Australia	22	0	78
Belgium (Flemish)	44	0	56
Chinese Taipei	11	0	89
Cyprus	44	0	56
England	78	0	22
Hong Kong, SAR	56	0	44
Hungary	11	0	89
Iran, Islamic Rep. of	67	0	33
Italy	89	0	11
Japan	33	0	67
Latvia	67	0	33
Lithuania	67	0	33
Moldova, Rep. of	100	0	0
Morocco	0	0	100
Netherlands	67	0	33
New Zealand	56	22	22
Norway	78	0	22
Philippines	67	0	33
Russian Federation	89	0	11
Scotland	33	0	67
Singapore	11	0	89
Slovenia	33	0	67
Tunisia	0	0	100
United States	78	0	22
Yemen	56	0	44
<b>International Avg.</b>	<b>50</b>	<b>2</b>	<b>47</b>
<b>Benchmarking Participants</b>			
Indiana State, US	44	0	56
Ontario Province, Can.	44	0	56
Quebec Province, Can.	33	0	67

Background data provided by National Research Coordinators.

\* Percentages may not add to 100 due to rounding.

See Exhibits 5.14 through 5.16 for data on individual topics.

Earth science, with 9 topics, had the lowest level of inclusion in the intended fourth-grade curriculum (50% of topics for most students and 2% for the top track only). Only three countries, Italy, Moldova, and the Russian Federation, had as many as 8 of the 9 topics in their curricula for most students, and 13 participants had fewer than half of the topics included.

At the fourth grade, as at the eighth grade, the relationship between the coverage of the TIMSS science topics in participants' intended curricula and student achievement in science is not straightforward. Among the six top-performing countries, there was a range of topic coverage in the intended curriculum: two countries included about 40 percent of topics (Singapore and Chinese Taipei), two included about 50 percent of topics (Japan and Hong Kong, SAR), and two about 75 percent (England and the United States). Among the three lowest-performing countries, the Philippines included more than half the topics (59%) but Morocco included just one of the 32 science topics, and Tunisia none at all.

### Are the TIMSS Science Topics Taught in School?

The previous section described the coverage of the TIMSS science topics in participating countries' *intended* curricula at the eighth and fourth grades, with a focus on the percentage of topics that were included in countries' intended curricula for all or almost all students. This section describes the coverage of the TIMSS topics in countries' *implemented* curricula at the eighth and fourth grades, based on teachers' reports of the percentage of students actually taught these topics.

To gather information about science coverage in the implemented curricula of participating countries, the science teachers<sup>7</sup> of the students assessed were asked to indicate whether each of the TIMSS 2003 science topics was "mostly taught before this year," "mostly taught this year," or "not yet taught or just introduced." Exhibit 5.8 presents for eighth and fourth grade the percentage of students whose teachers reported that the students had been taught the TIMSS science topics

7 At fourth grade there was one teacher questionnaire that asked about both mathematics and science, and at eighth grade there were separate questionnaires for mathematics teachers and science teachers.



either prior to or during the year of the assessment. The exhibit shows for each TIMSS participant, averaged across science content areas, the percentage of students whose teachers reported that the students had been taught each topic. The topics were listed in a questionnaire completed by the science teachers of the students who took the TIMSS 2003 test.<sup>8</sup> Although generally, teacher participation was high, sometimes teachers did not complete the questionnaire assigned to them, so most countries had some percentage of students for whom no teacher questionnaire information is available. The exhibits in this chapter have special notations on this point. For a country where teacher responses are available for at least 70 but less than 85 percent of the students, an “r” is included next to its data. Where teacher responses are available for at least 50 but less than 70 percent of the students, an “s” is included. Where teacher responses are available for less than 50 percent, an “x” replaces the data.

Exhibit 5.8 shows that, according to their teachers, on average 67 percent of the eighth-grade students tested in TIMSS 2003 had been taught the TIMSS science topics. In five countries, Armenia, Egypt, Macedonia, Romania, and Serbia, teachers reported that almost all students (90 percent or more) had been taught the topics, as had the majority of students in all participating entities except Belgium (Flemish), Botswana, New Zealand, Norway, South Africa and Tunisia.

Life science and chemistry were the content areas with the greatest coverage in the classroom, with 70 percent of students, on average, having been taught the TIMSS life science and chemistry topics by the eighth grade. Physics had the next greatest coverage (66%), followed by earth science (61%), and environmental science (49%). In life science, chemistry, physics, and earth science, teachers in 6-8 countries reported that almost all students (90 percent or more) had been taught the topics. Environmental science (just three topics) appears to have received proportionally less attention in the classroom than the other science areas.

8 Further results from the teacher questionnaire are presented in Chapters 6 and 7.

Exhibit 5.8: Summary of Students Taught the TIMSS Science Topics



Countries	Average Percentage of Students Taught the TIMSS Science Topics						
	Overall* (44 topics)	Life Science (12 topics)	Chemistry (8 topics)	Physics (10 topics)	Earth Science (11 topics)	Environmental Science (3 topics)	
Armenia	s 90 (0.7)	r 71 (2.1)	s 97 (1.2)	s 89 (1.0)	s 96 (2.5)	--	
Australia	r 52 (1.3)	r 51 (1.7)	r 58 (1.5)	r 50 (1.6)	r 53 (2.2)	r 37 (3.3)	
Bahrain	55 (0.8)	64 (0.9)	70 (1.3)	90 (1.2)	12 (1.4)	12 (1.6)	
Belgium (Flemish)	r 48 (1.3)	r 70 (1.5)	--	25 (1.6)	r 24 (1.7)	--	
Botswana	28 (0.9)	41 (1.6)	15 (1.3)	37 (1.2)	16 (1.2)	23 (2.1)	
Bulgaria	r 88 (0.9)	r 81 (1.6)	r 81 (1.8)	r 95 (1.1)	r 94 (0.9)	--	
Chile	79 (1.1)	90 (1.1)	84 (1.8)	66 (2.0)	74 (1.9)	79 (2.6)	
Chinese Taipei	78 (1.0)	--	90 (0.7)	68 (1.4)	--	--	
Cyprus	56 (0.4)	--	46 (0.5)	49 (0.4)	77 (0.8)	--	
Egypt	92 (0.9)	92 (0.9)	96 (1.0)	93 (1.1)	89 (1.3)	84 (2.0)	
Estonia	73 (0.9)	61 (1.4)	84 (1.3)	54 (1.5)	95 (0.7)	--	
Ghana	48 (1.3)	55 (1.5)	64 (1.6)	44 (1.6)	32 (2.3)	49 (3.5)	
Hong Kong, SAR	53 (1.3)	63 (1.8)	59 (2.2)	70 (1.7)	21 (1.6)	51 (3.9)	
Hungary	84 (0.7)	83 (1.1)	97 (0.8)	81 (1.0)	71 (2.3)	--	
Indonesia	75 (0.7)	72 (1.1)	--	79 (0.8)	--	--	
Iran, Islamic Rep. of	84 (1.0)	80 (1.3)	88 (1.1)	90 (1.3)	80 (1.5)	76 (2.6)	
Israel	r 56 (1.5)	49 (2.0)	76 (1.9)	59 (1.4)	s 45 (3.4)	s 39 (4.0)	
Italy	77 (1.0)	91 (0.8)	80 (1.7)	68 (1.8)	74 (1.7)	59 (2.9)	
Japan	52 (0.7)	39 (1.1)	80 (1.6)	68 (1.1)	46 (1.2)	1 (0.7)	
Jordan	75 (1.5)	75 (2.3)	77 (1.9)	87 (1.5)	66 (2.1)	63 (2.9)	
Korea, Rep. of	s 54 (1.7)	s 49 (1.7)	s 44 (2.1)	s 68 (2.2)	s 64 (2.5)	s 23 (2.7)	
Latvia	s 64 (1.4)	s 65 (2.6)	x x	s 62 (2.2)	--	--	
Lebanon	r 73 (1.5)	r 74 (2.0)	88 (1.4)	83 (1.5)	r 51 (3.5)	s 60 (3.9)	
Lithuania	70 (0.8)	68 (2.1)	67 (1.6)	47 (2.1)	95 (1.0)	--	
Macedonia, Rep. of	98 (0.3)	97 (0.6)	98 (1.3)	98 (0.6)	92 (1.6)	--	
Malaysia	64 (1.1)	78 (0.9)	81 (1.6)	74 (1.3)	25 (2.1)	67 (3.0)	
Moldova, Rep. of	s 80 (1.4)	s 68 (3.6)	s 94 (1.4)	s 77 (2.0)	r 79 (3.4)	x x	
Morocco	x x	s 55 (2.6)	s 67 (3.0)	s 61 (3.4)	s 31 (2.7)	--	
Netherlands	r 58 (1.5)	r 73 (1.8)	r 33 (2.4)	r 52 (1.9)	r 59 (2.5)	--	
New Zealand	45 (1.5)	46 (2.3)	59 (2.4)	48 (1.7)	36 (2.1)	30 (3.6)	
Norway	45 (1.3)	41 (2.0)	39 (2.1)	33 (1.4)	68 (2.0)	32 (3.4)	
Palestinian Nat'l Auth.	68 (1.4)	68 (1.6)	73 (1.7)	81 (1.5)	61 (2.1)	42 (3.5)	
Philippines	r 63 (1.8)	88 (1.5)	r 38 (3.7)	r 30 (3.2)	r 77 (3.2)	r 89 (2.9)	
Romania	96 (0.4)	96 (0.7)	95 (1.0)	96 (1.3)	95 (1.2)	--	
Russian Federation	--	--	--	--	--	--	
Saudi Arabia	70 (1.6)	73 (1.9)	63 (2.5)	65 (2.5)	77 (1.8)	68 (3.7)	
Scotland	s 61 (1.2)	s 64 (1.5)	s 75 (1.3)	s 70 (1.6)	s 42 (2.4)	s 41 (2.8)	
Serbia	96 (0.6)	94 (1.2)	95 (1.5)	95 (1.1)	94 (1.9)	--	
Singapore	58 (1.0)	67 (1.1)	75 (1.6)	77 (1.1)	17 (1.5)	48 (2.4)	
Slovak Republic	81 (0.8)	82 (1.8)	75 (1.4)	77 (0.7)	90 (1.7)	--	
Slovenia	67 (0.8)	77 (1.2)	78 (1.5)	44 (1.6)	--	--	
South Africa	r 49 (2.2)	r 57 (2.4)	r 54 (2.5)	r 46 (2.5)	r 37 (3.3)	r 63 (3.4)	
Sweden	r 63 (1.2)	r 66 (1.6)	r 70 (1.4)	r 64 (1.6)	x x	s 35 (3.4)	
Syrian Arab Republic	--	--	--	--	--	--	
Tunisia	r 32 (1.4)	66 (1.3)	r 14 (2.1)	r 11 (1.8)	27 (1.7)	31 (3.2)	
United States	r 79 (1.2)	r 86 (1.7)	r 73 (2.3)	r 70 (1.9)	r 86 (1.5)	r 69 (3.0)	
‡ England	x x	x x	x x	s 93 (1.2)	x x	x x	
International Avg.	67 (0.2)	70 (0.3)	70 (0.3)	66 (0.3)	61 (0.3)	49 (0.6)	
<b>Benchmarking Participants</b>							
Basque Country, Spain	68 (1.5)	66 (1.9)	54 (2.8)	66 (2.8)	82 (2.2)	70 (4.0)	
Indiana State, US	84 (1.6)	89 (2.4)	79 (3.3)	78 (3.0)	89 (3.1)	80 (4.6)	
Ontario Province, Can.	72 (1.3)	75 (1.9)	60 (2.2)	72 (2.2)	76 (2.6)	74 (3.9)	
Quebec Province, Can.	r 52 (1.3)	r 42 (2.3)	r 50 (1.8)	r 34 (1.8)	r 78 (2.1)	r 71 (3.6)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers at the time of testing.

\* Overall includes topics in content areas for which data are available.

For countries that teach science as separate subjects at grade 8, data are based on teachers who teach the relevant science subject.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

( ) 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.

See Exhibits 5.9-5.13 for data on individual topics.

## Exhibit 5.8: Summary of Students Taught the TIMSS Science Topics

Countries	Average Percentage of Students Taught the TIMSS Science Topics			
	Overall* (32 topics)	Life Science (10 topics)	Physical Science (13 topics)	Earth Science (9 topics)
Armenia	x x	x x	x x	x x
Australia	r 58 (2.0)	r 74 (2.0)	r 45 (2.7)	r 57 (2.2)
Belgium (Flemish)	43 (1.2)	59 (1.8)	30 (1.3)	44 (1.5)
Chinese Taipei	63 (1.5)	68 (1.5)	63 (1.9)	56 (1.9)
Cyprus	55 (1.7)	61 (2.2)	54 (1.9)	51 (2.0)
England	r 69 (1.3)	r 71 (2.1)	r 74 (1.7)	r 62 (1.8)
Hong Kong, SAR	r 62 (1.9)	r 62 (2.5)	r 67 (2.6)	r 53 (1.9)
Hungary	71 (1.5)	88 (1.5)	61 (2.1)	68 (2.0)
Iran, Islamic Rep. of	68 (1.9)	69 (2.4)	68 (2.1)	68 (2.2)
Italy	65 (1.1)	72 (1.1)	55 (1.6)	72 (1.7)
Japan	37 (1.2)	35 (1.5)	46 (1.6)	24 (1.4)
Latvia	x x	x x	x x	x x
Lithuania	81 (1.0)	96 (0.8)	67 (1.7)	85 (1.1)
Moldova, Rep. of	r 75 (1.5)	r 83 (1.7)	r 58 (2.3)	r 91 (1.3)
Morocco	x x	x x	x x	x x
Netherlands	47 (1.6)	65 (2.0)	31 (2.1)	49 (2.2)
New Zealand	r 62 (1.6)	r 73 (1.7)	r 54 (1.7)	r 60 (2.3)
Norway	55 (1.6)	63 (1.8)	45 (1.9)	62 (2.0)
Philippines	83 (1.9)	91 (1.6)	79 (2.2)	78 (2.7)
Russian Federation	--	--	--	--
Scotland	s 49 (1.6)	s 60 (2.3)	s 44 (2.0)	s 45 (2.4)
Singapore	58 (1.3)	65 (1.7)	68 (1.4)	37 (1.5)
Slovenia	56 (1.8)	63 (2.4)	53 (2.0)	52 (1.9)
Tunisia	54 (1.4)	68 (1.9)	54 (1.6)	r 39 (2.0)
United States	r 69 (1.2)	74 (1.6)	60 (1.7)	75 (1.4)
Yemen	--	--	--	--
<b>International Avg.</b>	<b>61 (0.3)</b>	<b>69 (0.4)</b>	<b>56 (0.4)</b>	<b>58 (0.4)</b>
<b>Benchmarking Participants</b>				
Indiana State, US	69 (2.2)	81 (2.8)	58 (2.9)	74 (3.3)
Ontario Province, Can.	57 (2.0)	64 (3.2)	53 (2.5)	57 (2.6)
Quebec Province, Can.	48 (1.7)	59 (2.3)	35 (1.8)	56 (2.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers at the time of testing.

\* Overall includes topics in content areas for which data are available.

( ) 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.

See Exhibits 5.14-5.16 for data on individual topics.

At the fourth grade, Exhibit 5.8 shows that internationally, on average, 61 percent of the students tested in TIMSS 2003 had been taught the TIMSS science topics, with the percentage ranging from 83 percent in Lithuania to 37 percent in Japan. The majority of students in every participating entity except Belgium (Flemish), Japan, the Netherlands, and Quebec had been taught the topics.

Consistent with the data reported on the intended science curriculum at the fourth grade (Exhibit 5.7), life science was the content area with the greatest percentage of students taught the topics, on average (69%). Percentages were greatest in Lithuania (96%) and the Philippines (91%) and least in Japan (35%). For physical science and earth science, the average percentages of fourth-grade students taught the TIMSS science topics were similar, 56 percent and 58 percent, respectively. The percentage of students taught physical science ranged from 79 percent in the Philippines to 30 and 31 percent in Belgium (Flemish) and the Netherlands, respectively. Although earth science topics did not figure prominently in the intended curriculum at the fourth grade, teachers' reports indicated that students have to a considerable extent been taught the topics. According to teachers' reports, the majority of students in 18 of the participating entities have been taught the earth science topics.

## Which TIMSS Science Topics Are in the Intended and Implemented Curricula?

For first the eighth grade and then the fourth grade, this section presents information about the coverage of each individual science topic in each country's intended and implemented curricula. For each topic, the exhibits indicate whether the topic was intended to be taught and if so, to all or only the more able students; the grade(s) at which the topic was primarily intended to be taught; and the percentage of students actually taught the topic. Exhibits 5.9 through 5.13 present these data for the science content areas at eighth grade, and Exhibits 5.14 through 5.16 for those at fourth grade.

Exhibit 5.9 presents information on the 12 life science topics at eighth grade. As shown in this exhibit, several of the TIMSS life science topics were included in the intended curriculum of most participants, and were taught to most students. These topics included "classification of organisms" (in the curriculum of 47 participants for most students; taught to 84% of students, on average), "major organ systems in humans and other organisms" (in the curricula of 44 participants for most students; taught to 82% of students, on average), and "the interaction of living organisms in an ecosystem" (in the curriculum of 42 participants for most students; taught to 69% of students, on average). In addition, there were several topics less widely intended or taught, but in the curriculum of more than 30 participants and taught to at least 70 percent of the students: "how systems function to maintain stable bodily functions," "cell structures and functions," "photosynthesis and respiration," "life cycles of organisms," and "reproduction and heredity." Exhibit 5.9 also shows that there was great variation among participants in the grade(s) at which the life science topics were primarily intended to be taught. Also, while some countries reported that topics were intended to be taught primarily at a single grade, many provided a range of grades in which they were taught.



Exhibit 5.9: Intended and Taught TIMSS Life Science Topics

Life Science	Classification of organisms			The major organ systems in humans and other organisms			How the systems function to maintain stable bodily conditions			Cell structures and functions						
	Countries	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	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic			
Armenia	●	--	s	95 (2.1)	●	--	r	99 (1.1)	●	--	s	91 (2.5)	●	--	r	77 (4.2)
Australia	●	--	r	82 (3.0)	●	--	r	57 (4.0)	●	--	r	42 (3.4)	●	--	r	82 (2.8)
Bahrain	●	1-3,5-7		88 (3.2)	●	4,5,8		97 (1.3)	●	5,8		91 (2.3)	●	7		95 (1.2)
Belgium (Flemish)	●	--	r	61 (4.1)	●	--	r	97 (1.0)	●	--	r	95 (1.8)	⊙	--	r	80 (3.6)
Botswana	●	2		84 (3.8)	●	2		69 (4.5)	○	9		38 (4.7)	●	8		98 (1.3)
Bulgaria	○	10	r	88 (2.9)	●	8	r	100 (0.4)	●	8	r	90 (3.4)	○	9	r	93 (2.0)
Chile	●	3-6		98 (1.1)	●	5,7,9,11		98 (1.0)	●	7,11		93 (2.0)	○	9		87 (2.5)
Chinese Taipei	●	7	--		●	7	--		●	7	--		●	7	--	
Cyprus	○	9	--		○	9	--		○	--	--		●	7-9	--	
Egypt	●	4,9		81 (3.7)	●	5		99 (1.0)	●	5		96 (1.7)	●	5,8		100 (0.0)
Estonia	●	2,4,6-8	r	95 (1.9)	●	2,4,7-9,12		35 (5.0)	●	4,7,9,11-12		32 (5.5)	●	4,7,9,11		74 (5.2)
Ghana	●	7		45 (4.8)	●	8		58 (4.2)	●	7		38 (5.0)	●	7		88 (2.8)
Hong Kong, SAR	●	7		85 (3.3)	●	4		72 (3.9)	○	9		35 (3.8)	⊙	10		84 (3.4)
Hungary	●	7		88 (2.7)	●	8		95 (1.7)	●	8	r	78 (3.6)	●	8		90 (1.9)
Indonesia	●	7		97 (1.5)	●	8		100 (0.0)	●	8		91 (2.7)	○	10		98 (1.5)
Iran, Islamic Rep. of	●	5-6		92 (2.0)	●	5-8		98 (1.0)	○	--		87 (2.7)	●	7-8		97 (1.2)
Israel	●	1-6		52 (3.9)	●	--		62 (3.4)	○	--		52 (4.0)	●	7-12		71 (4.1)
Italy	●	4-6		99 (0.8)	●	4-7		100 (0.0)	●	6-7		93 (1.9)	●	6		100 (0.3)
Japan	●	3-12		97 (1.6)	●	6,8,10-12		99 (0.7)	●	8,10-12		70 (3.6)	○	9-12		17 (3.1)
Jordan	●	1,6,8		98 (1.2)	●	4-6,8		93 (2.3)	●	5-6,8		80 (3.0)	●	4,7		83 (2.9)
Korea, Rep. of	●	6	s	38 (3.4)	●	7		78 (3.1)	●	8	s	77 (3.4)	●	7	s	85 (2.2)
Latvia	●	6-9	s	86 (3.2)	○	9		48 (6.3)	○	9	s	62 (5.7)	●	7-8	s	69 (5.9)
Lebanon	○	12	r	81 (3.7)	○	10	r	79 (3.9)	○	12	r	61 (4.4)	○	11	r	70 (4.5)
Lithuania	●	5-8		91 (2.6)	●	5-8		72 (4.4)	●	7-8		63 (4.4)	●	5-8		85 (3.5)
Macedonia, Rep. of	●	5-6		99 (0.8)	●	5-8		99 (0.8)	●	5-8		96 (1.9)	●	5		99 (0.7)
Malaysia	●	4-7		99 (0.9)	●	7-8		96 (1.7)	●	7-8		88 (3.0)	●	7		97 (1.6)
Moldova, Rep. of	●	6	s	71 (9.4)	●	6		92 (5.3)	●	6	s	91 (5.2)	●	6	s	87 (5.7)
Morocco	●	--	s	88 (4.6)	●	--		78 (4.4)	●	--	s	62 (6.5)	○	--	s	47 (7.3)
Netherlands	●	--	r	82 (4.2)	●	--	r	100 (0.0)	●	--	r	97 (1.5)	●	--	r	72 (5.1)
New Zealand	●	2-7		72 (5.2)	●	2-9		39 (5.0)	⊙	9-11		20 (3.6)	○	10-12		69 (4.2)
Norway	●	4-7		34 (3.9)	●	3,5		19 (3.5)	●	2,4,5,9		10 (2.9)	○	--		50 (4.7)
Palestinian Nat'l Auth.	●	7,11		96 (1.6)	●	4,6-8,11-12		87 (2.9)	●	3,7,11		75 (4.0)	●	8,11-12		98 (1.3)
Philippines	●	8		95 (1.9)	●	8		90 (2.7)	●	8		85 (2.9)	●	8		100 (0.0)
Romania	●	5-6,9		99 (1.1)	●	4-8,10-11		99 (0.7)	●	7,10-11		98 (1.2)	○	9-11		98 (1.3)
Russian Federation	●	7-8	--		●	6-9	--		○	9	--		●	6-8	--	
Saudi Arabia	●	--		95 (1.6)	●	8		100 (0.0)	●	--		97 (1.7)	●	--		96 (1.5)
Scotland	●	7	s	94 (1.8)	●	7		78 (3.0)	●	7	s	47 (3.5)	●	7	s	95 (1.5)
Serbia	●	5-6		89 (2.9)	●	5-6,8		97 (1.5)	●	6,8		96 (1.5)	●	5,8		98 (1.1)
Singapore	●	8		76 (2.4)	○	11		90 (1.5)	○	9		63 (2.3)	●	7		85 (2.2)
Slovak Republic	●	5-9		97 (1.5)	●	6-7		99 (1.3)	○	9		60 (5.3)	●	5-7,9		96 (1.7)
Slovenia	●	8		76 (3.8)	○	9		90 (2.3)	○	9		89 (2.5)	○	9		91 (2.2)
South Africa	●	--	r	69 (3.8)	●	--	r	58 (3.9)	○	--	r	43 (4.7)	○	--	r	44 (3.6)
Sweden	●	7	r	81 (3.3)	●	8	r	79 (3.6)	●	8	r	64 (4.2)	●	8	r	75 (3.4)
Syrian Arab Republic	●	--	--		●	--	--		⊙	--	--		●	--	--	
Tunisia	○	11		100 (0.0)	○	11		75 (3.8)	○	11		38 (4.1)	○	11		89 (2.7)
United States	●	--	r	87 (2.1)	●	--	r	89 (2.1)	●	--	r	88 (2.0)	●	--	r	92 (1.7)
‡ England	●	1,3,5-6	s	96 (3.1)	●	K,4,6,8	x x		●	4,7-8	x x		●	6,8	s	99 (0.4)
<b>International Avg.</b>				<b>84 (0.5)</b>				<b>82 (0.5)</b>				<b>71 (0.6)</b>				<b>84 (0.5)</b>
<b>Benchmarking Participants</b>																
Basque Country, Spain	●	--		84 (3.2)	●	--		83 (4.4)	●	--		63 (4.1)	○	11		70 (4.7)
Indiana State, US	●	--		90 (3.5)	●	--		88 (4.7)	●	--		86 (4.8)	●	--		93 (3.0)
Ontario Province, Can.	●	6		88 (3.2)	●	5		82 (3.6)	●	5,8		75 (3.8)	●	8		81 (4.3)
Quebec Province, Can.	●	--	r	50 (5.4)	○	9	r	10 (3.1)	○	9	r	5 (1.7)	○	9	r	25 (4.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

● 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.  
 ‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).  
 ( ) 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 5.9: Intended and Taught TIMSS Life Science Topics (Continued...)

Life Science	Photosynthesis and respiration			Life cycles of organisms, including humans, plants, birds, insects			Reproduction and heredity, inherited versus acquired/learned characteristics			The role of variation and adaptation in survival/extinction of species		
	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	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Armenia	●	--	r 70 (5.2)	⊙	--	86 (3.2)	●	8	r 54 (5.5)	○	--	r 34 (5.1)
Australia	○	10	r 70 (3.3)	●	7	r 49 (4.2)	●	7	r 26 (3.3)	○	10	r 40 (4.2)
Bahrain	●	6-8	77 (2.4)	●	2,4,5	43 (3.4)	●	6,8	51 (3.0)	●	3	15 (2.9)
Belgium (Flemish)	●	--	r 90 (2.6)	○	--	r 49 (3.7)	●	--	r 86 (2.7)	○	--	r 21 (3.7)
Botswana	●	8	29 (4.4)	○	9	14 (3.3)	●	8	32 (3.9)	○	9	5 (2.1)
Bulgaria	○	9	r 96 (1.7)	○	9	r 90 (2.4)	○	9-10	r 66 (4.4)	○	9	r 25 (4.3)
Chile	●	6,7,9	95 (1.8)	●	8,10,12	91 (2.2)	●	7,8	85 (2.6)	●	8,11	78 (3.3)
Chinese Taipei	●	7	--	●	7	--	●	7	--	●	7	--
Cyprus	○	9	--	⊙	7	--	○	9	--	○	9	--
Egypt	●	4,5,10	98 (1.1)	●	--	81 (3.4)	○	--	98 (1.1)	●	6	80 (3.0)
Estonia	●	4,7,9,11	88 (2.8)	●	2-4,7-8,11	95 (1.8)	●	2,4,9,11	24 (4.6)	●	2,4-5,8-9,12	26 (4.8)
Ghana	●	7	88 (3.0)	●	7-8	42 (4.7)	●	8	69 (4.3)	●	8	10 (3.1)
Hong Kong, SAR	●	8	99 (0.8)	○	10	40 (4.6)	●	7	78 (4.0)	●	6	54 (4.9)
Hungary	●	8	86 (2.3)	●	8	89 (2.5)	●	8	59 (4.1)	●	7	67 (3.9)
Indonesia	●	6-7	100 (0.0)	○	10	87 (3.1)	○	9	16 (3.3)	○	9	48 (4.3)
Iran, Islamic Rep. of	○	9-11	88 (2.5)	○	9-11	82 (3.2)	○	9-11	89 (2.5)	○	9-11	75 (3.9)
Israel	○	9-12	52 (3.8)	●	--	58 (4.3)	○	9-12	77 (3.7)	○	9-12	30 (3.6)
Italy	●	4-7	99 (0.7)	●	4-7	97 (1.1)	●	8	83 (2.8)	●	8	69 (3.5)
Japan	●	6-8,10-12	88 (3.0)	●	3-12	55 (4.5)	●	5,9-12	3 (1.2)	○	9-12	8 (2.2)
Jordan	●	4,6,8	91 (2.7)	●	4,6,7	76 (3.5)	●	7	56 (4.9)	●	4	59 (4.5)
Korea, Rep. of	●	8	s 89 (2.0)	●	3-4	27 (3.9)	○	9	s 44 (3.9)	○	9	s 20 (3.3)
Latvia	●	7-8	s 98 (1.5)	●	7	87 (4.0)	○	9	s 57 (6.0)	●	7-9	s 77 (4.9)
Lebanon	○	10,12	r 94 (1.8)	○	10,12	r 91 (2.1)	●	--	r 58 (5.3)	●	--	r 59 (5.4)
Lithuania	●	5-8	84 (3.8)	●	5-8	86 (3.3)	●	5-8	75 (4.1)	●	5-8	31 (4.2)
Macedonia, Rep. of	●	5-6	99 (1.1)	●	5-8	98 (1.2)	●	5-8	97 (1.5)	○	10	96 (1.3)
Malaysia	●	7	99 (0.7)	○	--	48 (4.4)	○	9	12 (2.6)	●	8	87 (2.7)
Moldova, Rep. of	●	6	s 57 (10.1)	●	6-9	73 (8.1)	●	7	s 49 (11.0)	●	7,9	s 33 (10.6)
Morocco	○	--	s 75 (5.6)	●	--	73 (6.6)	○	--	s 32 (8.1)	○	--	s 27 (4.8)
Netherlands	●	--	r 87 (3.4)	●	--	r 78 (4.6)	●	--	r 83 (4.4)	●	--	r 40 (5.0)
New Zealand	⊙	8-9	74 (4.0)	●	2-3	43 (5.7)	⊙	8-9	28 (5.1)	○	9-11	38 (5.0)
Norway	●	6	56 (4.4)	●	3	39 (4.1)	●	5-6,10	15 (3.1)	●	5,8	73 (3.9)
Palestinian Nat'l Auth.	●	6-8	89 (2.7)	●	4,6,8	50 (3.9)	●	7,8,10,12	59 (4.5)	○	11-12	39 (4.5)
Philippines	●	8	98 (1.3)	●	8	82 (3.5)	●	8	78 (3.4)	●	8	88 (3.2)
Romania	●	5-7,10-11	98 (1.3)	●	5-7,9-11	98 (1.4)	●	5-7,9-11	83 (3.4)	●	3,5-10,12	86 (3.0)
Russian Federation	●	7-8	--	●	7-9	--	●	7-11	--	●	6-8	--
Saudi Arabia	●	--	94 (2.9)	●	--	66 (5.3)	●	--	47 (5.7)	●	--	74 (4.2)
Scotland	⊙	8	s 83 (2.7)	●	7	60 (3.7)	●	7	s 81 (2.6)	●	8	s 53 (3.8)
Serbia	●	5	93 (2.2)	●	5-6,8	93 (2.3)	●	5-8	94 (1.9)	●	7	94 (1.9)
Singapore	●	8	86 (1.8)	●	3-6	51 (2.8)	●	8	81 (1.7)	○	--	50 (2.6)
Slovak Republic	●	5,9	90 (3.0)	●	5-7,9	94 (2.3)	●	7,9	82 (4.1)	○	9	62 (5.1)
Slovenia	●	8	99 (1.0)	●	4	90 (2.4)	○	9	22 (3.4)	○	10	22 (3.7)
South Africa	⊙	--	r 64 (4.1)	⊙	--	r 59 (3.8)	○	--	r 43 (4.1)	○	--	r 53 (4.4)
Sweden	●	8	r 90 (2.6)	●	8	r 74 (3.5)	●	8	r 33 (3.5)	○	9	r 25 (2.8)
Syrian Arab Republic	●	--	--	●	--	--	○	--	--	⊙	--	--
Tunisia	●	--	93 (2.2)	●	--	92 (2.1)	○	9	25 (3.7)	●	7	46 (4.2)
United States	●	--	r 88 (2.2)	●	--	r 88 (2.1)	●	--	r 82 (2.5)	●	--	r 83 (2.6)
‡ England	●	7-8	s 97 (0.8)	●	4,6-7	x x	●	4,6	x x	●	5-6,8	x x
International Avg.			86 (0.5)			71 (0.6)			57 (0.7)			50 (0.6)
<b>Benchmarking Participants</b>												
Basque Country, Spain	○	12	84 (4.2)	⊙	10	68 (4.4)	●	--	49 (5.5)	⊙	10	56 (5.3)
Indiana State, US	●	--	95 (2.6)	●	--	92 (2.8)	●	--	85 (3.4)	●	--	90 (2.8)
Ontario Province, Can.	○	10	74 (4.7)	●	2	83 (3.8)	○	9	53 (4.6)	●	6	76 (3.1)
Quebec Province, Can.	⊙	--	r 85 (3.1)	●	--	r 69 (4.5)	○	9	r 20 (4.0)	●	--	r 65 (5.0)

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.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

(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.



Exhibit 5.9: Intended and Taught TIMSS Life Science Topics (...Continued)

Life Science	The interaction of living organisms in an ecosystem			Cycling of materials in nature			Common infectious diseases			Preventive medicine methods		
	Countries	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	Student population intended to be taught through 8th grade	Grade(s) topic is intended to be taught
Armenia	●	--	r 24 (4.2)	●	--	40 (5.2)	○	--	r 96 (2.0)	⊙	--	r 96 (2.1)
Australia	●	--	r 62 (3.7)	○	--	r 47 (4.2)	○	11	r 18 (3.1)	○	--	r 35 (3.7)
Bahrain	●	3,6,8	51 (2.5)	●	2,3,6,8	28 (2.6)	●	3,6,8	85 (1.4)	●	1-3,5,8	51 (2.8)
Belgium (Flemish)	●	--	r 79 (3.1)	●	--	r 41 (4.4)	○	--	r 57 (3.7)	●	--	r 88 (2.5)
Botswana	○	9	6 (2.2)	○	10	19 (3.5)	○	9	33 (4.6)	●	2	62 (3.9)
Bulgaria	○	9	r 63 (5.1)	○	9	r 69 (4.9)	●	8	r 96 (1.7)	●	8	r 95 (2.0)
Chile	●	5,6,10,12	94 (1.7)	●	6,9	89 (2.1)	●	7,12	87 (2.8)	●	7,9-11	87 (2.8)
Chinese Taipei	●	7	--	●	7	--	●	7	--	●	7	--
Cyprus	○	9	--	○	9	--	○	9	--	○	9	--
Egypt	●	6,9	95 (1.8)	●	6	90 (2.2)	●	7	100 (0.1)	○	--	90 (2.5)
Estonia	●	3,6,8,11-12	77 (3.6)	●	2,5-6,11-12	52 (5.2)	●	2,4,8-9,11-12	71 (5.4)	●	1-2,4-7,9,10,12	63 (5.8)
Ghana	●	8-9	23 (4.0)	●	8-9	43 (5.1)	●	8	77 (4.2)	●	8-9	79 (4.2)
Hong Kong, SAR	●	8	86 (3.4)	⊙	8	79 (3.4)	●	5	16 (3.0)	●	5	23 (3.8)
Hungary	●	7	91 (2.4)	●	8	95 (1.9)	●	8	72 (3.9)	●	4	86 (3.0)
Indonesia	●	7	98 (1.4)	○	12	87 (2.8)	○	11	23 (3.5)	●	4	17 (3.1)
Iran, Islamic Rep. of	○	9-11	86 (2.9)	○	9-11	81 (3.4)	●	5-6,8	44 (4.0)	●	5-6,8	45 (3.8)
Israel	●	6-12	43 (4.4)	●	6-12	47 (4.1)	●	1-6	24 (3.5)	●	1-9	24 (4.0)
Italy	●	5-8	83 (2.5)	●	4-8	91 (2.0)	●	5-8	89 (2.1)	●	6-7	94 (1.8)
Japan	○	9-12	1 (0.0)	●	6,9-12	12 (2.6)	○	--	13 (2.6)	○	--	8 (2.3)
Jordan	●	6	80 (3.5)	●	7	77 (3.8)	●	6	46 (4.3)	●	1,4-6	59 (4.5)
Korea, Rep. of	●	6	s 20 (3.2)	○	11-12	27 (3.5)	○	11-12	s 30 (3.2)	○	11-12	s 52 (3.6)
Latvia	●	6-7	s 76 (5.4)	●	6-8	51 (5.9)	○	9	s 30 (6.0)	○	9	s 34 (5.4)
Lebanon	●	--	r 85 (3.3)	○	12	r 66 (4.4)	●	--	r 85 (3.7)	○	11	r 60 (4.6)
Lithuania	●	5-8	78 (3.9)	●	5-8	52 (5.3)	●	5-8	47 (4.3)	●	5-8	48 (4.6)
Macedonia, Rep. of	●	5,9	99 (1.0)	●	5	99 (0.9)	●	8	97 (1.5)	○	9	92 (2.5)
Malaysia	●	8	98 (1.3)	●	7-8	89 (2.7)	○	10	37 (4.0)	○	10	92 (2.0)
Moldova, Rep. of	●	6-8	s 31 (8.7)	●	7	47 (10.8)	●	7,9	s 90 (5.6)	●	6-9	s 94 (3.9)
Morocco	●	--	s 76 (5.4)	●	--	24 (6.6)	○	--	s 10 (4.5)	○	--	s 67 (6.6)
Netherlands	●	--	r 37 (5.8)	●	--	r 40 (5.5)	○	--	r 66 (5.5)	●	--	r 93 (2.9)
New Zealand	●	8-9	73 (3.9)	●	8-9	58 (5.3)	●	K-12	11 (3.0)	●	K-12	24 (3.9)
Norway	●	6-7	42 (4.2)	●	6-7	54 (4.0)	●	2,4,8	58 (3.9)	●	2,6,8	44 (4.5)
Palestinian Nat'l Auth.	●	7,10-12	60 (3.8)	●	4,7-12	56 (4.0)	●	6-7,9-12	55 (4.2)	●	7-12	48 (4.3)
Philippines	●	8	97 (1.3)	●	8	88 (2.5)	●	8	78 (4.2)	●	8	71 (4.0)
Romania	●	8,12	99 (0.6)	●	8,12	99 (0.7)	●	4-7,9-11	94 (2.0)	●	4-7,11	97 (1.5)
Russian Federation	●	6-8,10	--	●	6-8	--	○	9	--	○	9	--
Saudi Arabia	●	--	76 (4.3)	●	--	70 (5.8)	○	10-12	28 (3.7)	●	--	32 (4.9)
Scotland	●	7	s 79 (3.4)	●	7	53 (3.5)	⊙	8	s 21 (3.1)	●	8	s 26 (3.5)
Serbia	●	7	92 (2.6)	●	7	92 (2.4)	●	8	95 (1.9)	●	8	93 (1.9)
Singapore	●	8	73 (2.2)	●	8	69 (2.0)	○	10	48 (2.1)	○	10	35 (2.2)
Slovak Republic	○	9	50 (5.1)	○	9	60 (4.9)	●	7	96 (2.0)	●	7	97 (1.6)
Slovenia	●	8	93 (2.0)	●	8	94 (2.1)	○	10	72 (3.7)	●	5	89 (2.3)
South Africa	●	--	r 79 (3.2)	⊙	--	r 66 (4.1)	⊙	--	r 55 (3.9)	⊙	--	r 50 (4.2)
Sweden	●	8	r 74 (3.8)	●	8	r 82 (2.9)	●	8	r 55 (4.0)	●	8	r 65 (3.7)
Syrian Arab Republic	⊙	--	--	●	--	--	●	--	--	●	--	--
Tunisia	○	11	94 (2.0)	○	11	26 (3.7)	○	12	65 (4.0)	○	--	47 (4.3)
United States	●	--	r 90 (2.0)	●	--	r 88 (2.3)	●	--	r 77 (2.9)	●	--	r 81 (2.5)
‡ England	●	5-8	x x	○	9	x x	●	7	x x	●	8	x x
<b>International Avg.</b>			<b>69 (0.6)</b>			<b>63 (0.6)</b>			<b>58 (0.6)</b>			<b>63 (0.6)</b>
<b>Benchmarking Participants</b>												
Basque Country, Spain	○	--	62 (5.2)	○	--	63 (4.6)	●	--	45 (5.3)	●	--	67 (5.4)
Indiana State, US	●	--	87 (4.3)	●	--	85 (4.0)	●	--	86 (4.4)	●	--	90 (4.0)
Ontario Province, Can.	●	7	94 (1.9)	●	7	90 (2.9)	●	8	48 (5.2)	●	5-8	61 (4.4)
Quebec Province, Can.	●	--	r 82 (3.8)	●	--	r 74 (4.5)	○	9	r 6 (2.3)	○	9	r 12 (3.1)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

● 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.  
 ‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).  
 ( ) 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 x" indicates data are available for less than 50% of the students.



Chemistry topics were also generally included in participants' eighth-grade intended curricula and widely taught, as shown in Exhibit 5.10. The most frequently reported topic – “classification and composition of matter” – was included for all or almost all students in 43 of the participating entities and taught to 85 percent of students, on average. Of “properties of solutions,” “the particulate structure of matter,” and “properties and uses of water,” each was included in the curricula of at least 35 participants, and each was taught to 78 percent of students. In contrast, “classification of familiar chemical transformations” was included in the intended curriculum of just 17 participants, and was taught to just 47 percent of students, on average. Most participants indicated that this topic would be taught in later grades.

The TIMSS physics topics were widely included in participants' intended curricula at the eighth grade. Of the ten physics topics, three were in the curricula of at least 40 participants (“physical states and changes of matter,” “the processes of melting, freezing, evaporation, and condensation,” and “basic properties and behavior of light”), and the remaining seven in the curriculum of at least 34 participants (see Exhibit 5.11). Coverage in the classroom varied somewhat, however, from 85 percent of students, on average, having been taught “physical states and changes in matter” to just 51 percent having been taught “properties of permanent magnets and electromagnets.” The latter topic also was one of those in the curriculum of fewest participants (34).

As noted earlier, the 11 earth science topics were included in fewer curricula than the other eighth-grade science topics. As shown in Exhibit 5.12, only one topic, “Earth's water cycle,” appeared in the curricula of as many as 40 participants. A further seven were included in the curricula of between 30 and 40 participants. The two topics with the least coverage – “geological processes occurring over billions of years” and “the physical features of Earth” – were reported in the curriculum of between 20 and 30 participants. The percentages of students taught the topics in the classroom were rather similar, ranging from

Exhibit 5.10: Intended and Taught TIMSS Chemistry Topics



Chemistry	Classification and composition of matter			Properties of solutions			Particulate structure of matter			Properties and uses of water		
	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	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Armenia	●	--	s 99 (1.1)	●	--	99 (1.1)	●	8,10	s 100 (0.0)	●	--	s 99 (1.1)
Australia	●	--	r 90 (2.7)	●	7	r 84 (2.8)	●	--	r 67 (4.0)	○	11-12	r 72 (3.2)
Bahrain	●	6-8	89 (2.5)	●	6,8	81 (3.0)	●	6,8	100 (0.0)	●	1-4	26 (3.0)
Belgium (Flemish)	○	--	--	○	--	--	○	--	--	○	--	--
Botswana	○	10	18 (3.5)	○	9	11 (3.0)	○	10	5 (2.1)	●	6	75 (4.4)
Bulgaria	●	6	r 99 (0.9)	●	6-7,10	r 60 (4.2)	●	6-8	r 100 (0.0)	●	6	r 80 (4.0)
Chile	●	6,8	96 (1.7)	○	--	95 (1.5)	●	7,10,12	94 (1.9)	●	8-9	93 (1.8)
Chinese Taipei	●	8	100 (0.0)	●	8	99 (0.7)	●	8	99 (0.7)	●	8	98 (1.1)
Cyprus	○	--	61 (1.0)	○	--	15 (1.0)	○	12	25 (1.3)	●	8	98 (0.6)
Egypt	●	8,11	97 (1.5)	●	5,8	94 (1.9)	●	5,7,8	100 (0.0)	●	6,8	97 (1.4)
Estonia	●	1,5,8-11	99 (1.1)	●	1,5,7-10	77 (4.1)	●	1,8-10	100 (0.0)	●	1,2,5,7-10	93 (2.5)
Ghana	●	7-9	93 (2.4)	●	8-9	90 (3.0)	●	8-9	92 (2.4)	●	8-9	80 (3.8)
Hong Kong, SAR	○	9	67 (4.7)	●	7	83 (3.7)	○	9	56 (4.7)	○	7	86 (3.3)
Hungary	●	7	100 (0.0)	●	7	100 (0.0)	●	7	99 (0.7)	●	7	99 (1.0)
Indonesia	○	10-12	--	○	10-12	--	○	10-12	--	○	10-12	--
Iran, Islamic Rep. of	●	5,7-8	100 (0.0)	●	6,8	98 (1.0)	●	5-6,8	99 (0.6)	●	6,8	91 (2.4)
Israel	●	7-8	91 (2.6)	○	10-12	80 (3.9)	●	7-8	98 (1.0)	●	1-8	94 (2.4)
Italy	●	6	94 (1.4)	●	6-7	87 (2.1)	●	6-7	95 (1.6)	●	6	93 (1.8)
Japan	●	3-12	98 (1.2)	●	5-7,10-12	97 (1.5)	●	8,10-12	83 (3.5)	●	4,7,10-12	99 (1.0)
Jordan	●	3,5-7	93 (2.1)	●	6-7	79 (2.9)	●	6-8	99 (0.5)	●	1,3,6	81 (3.3)
Korea, Rep. of	●	8	s 89 (2.7)	●	5	90 (2.4)	○	12	s 40 (4.0)	●	7	s 46 (4.2)
Latvia	●	8-9	x x	●	8-9	x x	●	8-9	x x	●	8-9	x x
Lebanon	○	--	99 (0.7)	○	--	98 (1.3)	●	--	95 (2.1)	○	10	74 (5.2)
Lithuania	●	5-8	99 (0.7)	●	5-8	94 (2.3)	●	5-8	98 (1.1)	●	5-8	21 (3.9)
Macedonia, Rep. of	●	7	99 (1.2)	●	7	99 (1.2)	●	7-8	98 (1.3)	●	7	99 (1.2)
Malaysia	●	7	87 (3.1)	●	8	96 (1.8)	●	7	61 (4.1)	●	8	97 (1.2)
Moldova, Rep. of	●	7	s 96 (2.0)	●	7	91 (3.4)	●	7	s 99 (1.0)	●	8	s 94 (2.9)
Morocco	●	--	s 87 (4.8)	●	--	91 (4.1)	●	--	s 61 (8.3)	●	--	s 46 (8.2)
Netherlands	●	--	r 47 (5.8)	●	--	r 35 (4.9)	○	--	r 23 (4.1)	●	--	r 71 (5.3)
New Zealand	●	8-9	94 (1.9)	○	8-9	76 (4.8)	●	8-9	77 (3.9)	●	8	75 (3.3)
Norway	●	5,7	42 (4.6)	○	--	41 (4.5)	○	9	30 (4.1)	●	3,7	88 (2.8)
Palestinian Nat'l Auth.	●	4,7-8, 10-12	90 (2.5)	○	10-12	87 (2.9)	●	7-8, 11-12	99 (0.7)	●	4,7,11	74 (3.7)
Philippines	●	7	r 40 (4.7)	○	9	r 35 (4.7)	●	7	r 40 (4.6)	○	9	r 41 (4.5)
Romania	●	4,7	99 (0.8)	●	7,9	95 (2.0)	●	7,9	99 (0.8)	●	4,7,9-10	94 (2.0)
Russian Federation	●	8	--	○	9	--	●	7-8	--	●	7-8	--
Saudi Arabia	●	--	71 (4.1)	●	8	66 (3.8)	○	9	82 (3.4)	○	9	69 (3.6)
Scotland	●	8	s 94 (1.6)	●	7	93 (1.6)	●	7	s 78 (2.7)	○	8	s 79 (3.2)
Serbia	●	7	96 (1.6)	●	7	96 (1.6)	●	7	97 (1.2)	●	7	95 (1.6)
Singapore	●	7	87 (1.7)	●	7	85 (1.8)	●	8	88 (2.0)	●	4	71 (2.7)
Slovak Republic	●	8	99 (0.6)	○	8	92 (2.8)	●	8	100 (0.3)	○	8	99 (0.4)
Slovenia	●	7	100 (0.0)	●	8	59 (4.0)	●	8	100 (0.0)	●	5,8	62 (4.2)
South Africa	●	--	r 76 (3.3)	○	--	r 64 (4.1)	○	--	r 69 (3.3)	○	--	r 62 (4.0)
Sweden	●	7	r 96 (1.5)	●	7	r 87 (2.7)	●	7-9	r 67 (3.4)	●	7	r 94 (2.0)
Syrian Arab Republic	○	12	--	○	11-12	--	●	--	--	●	--	--
Tunisia	○	10	r 16 (3.5)	○	10	r 16 (3.5)	○	10	r 4 (1.8)	○	10	r 19 (3.8)
United States	●	--	r 85 (2.7)	●	--	r 72 (3.0)	●	--	r 88 (2.4)	●	--	r 84 (2.7)
‡ England	●	K-7	x x	●	5-6	x x	●	7	x x	●	4	x x
<b>International Avg.</b>			<b>85 (0.4)</b>			<b>78 (0.5)</b>			<b>78 (0.4)</b>			<b>78 (0.5)</b>
<b>Benchmarking Participants</b>												
Basque Country, Spain	●	--	80 (4.6)	●	--	56 (5.5)	○	10	82 (4.1)	●	--	83 (3.6)
Indiana State, US	●	--	96 (2.5)	●	--	74 (5.1)	●	--	94 (3.3)	●	--	89 (4.0)
Ontario Province, Can.	●	7	83 (3.5)	●	7	88 (3.3)	○	9	66 (4.6)	●	5,8	84 (3.3)
Quebec Province, Can.	●	--	r 86 (2.8)	●	--	r 91 (2.0)	○	10	r 19 (3.3)	●	--	r 83 (3.4)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

● 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.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

( ) 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 Chemistry Topics

Chemistry	The properties and common uses of acids and bases			Chemical change			The need for oxygen in 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	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
Armenia	●	--	s 100 (0.0)	●	8,10	99 (1.1)	●	8,10	s 96 (1.7)	●	8,10	s 82 (3.7)
Australia	○	9-10	r 46 (4.2)	●	--	r 67 (3.2)	○	10-11	r 23 (3.1)	○	10	r 19 (2.4)
Bahrain	●	8	94 (2.0)	●	6,8	74 (2.6)	●	6-7	58 (3.3)	○	--	33 (2.9)
Belgium (Flemish)	○	--	--	○	--	--	○	--	--	○	--	--
Botswana	○	10	3 (1.6)	○	10	4 (2.0)	○	10	2 (1.2)	○	11	3 (1.5)
Bulgaria	●	7-8	r 99 (0.8)	●	6-8	r 84 (4.0)	●	6,8	r 83 (3.9)	○	9-10	r 43 (4.6)
Chile	○	--	70 (3.7)	●	8,10-12	82 (3.1)	●	8,11	67 (3.7)	●	6,11-12	71 (3.4)
Chinese Taipei	○	9	35 (4.2)	●	8	99 (0.9)	●	8	97 (1.4)	●	8	95 (1.9)
Cyprus	●	8	99 (0.4)	●	8	31 (1.0)	○	--	11 (1.0)	○	--	28 (1.1)
Egypt	●	5,8	93 (2.1)	●	4,8	95 (1.8)	●	8	98 (1.3)	●	8	96 (1.5)
Estonia	●	8-11	83 (3.9)	●	7-11	91 (3.5)	●	5,7-11	92 (2.9)	●	7-10	38 (5.0)
Ghana	●	7-9	43 (4.4)	●	7-8	59 (4.4)	●	7-8	28 (4.2)	○	9	26 (4.5)
Hong Kong, SAR	●	8	95 (2.0)	○	10	22 (3.6)	○	10	41 (4.5)	○	10	25 (4.2)
Hungary	●	8	93 (2.1)	●	7	96 (1.6)	●	7	91 (2.3)	●	7	94 (2.1)
Indonesia	○	10-12	--	○	10-12	--	○	10-12	--	○	10-12	--
Iran, Islamic Rep. of	●	7-8	81 (3.0)	●	5,7-8	92 (2.2)	●	5,7-8	89 (2.6)	●	8	57 (4.2)
Israel	●	7-8	49 (4.9)	●	7-8	82 (3.2)	●	7-8	81 (3.1)	○	10-12	32 (4.3)
Italy	●	6-8	63 (3.5)	●	6-8	62 (3.6)	●	6-7	82 (2.8)	●	6-8	61 (3.5)
Japan	●	6,7,10-12	65 (4.0)	●	5-12	91 (2.5)	●	6,8-12	75 (3.7)	○	9-12	30 (4.2)
Jordan	●	6	64 (4.2)	●	6	76 (3.6)	●	8	91 (2.6)	●	8	37 (4.6)
Korea, Rep. of	○	10	s 16 (3.0)	○	9	28 (3.3)	○	11	s 22 (3.6)	○	12	s 21 (2.5)
Latvia	●	8-9	x x	●	8-9	x x	●	8-9	x x	●	8-9	x x
Lebanon	●	--	69 (4.6)	●	--	r 94 (2.9)	●	--	88 (3.3)	●	--	83 (3.6)
Lithuania	●	--	5 (2.3)	●	7-8	84 (3.1)	●	7-8	70 (4.1)	○	9-10	63 (4.4)
Macedonia, Rep. of	●	8	99 (1.2)	●	7	96 (1.9)	●	7-8	97 (1.5)	●	7-8	90 (2.9)
Malaysia	●	8	97 (1.6)	○	10	55 (4.7)	●	7	83 (3.2)	○	10	72 (4.1)
Moldova, Rep. of	●	8	s 96 (2.0)	●	8	96 (2.2)	●	8	s 93 (2.2)	○	9	s 88 (2.7)
Morocco	○	--	s 23 (6.5)	●	--	83 (5.4)	●	--	s 96 (3.0)	○	--	s 38 (7.1)
Netherlands	●	--	r 20 (4.3)	●	--	r 11 (3.3)	●	--	r 47 (5.2)	⊙	--	r 11 (3.9)
New Zealand	●	8-9	32 (5.1)	⊙	8-9	64 (4.5)	⊙	8-9	28 (4.8)	○	10	22 (4.4)
Norway	●	8,10	--	●	3,5,9	19 (3.3)	●	8-9	36 (4.7)	○	--	15 (2.5)
Palestinian Nat'l Auth.	●	8-9	90 (2.5)	●	8-12	60 (4.6)	●	3,8,10-12	64 (4.4)	○	11-12	17 (3.2)
Philippines	○	9	r 40 (4.6)	●	7	r 36 (4.7)	○	9	r 33 (4.6)	⊙	9	r 34 (4.3)
Romania	●	8-10	98 (1.3)	●	7-10	98 (1.3)	●	7-8,10	95 (2.0)	●	7,10	84 (3.2)
Russian Federation	●	8	--	●	8	--	●	8	--	●	8	--
Saudi Arabia	○	9	41 (3.7)	●	--	66 (4.3)	●	--	87 (2.7)	○	10-12	21 (5.3)
Scotland	●	8	s 90 (2.0)	●	7	71 (3.2)	●	7	s 59 (3.3)	●	7	s 38 (3.5)
Serbia	●	7	96 (1.6)	●	7	95 (1.8)	●	7	97 (1.4)	○	--	85 (3.2)
Singapore	●	7	81 (2.3)	●	8	77 (2.5)	●	8	55 (2.8)	○	10	53 (2.7)
Slovak Republic	●	8-9	75 (4.5)	●	8-9	79 (4.1)	●	8	45 (4.8)	●	8	11 (2.3)
Slovenia	○	9	43 (4.2)	●	8	89 (2.8)	●	8	78 (3.9)	●	8	95 (1.7)
South Africa	○	--	r 40 (4.3)	○	--	r 43 (4.0)	○	--	r 43 (4.0)	○	--	r 40 (3.5)
Sweden	●	8	r 83 (2.9)	⊙	7-9	r 50 (3.7)	⊙	8-9	r 61 (3.5)	⊙	8-9	r 18 (2.5)
Syrian Arab Republic	○	9	--	○	12	--	●	--	--	○	11-12	--
Tunisia	○	11	r 19 (3.6)	○	10	r 11 (3.1)	○	10	r 13 (3.1)	○	10	r 9 (2.7)
United States	●	--	r 66 (3.3)	●	--	r 73 (3.0)	⊙	--	r 58 (3.4)	○	--	r 60 (3.1)
‡ England	●	6	x x	●	6,8	x x	●	8	x x	○	--	x x
<b>International Avg.</b>			<b>65 (0.5)</b>			<b>68 (0.5)</b>			<b>65 (0.5)</b>			<b>47 (0.6)</b>
<b>Benchmarking Participants</b>												
Basque Country, Spain	○	10	15 (4.1)	⊙	11	44 (5.8)	○	12	43 (5.2)	⊙	10	26 (4.6)
Indiana State, US	●	--	61 (5.7)	○	9-12	87 (4.7)	○	9-12	67 (5.8)	○	9-12	66 (6.1)
Ontario Province, Can.	○	10	38 (4.3)	●	5	42 (4.5)	○	10	32 (4.3)	○	10	50 (4.5)
Quebec Province, Can.	○	10	r 16 (3.9)	●	--	r 13 (2.7)	○	11	r 50 (5.2)	○	11	r 42 (4.9)

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.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

( ) 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 Physics Topics (...Continued)

Physics	Forces and motion, uses of distance/time graphs			Effects of density and pressure				
	Countries	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	
Armenia	●	7	s	87 (3.0)	●	5	95 (1.9)	
Australia	●	--	r	48 (3.8)	○	11	22 (3.1)	
Bahrain	●	1-2,7		85 (2.3)	●	2,4,6-7	82 (2.2)	
Belgium (Flemish)	○	--		27 (4.1)	○	--	12 (2.7)	
Botswana	○	11		5 (2.1)	○	11	19 (4.2)	
Bulgaria	●	8	r	99 (0.6)	●	6	r	88 (2.6)
Chile	○	5,10		72 (4.0)	○	--	68 (3.7)	
Chinese Taipei	○	9		25 (3.6)	●	8	75 (3.2)	
Cyprus	○	9		2 (0.2)	○	9	12 (2.2)	
Egypt	●	5,8		78 (3.9)	●	6	87 (2.9)	
Estonia	●	2,7-8,10		96 (2.4)	●	8	95 (2.4)	
Ghana	●	7-9		45 (4.2)	●	7-9	43 (3.6)	
Hong Kong, SAR	○	10		77 (3.4)	●	7	55 (4.6)	
Hungary	●	7		97 (1.3)	●	7	76 (3.8)	
Indonesia	●	7		93 (2.1)	●	7	89 (2.6)	
Iran, Islamic Rep. of	●	6,8		84 (2.9)	●	8	82 (3.0)	
Israel	○	--		20 (3.7)	○	--	59 (4.3)	
Italy	●	6-7		87 (2.4)	●	8	61 (3.3)	
Japan	●	5,7,9-12		5 (1.7)	●	4,7,10-12	85 (3.3)	
Jordan	●	3,5,7-8		91 (2.4)	●	7	72 (3.9)	
Korea, Rep. of	●	8	s	90 (2.3)	●	7	77 (3.6)	
Latvia	●	8-9	s	46 (6.9)	●	8-9	62 (6.2)	
Lebanon	○	9-12		91 (2.3)	○	10-11	79 (4.0)	
Lithuania	●	5-8		93 (2.7)	●	7-8	85 (3.6)	
Macedonia, Rep. of	●	7		99 (0.6)	●	7-8	95 (1.8)	
Malaysia	○	10		90 (2.9)	●	7	79 (3.6)	
Moldova, Rep. of	●	7	s	89 (2.6)	●	7	92 (3.0)	
Morocco	●	--	s	69 (7.2)	○	--	23 (7.1)	
Netherlands	⊙	--	r	41 (4.7)	○	9	r	18 (3.6)
New Zealand	●	6-9		40 (5.0)	○	9	21 (4.2)	
Norway	○	--		39 (4.2)	●	8	31 (3.8)	
Palestinian Nat'l Auth.	●	3,6,10-12		47 (4.2)	●	7,10-12	74 (3.4)	
Philippines	○	10	r	42 (4.2)	○	9-10	r	31 (4.1)
Romania	●	6-7,9		98 (1.4)	○	11	92 (2.4)	
Russian Federation	●	7	--	--	●	7	--	
Saudi Arabia	●	--		79 (4.0)	●	--	56 (5.6)	
Scotland	○	9-10	s	63 (3.9)	⊙	8	36 (3.5)	
Serbia	●	7		95 (1.6)	●	6-7	95 (1.5)	
Singapore	●	7		62 (2.5)	●	7	61 (2.8)	
Slovak Republic	●	7		100 (0.0)	●	7	95 (1.8)	
Slovenia	●	8		65 (4.3)	●	8	97 (1.5)	
South Africa	⊙	--	r	51 (3.7)	○	--	r	41 (4.3)
Sweden	⊙	7	r	71 (3.8)	●	7-8	r	57 (3.9)
Syrian Arab Republic	●	--	--	--	●	--	--	
Tunisia	○	12	r	12 (2.9)	○	11	r	4 (1.9)
United States	●	--	r	77 (3.0)	●	--	r	77 (2.7)
‡ England	●	K,1,3,5-6,8	s	94 (2.2)	●	8	85 (3.4)	
<b>International Avg.</b>				<b>66 (0.5)</b>			<b>63 (0.5)</b>	
<b>Benchmarking Participants</b>								
Basque Country, Spain	⊙	10		66 (5.2)	○	10	57 (4.8)	
Indiana State, US	●	--		84 (5.1)	●	--	92 (3.2)	
Ontario Province, Can.	●	5,7-8		57 (4.7)	●	8	79 (3.3)	
Quebec Province, Can.	○	11	r	9 (2.1)	⊙	10	r	34 (4.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

○ Only the more able students  
 ⊙ All or almost all 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.  
 ‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).  
 ( ) 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.

68 percent for the “Earth’s water cycle” to 54 percent for “weather data and maps, and changes in weather patterns.”

Environmental science had just three topics in the TIMSS eighth-grade science assessment; and, as noted earlier, did not receive as much emphasis as topics in other areas either in the intended or the implemented curriculum. As shown in detail in Exhibit 5.13, the three topics were included for most students in the intended curricula of between 30 and 39 participants. “Changes in environments” and “use and conservation of natural resources” were included in the curricula of 39 and 38 participants, respectively, and had the greatest percentages of students who were taught them – 53 percent and 56 percent, respectively. “Trends in human population and its effects on the environment” was included in 30 participants’ curricula and was taught to just 38 percent of students, on average.

At the fourth grade, 10 of the 32 TIMSS science topics were in life science. As shown in Exhibit 5.14, three of the topics – “types, characteristics, and classification of living things,” “major body structures and their function in humans and other organisms,” and “the general steps in the life cycle of familiar organisms” – were included in two-thirds or more of participants’ intended curricula and were generally well-covered in the classroom. On average, 82 percent, 77 percent, and 78 percent of students, respectively, were taught these topics. The remaining life science topics were included in fewer participants’ curricula, from a maximum of 17 to a minimum of 13. The average percentage of students taught these topics ranged from 80 percent for “ways of maintaining good health, including diet and exercise” to 53 percent for “plant and animal reproduction.”

As shown in Exhibit 5.15, the 13 TIMSS physical science topics vary considerably, both in terms of inclusion in the intended curriculum and in being taught in the classroom. Just three of the topics were included in the curricula of 20 or more participants – “classification of objects and materials based on physical properties,” “properties and uses of water,” and “changes in state of water by heating and

Exhibit 5.12: Intended and Taught TIMSS Earth Science Topics



Earth Science	Earth's structure and physical features			Water on the Earth			The Earth's atmosphere			Earth's water cycle						
	Countries	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	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic			
Armenia	●	5	s	98 (2.5)	●	5	98 (2.5)	●	5	s	98 (2.5)	●	5	s	98 (2.5)	
Australia	●	--	r	63 (3.9)	○	--	r	43 (4.2)	○	--	r	57 (3.9)	○	--	r	57 (3.5)
Bahrain	●	8		5 (1.4)	●	6-7	7 (1.5)	●	6-7		8 (2.1)	●	3-4,7		19 (2.6)	
Belgium (Flemish)	○	--	r	38 (4.0)	○	--	r	16 (2.6)	○	--	r	12 (2.4)	○	--	r	34 (4.0)
Botswana	○	10		2 (1.4)	○	11	14 (3.2)	○	11	r	6 (2.3)	●	8		64 (3.8)	
Bulgaria	●	8	r	98 (1.4)	●	8	r	100 (0.0)	●	8	r	100 (0.0)	●	8	r	100 (0.5)
Chile	○	--		77 (2.9)	○	9	84 (3.2)	○	9		92 (2.2)	○	9		89 (2.2)	
Chinese Taipei	○	9	--	--	○	9	--	○	9	--	--	●	8	--	--	
Cyprus	○	10		88 (0.6)	○	--	63 (2.0)	○	10		43 (1.9)	○	--		58 (1.8)	
Egypt	○	--		94 (1.9)	●	6	70 (4.1)	●	7		96 (1.5)	●	6		91 (2.5)	
Estonia	●	3-4,7-8,11		100 (0.0)	●	2,5,7,11	99 (1.4)	●	2,5,7-8,11		100 (0.0)	●	2,5,7-8,11		98 (1.2)	
Ghana	●	7-8		25 (4.1)	●	7-8	33 (4.2)	●	7-8		29 (4.2)	●	7-8		34 (4.9)	
Hong Kong, SAR	●	8		8 (2.3)	●	8	21 (3.3)	●	8		46 (4.9)	●	8		58 (4.3)	
Hungary	●	6		65 (4.3)	●	6	78 (4.1)	●	6,8		64 (4.1)	●	8		83 (3.6)	
Indonesia	●	8	--	--	○	10	--	○	11	--	--	●	6	--	--	
Iran, Islamic Rep. of	●	7-8		97 (1.0)	○	--	78 (3.6)	●	6,8		73 (3.6)	●	6,8		85 (2.8)	
Israel	●	7-12	s	53 (4.8)	●	5-8	64 (4.8)	●	5-8	s	64 (5.2)	●	5-8	s	59 (5.2)	
Italy	●	8		81 (2.8)	●	6-7	86 (2.4)	●	4,6-7		85 (2.5)	●	3-6		90 (2.4)	
Japan	●	7,10-12		69 (3.3)	●	5,6,10-12	33 (3.7)	●	7,10-12		61 (4.0)	●	8,10-12		33 (3.8)	
Jordan	●	1-5		86 (2.9)	●	1,6	57 (4.2)	●	1-2,6		40 (4.2)	●	3,6,8		81 (3.5)	
Korea, Rep. of	●	7	s	76 (3.3)	●	7	65 (3.8)	●	7	s	71 (3.5)	○	9	s	51 (4.0)	
Latvia	●	6	--	--	●	6-7	--	●	6	--	--	●	7	--	--	
Lebanon	●	--	r	57 (4.5)	●	--	r	45 (5.9)	●	--	r	44 (6.1)	●	--	r	57 (5.5)
Lithuania	●	5-8		98 (1.1)	●	7-8	r	96 (1.7)	●	5-8		98 (1.5)	●	5-8		98 (1.1)
Macedonia, Rep. of	●	5		94 (2.2)	●	5	94 (2.0)	●	5		94 (1.8)	●	5		94 (2.3)	
Malaysia	○	9		15 (3.0)	○	10	35 (4.3)	●	7		24 (3.9)	●	8		79 (3.5)	
Moldova, Rep. of	●	5	r	81 (3.9)	●	5	r	83 (3.9)	●	5	r	79 (4.7)	●	5	r	81 (4.4)
Morocco	○	--	s	43 (5.6)	○	--	15 (5.1)	○	--	s	9 (4.1)	○	--	s	13 (4.9)	
Netherlands	●	--	r	89 (2.8)	○	10	r	73 (4.5)	○	10	r	67 (5.4)	●	--	r	74 (4.1)
New Zealand	●	8-9		23 (3.2)	●	4-5	18 (3.8)	●	8-9		35 (5.0)	●	4-5		53 (6.3)	
Norway	●	8		85 (2.8)	●	8	58 (4.3)	●	8		78 (3.6)	●	7-8		57 (4.8)	
Palestinian Nat'l Auth.	●	3,8		70 (3.6)	○	--	36 (4.5)	●	4,8		47 (4.3)	●	4,8		69 (4.0)	
Philippines	●	7	r	81 (3.3)	●	7	r	75 (3.9)	●	7	r	78 (3.7)	○	8	r	81 (3.4)
Romania	○	9		99 (1.0)	●	5,9	97 (1.6)	●	5,9		98 (1.3)	●	4,5,9		94 (2.1)	
Russian Federation	●	6-8	--	--	●	6-8	--	●	7	--	--	●	7	--	--	
Saudi Arabia	●	--		95 (1.8)	●	--	72 (4.5)	●	--		96 (1.7)	●	--		84 (3.9)	
Scotland	●	6	s	44 (4.3)	○	8	32 (3.3)	●	6	s	64 (3.9)	●	8	s	70 (4.2)	
Serbia	●	5		95 (2.0)	●	5	95 (2.0)	●	5		95 (1.9)	●	5		95 (2.0)	
Singapore	●	7		13 (2.1)	●	7	14 (2.3)	●	7		23 (2.2)	●	7		35 (2.8)	
Slovak Republic	●	5-6		99 (0.5)	●	5-6	94 (2.2)	●	5		90 (3.2)	●	5-6		97 (1.4)	
Slovenia	●	6	--	--	●	7	--	●	6	--	--	●	7	--	--	
South Africa	○	--	r	39 (4.1)	○	--	r	41 (4.4)	○	--	r	38 (4.5)	○	--	r	50 (4.6)
Sweden	●	6	x x	--	●	5	x x	●	7-8	x x	--	●	8	s	62 (4.8)	
Syrian Arab Republic	○	9,11	--	--	●	--	--	○	9	--	--	●	--	--	--	
Tunisia	○	11		31 (4.2)	○	11	12 (2.7)	○	11		7 (2.2)	○	11		17 (3.1)	
United States	●	--	r	90 (1.9)	●	--	r	88 (2.1)	●	--	r	86 (1.8)	●	--	r	90 (2.0)
‡ England	○	--	x x	--	●	6-7	x x	○	--	x x	--	●	4	x x	--	
<b>International Avg.</b>				<b>66 (0.5)</b>												<b>68 (0.6)</b>
<b>Benchmarking Participants</b>																
Basque Country, Spain	●	--		87 (3.5)	●	--	90 (3.0)	●	--		95 (2.3)	●	--		85 (3.5)	
Indiana State, US	●	--		92 (3.4)	●	--	89 (3.7)	●	--		86 (5.0)	●	--		91 (3.7)	
Ontario Province, Can.	●	7		87 (3.2)	●	8	69 (4.7)	○	9-10		67 (4.3)	●	8		71 (4.9)	
Quebec Province, Can.	●	--	r	81 (3.8)	●	--	r	84 (3.3)	●	--	r	90 (2.3)	●	--	r	93 (1.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

○ Not included in the curriculum through eighth grade

● Only the more able students

● All or almost all students

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.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

( ) 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 5.12: Intended and Taught TIMSS Earth Science Topics (Continued...)



Earth Science	Processes in the rock cycle and the formation of rocks			Weather data/maps, and changes in weather patterns			Geological processes occurring over billions of years			Formation of fossils and fossil fuels						
	Countries	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	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic			
Armenia	●	5	s	96 (2.8)	●	5	98 (2.5)	●	5	s	95 (3.0)	●	5	s	96 (2.8)	
Australia	●	--	r	56 (3.5)	●	--	r	25 (3.8)	●	--	r	43 (3.9)	○	10	r	45 (3.9)
Bahrain	○	--		5 (1.6)	●	3,6	12 (2.6)	○	--		5 (1.2)	○	--		4 (1.6)	
Belgium (Flemish)	○	--	r	28 (3.3)	⊙	--	r	70 (3.7)	○	--	r	22 (3.5)	○	--	r	17 (3.1)
Botswana	○	10		2 (1.2)	○	10	2 (1.3)	○	11		4 (1.9)	●	8		73 (3.8)	
Bulgaria	●	8	r	96 (1.9)	●	8	r	99 (1.4)	●	8	r	93 (2.5)	○	--	r	79 (3.6)
Chile	○	--		39 (4.1)	○	--		55 (3.8)	○	10		63 (3.9)	●	7,9		63 (3.8)
Chinese Taipei	○	9	--		○	9	--		○	9	--		○	9	--	
Cyprus	○	--		69 (1.5)	○	10	95 (1.3)	○	--		91 (0.8)	○	--		60 (2.6)	
Egypt	●	7		99 (0.7)	○	--		78 (3.4)	○	--		94 (1.9)	○	--		62 (4.3)
Estonia	●	4,7,11		100 (0.0)	●	1-2,6-8,11	100 (0.5)	●	4,7,11		99 (0.9)	●	4,5,7,9,11		89 (3.1)	
Ghana	●	8-9		41 (4.8)	●	8-9	30 (4.4)	●	7-8		32 (4.0)	●	7-8		15 (3.2)	
Hong Kong, SAR	○	11		2 (1.4)	●	8	6 (2.2)	●	8		3 (1.7)	●	7		41 (4.8)	
Hungary	●	5		91 (2.6)	●	6,8	94 (2.1)	●	5		96 (1.8)	●	6		82 (3.5)	
Indonesia	●	5	--		○	10	--		○	10	--		○	9	--	
Iran, Islamic Rep. of	●	7-8		98 (1.2)	○	9-11	36 (3.6)	○	9-11		88 (2.5)	○	9-11		87 (3.0)	
Israel	●	7-8	s	36 (4.9)	●	7-8	35 (5.4)	○	--	s	38 (5.2)	●	5-8	s	32 (5.5)	
Italy	●	8		59 (3.6)	●	6-8	61 (3.7)	●	8		77 (2.8)	●	8		65 (3.3)	
Japan	●	7,10-12		92 (2.0)	●	5,8,10-12	58 (4.5)	●	7,10-12		89 (2.2)	●	6,7,10-12		48 (4.5)	
Jordan	●	3-4		74 (3.7)	●	5	42 (4.4)	●	5		58 (3.8)	●	6,8		93 (2.0)	
Korea, Rep. of	●	7	s	76 (3.2)	○	9	30 (3.6)	●	8	s	89 (2.5)	●	8	s	80 (3.2)	
Latvia	●	7	--		●	7	--		●	7	--		●	6	--	
Lebanon	●	--	r	75 (4.0)	●	--	r	30 (5.7)	○	--	r	65 (5.2)	○	--	r	66 (5.0)
Lithuania	●	7-8		98 (1.1)	●	5-8	r	99 (0.9)	●	7-8	r	99 (0.9)	●	5-8	r	81 (3.6)
Macedonia, Rep. of	●	5		94 (2.3)	●	5	94 (2.1)	●	5		92 (2.4)	●	5-8	r	77 (3.8)	
Malaysia	○	9		9 (2.5)	○	10	16 (3.2)	○	10		13 (2.7)	○	9		37 (4.2)	
Moldova, Rep. of	●	5	r	80 (4.3)	●	5	r	89 (3.3)	●	5	r	84 (3.6)	●	5	r	75 (5.1)
Morocco	○	--	s	63 (6.1)	○	--		14 (5.2)	○	--	s	52 (6.1)	○	--	s	93 (3.8)
Netherlands	⊙	--	r	37 (5.3)	●	--	r	81 (4.2)	●	--	r	82 (3.8)	○	--	r	30 (5.1)
New Zealand	○	10		16 (3.8)	●	6-7	26 (4.3)	⊙	8-9		12 (3.1)	●	6-7		11 (3.2)	
Norway	○	--		48 (4.4)	●	4,7	46 (4.7)	●	8		66 (4.1)	●	8		59 (4.2)	
Palestinian Nat'l Auth.	●	8,11-12		77 (3.4)	●	8-9	34 (4.2)	○	--		42 (4.1)	○	--		76 (3.7)	
Philippines	●	7	r	78 (3.6)	●	7	r	74 (4.1)	●	7	r	74 (4.0)	●	7	r	79 (3.8)
Romania	○	9		93 (2.0)	●	5,9	97 (1.3)	○	9		96 (1.7)	○	--		78 (3.4)	
Russian Federation	●	6-8	--		●	7	--		●	7-8	--		●	7-8	--	
Saudi Arabia	●	--		91 (2.8)	○	--		38 (6.7)	○	11-12		55 (4.4)	○	11-12		46 (5.6)
Scotland	●	6	s	45 (4.1)	○	--		11 (2.2)	●	--	s	24 (3.8)	●	6	s	63 (4.2)
Serbia	●	5		95 (2.0)	●	5	94 (2.1)	●	5		96 (1.8)	●	5		86 (2.9)	
Singapore	●	7		8 (1.9)	●	7	10 (1.9)	●	7		11 (2.0)	○	--		32 (2.9)	
Slovak Republic	●	5,8		79 (4.1)	●	5,8	90 (3.2)	●	5,8		91 (2.9)	●	7		67 (5.2)	
Slovenia	●	6	--		●	5-6	--		○	10	--		●	8-9	--	
South Africa	○	--	r	26 (4.0)	○	--	r	37 (4.6)	○	--	r	39 (4.3)	○	--	r	35 (3.7)
Sweden	○	9	x	x	●	7-8	x	x	○	9	x	x	●	8-9	s	44 (5.3)
Syrian Arab Republic	●	--	--		○	10	--		●	--	--		●	--	--	
Tunisia	○	11		88 (2.6)	○	10	29 (4.5)	○	11		42 (3.9)	○	11		58 (3.9)	
United States	●	--	r	84 (2.1)	●	--	r	80 (2.4)	○	--	r	86 (2.1)	●	--	r	82 (2.5)
‡ England	●	7	x	x	●	7	x	x	○	--	x	x	○	--	x	x
<b>International Avg.</b>				<b>63 (0.5)</b>				<b>54 (0.6)</b>				<b>62 (0.5)</b>				<b>60 (0.6)</b>
<b>Benchmarking Participants</b>																
Basque Country, Spain	⊙	10		83 (3.7)	⊙	10	69 (5.3)	○	10		66 (4.9)	⊙	9		62 (5.0)	
Indiana State, US	●	--		86 (4.7)	●	--		86 (5.0)	●	--		90 (3.8)	●	--		89 (4.4)
Ontario Province, Can.	●	7		86 (3.1)	●	5	76 (4.2)	●	7	r	81 (4.2)	●	7		78 (4.2)	
Quebec Province, Can.	●	--	r	58 (5.2)	●	--	r	83 (3.1)	●	--	x	x	⊙	--	r	70 (4.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

○ Not included in the curriculum through eighth grade

● Only the more able students

⊙ All or almost all students

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.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

( ) 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 5.12: Intended and Taught TIMSS Earth Science Topics (...Continued)

Earth Science	Explanation of phenomena on Earth			The physical features of Earth			The sun as a star					
	Countries	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		
Armenia	●	5	s	96 (2.9)	●	5	93 (3.3)	●	5	91 (3.7)		
Australia	●	--	r	69 (3.5)	●	--	r	66 (3.8)	○	--	r	63 (3.4)
Bahrain	●	2,6-8		30 (2.5)	●	7-8	13 (2.4)	●	2,6-7	19 (2.7)		
Belgium (Flemish)	○	--	r	17 (3.2)	○	--	r	8 (2.1)	○	--	r	4 (1.7)
Botswana	○	10		3 (1.5)	○	10	1 (1.0)	○	10	3 (1.7)		
Bulgaria	●	8	r	99 (0.9)	●	8	r	91 (2.8)	●	8	r	84 (3.3)
Chile	●	5,10		81 (3.5)	●	4,10	82 (3.4)	●	4,10	82 (3.4)		
Chinese Taipei	○	10	--		○	10	--	●	8	--		
Cyprus	○	--		96 (0.6)	○	--	89 (1.6)	○	--	88 (0.9)		
Egypt	●	6		98 (1.1)	●	6	97 (1.5)	●	6	100 (0.0)		
Estonia	●	4,7		99 (0.6)	●	7	85 (3.2)	●	4,7	76 (3.5)		
Ghana	●	8-9		37 (4.5)	●	8-9	42 (4.8)	●	8-9	39 (4.6)		
Hong Kong, SAR	●	6		10 (2.9)	○	--	14 (3.3)	●	6	20 (3.7)		
Hungary	●	6		42 (4.0)	○	9	44 (4.4)	●	8	41 (4.4)		
Indonesia	●	6	--		○	11	--	●	6	--		
Iran, Islamic Rep. of	○	9-11		86 (2.6)	○	9-11	70 (3.6)	○	9-11	79 (2.8)		
Israel	●	5-8	s	47 (5.3)	●	5-8	45 (5.1)	●	5-8	36 (5.2)		
Italy	●	8		71 (3.1)	●	8	67 (3.3)	●	8	67 (3.3)		
Japan	●	4,9-12		6 (1.5)	○	9-12	8 (1.7)	○	9-12	8 (2.0)		
Jordan	●	3-7		71 (4.2)	●	3-4,7	49 (5.1)	●	4,7	74 (4.1)		
Korea, Rep. of	○	9-10	s	45 (4.0)	○	9	56 (3.8)	○	9	66 (3.7)		
Latvia	○	--	--		○	--	--	○	--	--		
Lebanon	○	--	r	49 (5.2)	○	--	r	41 (5.3)	○	--	r	33 (5.1)
Lithuania	●	5-8	r	95 (2.0)	●	5-8	r	88 (2.8)	●	5-8	r	91 (2.7)
Macedonia, Rep. of	○	9		94 (1.9)	○	12	95 (1.9)	●	5	r	94 (2.0)	
Malaysia	○	9		19 (3.3)	○	9	12 (2.5)	○	9	15 (2.7)		
Moldova, Rep. of	●	6	r	75 (4.4)	●	6	r	73 (4.5)	●	6	r	70 (4.5)
Morocco	○	--	s	15 (4.0)	○	--	9 (2.3)	○	--	x x		
Netherlands	●	--	r	57 (5.4)	○	10	r	32 (5.3)	○	10	r	28 (4.9)
New Zealand	●	1-9		67 (4.1)	⊙	8-9	67 (4.9)	●	8-9	74 (4.5)		
Norway	●	4,8		87 (2.9)	●	8	82 (3.3)	●	8	81 (3.5)		
Palestinian Nat'l Auth.	●	4-8		84 (3.1)	●	7-8	57 (4.5)	●	4,8	78 (3.7)		
Philippines	●	7	r	79 (3.5)	●	7	r	76 (3.7)	●	7	r	76 (3.9)
Romania	●	5,9		98 (1.2)	●	5,9	98 (1.4)	●	5,9	96 (1.7)		
Russian Federation	●	5,11	--		○	11	--	●	5,11	--		
Saudi Arabia	●	--		84 (3.1)	○	--	84 (4.5)	●	--	96 (1.6)		
Scotland	●	7	s	38 (4.1)	●	6	36 (4.0)	●	2	39 (4.2)		
Serbia	●	5		95 (1.9)	●	5	93 (2.2)	●	5	94 (2.2)		
Singapore	○	--		15 (2.1)	○	--	9 (1.7)	●	3	11 (1.8)		
Slovak Republic	●	5-9		99 (0.7)	●	5	88 (3.3)	●	5	92 (2.7)		
Slovenia	●	6,9	--		●	6	--	●	6	--		
South Africa	○	--	r	36 (3.9)	○	--	r	37 (4.2)	○	--	r	32 (4.6)
Sweden	●	5-9	s	62 (5.3)	⊙	7-9	45 (5.1)	○	9	39 (5.2)		
Syrian Arab Republic	●	--	--		●	--	--	●	--	--		
Tunisia	○	10		10 (2.6)	○	10	7 (2.3)	○	--	3 (1.5)		
United States	●	--	r	87 (2.1)	●	--	r	86 (2.1)	●	--	r	87 (2.2)
‡ England	●	4,6,8	x x		●	--	x x	●	--	x x		
<b>International Avg.</b>				<b>61 (0.5)</b>			<b>56 (0.6)</b>			<b>58 (0.5)</b>		
<b>Benchmarking Participants</b>												
Basque Country, Spain	●	--		92 (3.2)	⊙	10	87 (3.8)	●	--	84 (4.0)		
Indiana State, US	●	--		90 (3.9)	●	--	90 (3.0)	●	--	91 (3.4)		
Ontario Province, Can.	●	6		73 (3.8)	●	6	67 (4.2)	●	6	75 (4.1)		
Quebec Province, Can.	●	--	r	80 (3.3)	○	11	r	72 (4.2)	⊙	--	r	68 (4.1)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

○ Not included in the curriculum through eighth grade

● Only the more able students

● All or almost all students

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.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

( ) 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 Environmental Science Topics



Environmental Science	Trends in human population and its effects on the environment			Use and conservation of natural resources			Changes in environments			
	Countries	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
Armenia	●	8,10	--	●	8,10	--	●	K-8	--	
Australia	○	--	r 25 (3.2)	○	--	r 46 (3.9)	●	--	r 40 (4.1)	
Bahrain	●	4-6	7 (2.1)	●	4-7	17 (2.4)	●	1,4,6-7	13 (2.0)	
Belgium (Flemish)	○	--	--	●	--	--	●	--	--	
Botswana	○	11	8 (2.5)	○	10	53 (4.5)	○	10	7 (2.2)	
Bulgaria	●	8	--	○	9	--	●	8-9	--	
Chile	○	--	64 (4.0)	●	5,8	88 (2.7)	●	6,8	84 (2.9)	
Chinese Taipei	○	9	--	○	9	--	○	9	--	
Cyprus	○	--	--	○	--	--	○	--	--	
Egypt	●	6,10	67 (3.7)	●	6	97 (1.2)	●	6,9	87 (2.8)	
Estonia	●	2,8-9	--	●	5-7	--	●	6-11	--	
Ghana	●	8-9	40 (4.5)	●	7-9	47 (4.6)	●	7-9	60 (4.6)	
Hong Kong, SAR	●	6	28 (4.6)	●	6	60 (5.0)	●	6	65 (5.0)	
Hungary	○	10	--	○	10	--	●	8	--	
Indonesia	○	9	--	●	5	--	●	7	--	
Iran, Islamic Rep. of	○	9-11	74 (3.4)	○	9-11	78 (3.3)	○	9-11	78 (3.5)	
Israel	●	5-8	s 36 (4.1)	●	5-8	38 (4.4)	●	5-8	s 44 (4.7)	
Italy	○	--	40 (3.8)	●	8	68 (3.8)	●	8	68 (3.9)	
Japan	○	--	0 (0.0)	●	6,9-12	2 (1.2)	○	9-12	2 (1.2)	
Jordan	●	6	49 (4.0)	●	4-6,8	81 (3.4)	●	6	60 (4.4)	
Korea, Rep. of	○	11	s 20 (3.0)	○	11	22 (3.0)	○	10	s 27 (3.3)	
Latvia	●	--	--	●	--	--	●	--	--	
Lebanon	○	--	s 48 (4.8)	○	--	72 (5.2)	○	12	s 60 (5.5)	
Lithuania	●	7-8	--	●	5-8	--	●	5-8	--	
Macedonia, Rep. of	●	5-8	--	●	5-8	--	●	5-8	--	
Malaysia	●	8	53 (4.2)	●	8	71 (3.9)	●	8	76 (3.6)	
Moldova, Rep. of	●	8-9	x x	●	8-9	x x	●	8-9	x x	
Morocco	○	--	--	○	--	--	○	--	--	
Netherlands	●	--	--	●	--	--	●	--	--	
New Zealand	○	--	18 (3.4)	○	8-9	42 (5.8)	○	8-9	31 (4.4)	
Norway	●	4,8,10	21 (4.0)	●	8-10	33 (4.4)	●	8-10	40 (4.6)	
Palestinian Nat'l Auth.	●	6-12	28 (4.0)	●	6,8-10	60 (4.3)	●	7-10	38 (4.3)	
Philippines	●	7	r 82 (4.2)	●	7	r 91 (2.8)	●	7	r 91 (3.0)	
Romania	○	10-11	--	○	10-11	--	●	5,10-11	--	
Russian Federation	●	7-8	--	●	7-8	--	●	7-8	--	
Saudi Arabia	●	--	63 (5.1)	●	--	65 (5.8)	●	--	75 (3.6)	
Scotland	○	--	s 23 (3.0)	●	8	60 (3.4)	○	8	s 41 (3.6)	
Serbia	●	6	--	●	6-7	--	●	5-7	--	
Singapore	●	8-10	27 (2.9)	●	8-10	57 (2.8)	●	8-10	60 (2.6)	
Slovak Republic	●	7,9	--	●	7,9	--	●	7,9	--	
Slovenia	●	8	--	●	7	--	●	8	--	
South Africa	○	--	r 52 (4.0)	●	--	r 70 (4.2)	○	--	r 65 (3.5)	
Sweden	●	8	s 24 (4.1)	●	7-9	43 (4.3)	●	7-9	s 37 (4.2)	
Syrian Arab Republic	●	--	--	●	--	--	●	--	--	
Tunisia	○	11	18 (3.6)	○	11	29 (4.2)	○	11	47 (3.8)	
United States	●	--	r 62 (3.4)	●	--	r 73 (3.0)	●	--	r 71 (3.3)	
‡ England	○	--	x x	●	7-8	x x	●	7-8	x x	
<b>International Avg.</b>			<b>38 (0.7)</b>			<b>56 (0.8)</b>			<b>53 (0.7)</b>	
<b>Benchmarking Participants</b>										
Basque Country, Spain	●	--	61 (5.3)	●	--	73 (4.4)	●	--	76 (4.6)	
Indiana State, US	●	--	77 (5.2)	●	--	83 (5.0)	●	--	81 (5.6)	
Ontario Province, Can.	●	7	65 (4.7)	●	5-8	77 (4.4)	●	7	79 (4.5)	
Quebec Province, Can.	○	9	r 61 (4.5)	●	--	r 78 (3.8)	●	--	r 75 (3.8)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

○ Not included in the curriculum through eighth grade

● Only the more able students

○ All or almost all students

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.  
 Data for percent of students taught the topic are not available for countries that teach science as separate subjects at grade 8.  
 ‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

( ) 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 5.14: Intended and Taught TIMSS Life Science Topics

Life Science	Types, characteristics, and classification of living things			Major body structures and their function in humans and other organisms			Bodily actions in response to outside conditions and exercise			The general steps in the life cycle of familiar organisms		
	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	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Armenia	●	--	x x	●	--	x x	●	--	x x	●	--	x x
Australia	●	--	r 85 (3.0)	●	--	r 70 (4.2)	●	--	r 76 (3.2)	●	--	r 90 (2.9)
Belgium (Flemish)	●	--	49 (3.9)	⊙	5	40 (4.0)	⊙	5	58 (4.2)	○	6	70 (3.4)
Chinese Taipei	●	3	91 (2.2)	●	3-4	92 (2.3)	●	3-4	69 (3.8)	●	3-4	76 (3.3)
Cyprus	●	4-5	96 (1.6)	●	1-6	77 (3.5)	○	--	50 (4.3)	●	1-3	68 (3.7)
England	●	1,3	r 84 (3.5)	●	K,4	r 85 (3.5)	●	3-4	r 82 (3.7)	●	4	r 85 (3.6)
Hong Kong, SAR	●	2	r 74 (4.6)	●	4	r 87 (3.4)	○	6	r 87 (3.3)	●	2	r 82 (4.6)
Hungary	●	2	95 (1.9)	●	2	89 (2.6)	○	7	86 (2.7)	●	4	69 (2.9)
Iran, Islamic Rep. of	●	1-4	91 (2.6)	●	2-4	94 (1.8)	●	1-4	71 (3.9)	○	5,6,8	76 (4.1)
Italy	●	4-6	97 (1.2)	●	4-7	71 (3.1)	●	4-6	50 (3.3)	●	4-7	93 (1.7)
Japan	●	3-12	53 (4.0)	●	3-12	30 (3.8)	●	4,6,8-12	24 (3.5)	●	3-12	85 (2.8)
Latvia	●	--	x x	●	--	x x	○	--	x x	○	6-9	x x
Lithuania	●	1-4	93 (1.8)	●	3-4	98 (1.2)	○	5-6	98 (0.8)	●	1-4	99 (0.8)
Moldova, Rep. of	●	--	r 81 (3.6)	●	--	r 95 (1.8)	●	--	r 87 (3.4)	●	--	r 85 (2.5)
Morocco	⊙	--	x x	⊙	--	x x	●	--	x x	⊙	--	x x
Netherlands	●	--	71 (4.6)	●	--	72 (4.0)	●	--	72 (4.0)	●	--	72 (4.1)
New Zealand	●	1-4	r 87 (2.4)	●	2-3	r 77 (3.4)	●	2-3	r 63 (3.7)	●	2-3	r 88 (2.0)
Norway	●	1,4-5,8	60 (4.0)	●	3-10	70 (3.6)	●	2-10	63 (4.4)	●	3-5	67 (4.2)
Philippines	○	5,8	98 (1.4)	●	3-4,8	96 (2.4)	○	5,8	91 (3.2)	●	4	98 (1.7)
Russian Federation	●	3-4	--	○	6-9	--	○	6-9	--	○	6-9	--
Scotland	●	--	s 83 (3.6)	○	--	s 73 (4.0)	○	--	s 69 (4.4)	●	--	s 74 (4.6)
Singapore	●	3	97 (1.4)	●	3-5	98 (1.3)	○	6	83 (3.3)	●	3	80 (3.5)
Slovenia	●	4	65 (4.5)	●	4	75 (4.1)	○	10	77 (4.0)	●	4	39 (4.5)
Tunisia	○	9	r 93 (2.4)	○	6	65 (4.1)	○	5	59 (4.0)	○	7	r 59 (4.6)
United States	●	--	r 83 (2.4)	●	--	71 (2.8)	○	--	r 69 (2.7)	●	--	80 (2.4)
Yemen	○	--	--	●	--	--	●	4	--	○	--	--
<b>International Avg.</b>			<b>82 (0.7)</b>			<b>77 (0.7)</b>			<b>71 (0.8)</b>			<b>78 (0.7)</b>
<b>Benchmarking Participants</b>												
Indiana State, US	●	--	84 (4.1)	○	5	77 (5.9)	●	--	80 (4.9)	○	5,6	81 (4.0)
Ontario Province, Can.	●	1-2	72 (4.8)	●	1-2	49 (4.9)	●	3-4	60 (5.1)	●	2	72 (4.6)
Quebec Province, Can.	●	3-4	73 (3.7)	●	--	61 (4.0)	○	5-7	60 (4.9)	○	5-7	64 (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) 2003

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

( ) 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 5.14: Intended and Taught TIMSS Life Science Topics (Continued...)



Life Science	Plant and animal reproduction			Physical features, behavior, and survival of plants and animals			Relationships in a living community			Changes in environments		
	Countries	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	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught
Armenia	●	K-4	x x	●	--	x x	●	--	x x	●	4,10	x x
Australia	●	--	r 44 (4.9)	●	--	r 73 (4.1)	●	--	r 80 (3.9)	●	--	r 79 (2.8)
Belgium (Flemish)	○	6	40 (4.0)	○	6	58 (3.7)	⊙	5	68 (3.8)	●	--	69 (3.7)
Chinese Taipei	○	5	43 (3.7)	○	6	77 (3.3)	○	5	41 (3.9)	○	6	82 (3.1)
Cyprus	●	2-3	50 (5.0)	⊙	4	59 (4.5)	●	2-3	88 (3.2)	●	3-5	57 (4.5)
England	●	4	r 67 (4.8)	●	3	r 65 (4.7)	○	--	r 60 (4.6)	○	--	r 45 (4.4)
Hong Kong, SAR	○	5	r 34 (4.8)	○	6	r 39 (3.5)	○	6	r 28 (4.9)	○	5	r 56 (4.5)
Hungary	●	4,8	74 (3.7)	●	4	81 (3.5)	●	4	89 (2.6)	●	4	92 (2.2)
Iran, Islamic Rep. of	○	5,6,8	45 (4.9)	●	1-4	50 (4.9)	○	5,8	53 (4.5)	○	5,8	79 (3.8)
Italy	●	4-7	71 (3.6)	●	4-7	85 (2.6)	●	3-8	95 (1.5)	●	3-8	80 (2.8)
Japan	○	5,9-12	24 (3.5)	○	9-12	55 (3.9)	○	9-12	10 (2.7)	○	9-12	8 (2.3)
Latvia	○	6-9	x x	●	--	x x	●	--	x x	●	--	x x
Lithuania	●	3-4	95 (1.5)	●	1-4	94 (1.9)	●	3-4	98 (0.8)	●	1-4	96 (1.4)
Moldova, Rep. of	●	--	r 62 (4.4)	●	--	r 78 (3.6)	●	--	r 83 (3.3)	●	--	r 88 (2.5)
Morocco	⊙	--	x x	⊙	--	x x	⊙	--	x x	⊙	--	x x
Netherlands	●	--	48 (4.8)	●	--	64 (4.8)	●	--	66 (5.0)	●	--	66 (4.7)
New Zealand	○	6-11	r 44 (3.5)	●	4-5	r 75 (3.0)	○	6-9	r 80 (2.8)	⊙	4-5	r 70 (3.0)
Norway	●	3	31 (4.4)	●	3-4	38 (4.0)	●	3-4	74 (4.0)	●	1,4	72 (3.6)
Philippines	●	4-5,8	99 (0.9)	●	4-6,8	84 (3.7)	○	6,8	68 (4.2)	○	5-7	95 (2.3)
Russian Federation	○	6-9	--	○	6-8	--	○	6-8	--	●	3-4	--
Scotland	○	--	s 32 (4.7)	⊙	--	s 49 (5.3)	●	--	s 52 (5.4)	○	--	s 45 (4.7)
Singapore	○	5	63 (4.2)	○	6	52 (3.8)	○	6	39 (4.4)	○	6	69 (4.2)
Slovenia	●	3-4	37 (3.8)	●	4	35 (4.4)	●	3-5	37 (4.7)	○	5	93 (2.5)
Tunisia	○	7	r 67 (3.5)	○	7	r 46 (4.4)	○	11	r 35 (4.2)	○	11	r 80 (3.8)
United States	●	--	r 53 (3.0)	●	--	82 (2.4)	●	--	87 (2.3)	●	--	r 78 (2.5)
Yemen	●	4,9, 11-12	--	●	4,11-12	--	●	4,11	--	○	7,12	--
<b>International Avg.</b>			<b>53 (0.9)</b>			<b>64 (0.9)</b>			<b>64 (0.8)</b>			<b>71 (0.7)</b>
<b>Benchmarking Participants</b>												
Indiana State, US	○	5,6	53 (6.0)	○	6	78 (5.1)	●	--	90 (4.1)	○	6	88 (3.5)
Ontario Province, Can.	●	4	46 (4.6)	●	2-3	73 (5.0)	●	4	73 (5.0)	●	4	73 (5.0)
Quebec Province, Can.	○	5-7	51 (4.4)	○	5-7	50 (4.6)	●	3-4	61 (4.5)	⊙	6	57 (4.2)

● 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.  
 ( ) 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.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Exhibit 5.14: Intended and Taught TIMSS Life Science Topics (...Continued)

Life Science	Ways that common communicable diseases are transmitted			Ways of maintaining good health, including diet and exercise			
	Countries	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
Armenia	●	4,8	x x	●	4,10	x x	
Australia	○	--	r 46 (4.3)	○	--	r 92 (2.3)	
Belgium (Flemish)	◉	6	55 (3.6)	◉	6	85 (2.7)	
Chinese Taipei	○	7	42 (4.0)	○	7	67 (3.6)	
Cyprus	○	--	24 (3.9)	◉	4	43 (4.2)	
England	○	--	r 39 (4.6)	●	4	r 92 (2.4)	
Hong Kong, SAR	○	5	r 60 (5.0)	●	4	r 95 (2.3)	
Hungary	●	3	85 (2.5)	●	4	97 (1.5)	
Iran, Islamic Rep. of	○	5,6	50 (4.8)	●	1-4	79 (3.4)	
Italy	○	5-8	27 (2.6)	○	--	49 (3.4)	
Japan	○	--	22 (3.5)	○	--	40 (4.1)	
Latvia	○	5	x x	○	5	x x	
Lithuania	●	3-4	93 (1.8)	●	1-4	95 (1.7)	
Moldova, Rep. of	●	--	r 79 (3.4)	●	--	r 90 (2.6)	
Morocco	◉	--	x x	◉	--	x x	
Netherlands	●	--	35 (4.8)	●	--	85 (3.6)	
New Zealand	●	K-12	r 52 (3.8)	●	K-12	r 97 (0.8)	
Norway	●	2	72 (3.6)	●	2	82 (3.1)	
Philippines	○	5	88 (3.3)	●	3-6	93 (2.8)	
Russian Federation	●	3-4	--	●	3-4	--	
Scotland	●	--	s 36 (4.6)	●	--	s 87 (4.0)	
Singapore	○	--	15 (3.0)	○	--	51 (3.9)	
Slovenia	●	3	76 (3.9)	●	2	91 (2.7)	
Tunisia	○	--	90 (2.5)	○	--	85 (2.9)	
United States	●	--	55 (3.3)	○	--	79 (2.8)	
Yemen	○	6-8,10	--	○	6,8-10	--	
<b>International Avg.</b>			<b>54 (0.8)</b>			<b>80 (0.7)</b>	
<b>Benchmarking Participants</b>							
Indiana State, US	●	--	85 (4.7)	●	--	92 (3.4)	
Ontario Province, Can.	●	2-4	40 (4.9)	●	4	81 (3.6)	
Quebec Province, Can.	○	--	38 (4.4)	○	--	71 (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) 2003

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

( ) 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.

cooling.” These were taught, respectively, to 61 percent, 80 percent, and 83 percent of students, on average. The remaining topics were in the intended curricula of between 13 and 19 participants, with the percentage of students taught the topics ranging from 35 to 69 percent, on average. The topics taught to the least percentages of students were “properties and uses of metals” (38%) and “forming and separating mixtures” (35%).

As described before, earth science topics did not figure prominently in the intended fourth-grade science curricula of the participating countries, and they were taught to fewer students than the other science content areas. As shown in Exhibit 5.16, “water on Earth” was the topic included in the curriculum of most participants (18). Other topics included in the curricula of about half the participants were: “rocks, minerals, sand, and soil,” “air,” “common features of the Earth’s landscape,” “Earth’s water cycle,” and “weather conditions from day to day or over the seasons.” The percentage of students taught these topics, on average, ranged from 41 percent (rocks, minerals, sand, and soil) to 81 percent (Earth’s water cycle). “Fossils of animals and plants” was included in the curriculum of the fewest participants and had the lowest percentage of students taught the topic (27%).

Exhibit 5.15: Intended and Taught TIMSS Physical Science Topics

Physical Science	Classification of objects and materials based on physical properties			Properties and uses of metals			Forming and separating mixtures			Properties and uses of water		
	Countries	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	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught
Armenia	●	4,6	x x	●	4,6	x x	●	--	x x	●	4	x x
Australia	●	--	r 55 (4.4)	○	--	r 21 (3.9)	●	--	r 26 (4.3)	○	--	r 69 (4.7)
Belgium (Flemish)	⊙	5	17 (2.8)	○	7	3 (1.3)	○	7	3 (1.2)	●	--	70 (4.1)
Chinese Taipei	●	3-4	49 (4.1)	●	4	30 (4.0)	○	8	28 (3.4)	●	3-4	90 (2.5)
Cyprus	●	1-5	76 (3.7)	○	--	24 (3.8)	●	3	57 (4.0)	●	4-5	68 (4.2)
England	●	K-4	r 95 (2.2)	○	--	r 78 (3.7)	●	3	r 70 (4.7)	●	4	r 80 (4.1)
Hong Kong, SAR	●	1	r 58 (5.4)	○	9	r 59 (5.3)	○	7	r 24 (4.7)	●	3	r 85 (3.9)
Hungary	●	2	86 (2.7)	●	2	49 (4.5)	○	7	28 (4.1)	●	2	93 (1.7)
Iran, Islamic Rep. of	●	1-2,4	55 (4.6)	○	9	43 (4.2)	●	2-4	93 (1.9)	●	1,3-4	70 (4.6)
Italy	●	3,6-8	76 (3.3)	○	6-8	43 (3.6)	●	3,6-8	64 (3.3)	●	3,6-8	95 (1.7)
Japan	●	3-12	26 (3.7)	●	3,4,6-12	48 (4.1)	○	5-7,10-12	5 (1.8)	●	4,7,10-12	65 (3.9)
Latvia	○	8-9	x x	○	8-9	x x	○	8-9	x x	○	8-9	x x
Lithuania	●	1-4	68 (3.4)	●	3-4	51 (3.6)	●	3-4	21 (2.8)	●	3-4	98 (0.9)
Moldova, Rep. of	●	--	r 70 (3.9)	●	--	r 35 (4.5)	●	--	r 36 (4.5)	●	--	r 94 (1.9)
Morocco	○	--	x x	○	--	x x	○	--	x x	⊙	--	x x
Netherlands	○	--	24 (4.3)	○	--	14 (3.4)	○	--	6 (2.3)	○	--	65 (4.6)
New Zealand	●	2-5	r 74 (3.1)	⊙	4-5	r 30 (3.3)	●	2-5	r 46 (3.4)	●	4-5	r 68 (3.2)
Norway	●	1	20 (3.3)	●	1-3	11 (2.6)	○	5	7 (2.3)	●	3	83 (2.9)
Philippines	●	3-4,7,9	89 (3.0)	○	9	58 (4.7)	●	4,9	89 (3.4)	●	3,7,9	93 (2.0)
Russian Federation	●	3-4	--	○	8	--	○	8	--	●	3-4	--
Scotland	●	--	s 57 (4.9)	●	--	s 19 (3.9)	⊙	--	s 29 (4.2)	●	--	s 73 (4.3)
Singapore	●	3-4,6	99 (0.5)	●	3,6	63 (3.8)	○	--	21 (3.3)	●	4	90 (2.5)
Slovenia	●	1	62 (4.4)	●	4	25 (4.3)	●	4	29 (3.8)	●	2,5	94 (1.9)
Tunisia	○	10	r 61 (4.5)	○	10	48 (4.6)	○	10	16 (3.3)	○	10	70 (3.6)
United States	●	--	74 (2.9)	○	--	35 (2.6)	●	--	31 (2.5)	●	--	r 71 (2.7)
Yemen	●	--	--	○	5,10	--	○	7	--	●	--	--
<b>International Avg.</b>			<b>61 (0.8)</b>			<b>38 (0.8)</b>			<b>35 (0.8)</b>			<b>80 (0.7)</b>
<b>Benchmarking Participants</b>												
Indiana State, US	●	--	72 (6.0)	○	5-8	33 (4.4)	○	6	32 (5.4)	○	5,6	74 (6.1)
Ontario Province, Can.	●	1	66 (4.5)	●	1	47 (4.9)	○	7	16 (4.2)	●	2	r 59 (5.3)
Quebec Province, Can.	●	--	49 (4.3)	○	--	24 (3.9)	●	--	21 (3.5)	●	--	70 (4.0)

● 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) 2003

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.

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

A dash (--) indicates 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 5.15: Intended and Taught TIMSS Physical Science Topics (Continued...)

Physical Science	Chemical and physical changes			States of matter and differences in their physical properties			Changes in state of water by heating and cooling			Common energy sources/forms and their practical uses		
	Countries	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	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught
Armenia	●	4	x x	●	4	x x	●	4	x x	●	4	x x
Australia	○	5	r 33 (4.4)	●	--	r 39 (4.2)	●	--	r 72 (4.0)	●	--	r 70 (3.7)
Belgium (Flemish)	○	7	16 (2.4)	○	6	28 (2.8)	●	--	69 (3.8)	●	--	52 (3.5)
Chinese Taipei	○	5	42 (4.0)	○	6	67 (4.0)	●	3-4	75 (4.0)	○	6	89 (2.2)
Cyprus	○	--	18 (3.5)	●	2-4	76 (4.6)	●	2,4	90 (2.4)	○	6	38 (4.3)
England	○	--	r 48 (5.0)	●	4	r 94 (1.9)	●	4	r 95 (2.0)	○	--	r 43 (5.1)
Hong Kong, SAR	●	4	r 77 (4.7)	○	7	r 85 (3.8)	●	3	r 90 (3.3)	○	5	r 64 (5.5)
Hungary	○	7	41 (4.3)	●	3	89 (2.4)	●	3	95 (1.4)	○	7	67 (4.8)
Iran, Islamic Rep. of	○	5	25 (4.4)	●	2-4	80 (3.7)	●	2-4	61 (4.3)	●	1-4	68 (4.3)
Italy	●	4-8	65 (3.7)	●	3,6-7	89 (2.4)	●	3,6	94 (1.8)	○	5,8	48 (3.4)
Japan	●	4-12	6 (2.0)	●	4,7,10-12	61 (4.1)	●	4,7,10-12	65 (4.1)	○	9-12	37 (4.5)
Latvia	○	8-9	x x	○	8-9	x x	○	8-9	x x	●	--	x x
Lithuania	●	3-4	73 (3.3)	●	3-4	55 (3.5)	●	3-4	87 (2.2)	●	1-4	97 (1.4)
Moldova, Rep. of	●	--	r 53 (5.0)	●	--	r 93 (1.9)	●	--	r 96 (1.6)	●	--	r 65 (4.2)
Morocco	○	--	x x	○	--	x x	⊙	--	x x	○	--	x x
Netherlands	●	--	28 (4.5)	○	--	22 (4.2)	○	--	65 (4.7)	●	--	64 (4.4)
New Zealand	⊙	4-5	r 43 (3.5)	⊙	2-5	r 53 (3.6)	●	2-3	r 79 (2.7)	○	6-7	r 56 (3.5)
Norway	●	1	48 (4.4)	●	3	42 (4.6)	●	3	88 (2.3)	○	10	70 (3.8)
Philippines	○	5	93 (2.9)	●	3	95 (1.6)	○	5	94 (2.4)	●	3,5,7,10	91 (3.1)
Russian Federation	○	6-7	--	●	3-4	--	●	3-4	--	○	6-7	--
Scotland	○	--	s 13 (3.3)	○	--	s 48 (5.3)	○	--	s 76 (4.4)	●	--	s 51 (4.6)
Singapore	○	6	26 (3.5)	●	4	96 (1.6)	●	4	98 (1.1)	○	6	83 (3.2)
Slovenia	○	7	25 (4.3)	●	4	69 (4.0)	○	5	86 (3.4)	○	6	80 (3.7)
Tunisia	○	10	r 73 (3.5)	○	10	r 90 (2.9)	○	10	r 87 (3.3)	○	9	87 (3.0)
United States	○	--	r 56 (3.3)	●	--	r 74 (2.9)	●	--	r 80 (2.6)	●	--	r 68 (3.2)
Yemen	○	6	--	○	7,10	--	●	4,6	--	●	4,6,9-11	--
<b>International Avg.</b>			<b>43 (0.8)</b>			<b>69 (0.8)</b>			<b>83 (0.7)</b>			<b>66 (0.9)</b>
<b>Benchmarking Participants</b>												
Indiana State, US	○	8	61 (5.9)	○	5	76 (5.3)	○	5	81 (4.9)	●	--	67 (5.5)
Ontario Province, Can.	●	3-4	36 (4.8)	●	2	49 (5.3)	●	2	61 (4.4)	●	1	64 (4.6)
Quebec Province, Can.	○	6	17 (3.4)	●	--	54 (4.6)	○	7	75 (3.8)	●	--	38 (4.4)

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

A dash (–) indicates 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.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Exhibit 5.15: Intended and Taught TIMSS Physical Science Topics (...Continued)

Physical Science	Heat flow and temperature			Common sources of light and related phenomena			Common uses of electricity and electrical circuits			Magnets		
	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	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Armenia	●	4,6	x x	⊙	6	x x	○	8	x x	●	--	x x
Australia	●	--	r 33 (4.6)	●	--	r 30 (4.4)	●	--	r 32 (4.7)	●	--	r 53 (5.3)
Belgium (Flemish)	●	--	73 (3.4)	⊙	5	22 (3.1)	○	7	9 (1.8)	○	7	16 (2.7)
Chinese Taipei	●	4	77 (3.7)	○	8	76 (3.5)	●	3-4	67 (4.3)	●	2	74 (3.8)
Cyprus	●	3	44 (4.3)	●	2-3	30 (4.1)	●	4	75 (4.0)	●	2-3	66 (4.4)
England	●	3	r 45 (4.7)	●	K,2	r 69 (5.3)	●	1,3	r 85 (3.6)	●	2	r 83 (4.0)
Hong Kong, SAR	●	2	r 66 (5.1)	●	3	r 70 (4.6)	●	4	r 93 (2.4)	●	1	r 72 (5.5)
Hungary	○	5	73 (4.2)	○	5	49 (4.1)	○	8	21 (3.5)	●	3	74 (4.0)
Iran, Islamic Rep. of	○	7	61 (4.8)	○	5	76 (4.1)	●	4	96 (1.6)	●	1,4	98 (1.1)
Italy	○	6-8	49 (3.8)	○	6-8	34 (3.4)	○	6-8	11 (2.1)	○	6-8	14 (2.1)
Japan	○	5,9-12	77 (3.6)	●	3,7,10-12	33 (4.0)	●	3,4,8,10-12	81 (3.3)	●	3	91 (2.6)
Latvia	●	--	x x	○	8-9	x x	○	8-9	x x	○	8-9	x x
Lithuania	●	1-4	92 (2.0)	●	3-4	73 (3.6)	●	1-4	77 (3.2)	●	3-4	51 (4.0)
Moldova, Rep. of	●	--	r 62 (4.5)	●	--	r 50 (4.7)	●	--	r 33 (4.1)	○	--	r 37 (4.5)
Morocco	⊙	--	x x	○	--	x x	⊙	--	x x	○	--	x x
Netherlands	●	--	41 (4.5)	●	--	23 (4.2)	○	--	12 (2.4)	●	--	26 (4.2)
New Zealand	⊙	4-5	r 40 (3.3)	●	2-5	r 50 (3.5)	●	2-5	r 56 (3.7)	●	2-3	r 55 (3.7)
Norway	●	3,5,8	61 (4.8)	○	6	58 (4.4)	○	7,9	11 (2.6)	○	5	30 (4.0)
Philippines	●	4,7,10	82 (4.2)	●	3,10	63 (4.7)	○	5,10	56 (5.0)	○	5,10	49 (5.2)
Russian Federation	●	3-4	--	○	8-9	--	●	3-4	--	○	8	--
Scotland	○	--	s 27 (5.1)	●	--	s 49 (4.8)	●	--	s 42 (5.2)	●	--	s 38 (4.9)
Singapore	●	4	95 (1.4)	●	4	81 (2.9)	○	5	31 (4.1)	●	3	83 (3.0)
Slovenia	○	5	34 (4.6)	●	3	21 (3.9)	●	4	83 (3.4)	●	4	55 (3.9)
Tunisia	○	10	91 (2.4)	○	10	11 (2.9)	○	7	r 10 (2.6)	○	8	4 (1.6)
United States	●	--	r 53 (3.1)	●	--	r 40 (2.9)	○	--	61 (3.1)	●	--	67 (2.7)
Yemen	●	--	--	●	4,10,12	--	●	4,12	--	●	4,9-10,12	--
<b>International Avg.</b>			<b>61 (0.9)</b>			<b>48 (0.9)</b>			<b>50 (0.8)</b>			<b>54 (0.8)</b>
<b>Benchmarking Participants</b>												
Indiana State, US	○	5	42 (4.9)	●	--	28 (4.7)	○	6	63 (5.3)	●	--	61 (4.6)
Ontario Province, Can.	○	7	34 (4.6)	●	4	84 (3.6)	●	1	26 (4.7)	●	3	78 (4.0)
Quebec Province, Can.	●	--	33 (4.5)	○	5-7	25 (4.1)	●	--	12 (3.1)	○	6	16 (3.0)

● 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) 2003

Background data on intended curriculum provided by National Research Coordinators, and on implemented curriculum by teachers at the time of testing.  
 ( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

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Exhibit 5.15: Intended and Taught TIMSS Physical Science Topics

Physical Science	Forces that cause objects to move.			
	Countries	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic
Armenia	☉	--	x x	
Australia	●	--	r	58 (5.0)
Belgium (Flemish)	○	6		13 (2.2)
Chinese Taipei	○	6		56 (4.1)
Cyprus	●	3		41 (4.6)
England	●	K,1,3	r	77 (4.4)
Hong Kong, SAR	○	6	r	27 (4.7)
Hungary	○	7		26 (3.8)
Iran, Islamic Rep. of	○	6		52 (4.8)
Italy	○	6-8		30 (3.3)
Japan	○	5,7,9-12		5 (1.8)
Latvia	○	8-9		x x
Lithuania	●	1-4		29 (3.2)
Moldova, Rep. of	○	--	r	34 (4.3)
Morocco	○	--		x x
Netherlands	●	--		20 (3.9)
New Zealand	☉	2-3	r	51 (3.4)
Norway	●	4		58 (4.5)
Philippines	●	3,6-7,10		77 (4.5)
Russian Federation	○	7	--	--
Scotland	●	--	s	51 (5.1)
Singapore	○	6		18 (3.4)
Slovenia	●	3		22 (3.7)
Tunisia	○	10	r	60 (3.4)
United States	●	--		68 (3.0)
Yemen	●	4,6	--	--
<b>International Avg.</b>				<b>42 (0.9)</b>
<b>Benchmarking Participants</b>				
Indiana State, US	●	--		60 (4.7)
Ontario Province, Can.	●	3		65 (4.6)
Quebec Province, Can.	○	6		20 (3.8)

● 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.

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

A dash (–) indicates 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 5.16: Intended and Taught TIMSS Earth Science Topics

Earth Science	Rocks, minerals, sand, and soil			Water on Earth			Air			Common features of the Earth's landscape and relationship to human use		
	Countries	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	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught
Armenia	●	--	x x	●	--	x x	●	--	x x	●	--	x x
Australia	●	--	r 36 (5.0)	○	--	r 57 (4.3)	○	--	r 43 (4.2)	●	--	r 66 (4.4)
Belgium (Flemish)	○	6	8 (1.7)	●	--	59 (3.6)	●	--	30 (3.2)	○	6	39 (3.6)
Chinese Taipei	○	7	27 (3.5)	○	9	71 (3.6)	●	3	71 (3.8)	○	9	43 (4.2)
Cyprus	●	4	46 (4.4)	○	--	37 (4.4)	●	4	91 (2.1)	○	--	51 (4.6)
England	●	2	r 68 (4.4)	●	4	r 64 (4.1)	●	4	r 65 (4.6)	●	1-4	r 42 (4.5)
Hong Kong, SAR	○	--	r 29 (4.2)	●	3	r 38 (4.5)	○	4	r 98 (1.2)	●	4	67 (4.6)
Hungary	○	5	53 (4.6)	○	5	78 (3.6)	○	5	65 (4.3)	○	5	92 (2.4)
Iran, Islamic Rep. of	●	1,4	95 (1.8)	●	1,3	64 (4.7)	●	2-4	57 (4.4)	○	5-8	78 (4.3)
Italy	●	3-8	68 (3.8)	●	3-7	85 (2.8)	●	4,6-7	87 (2.3)	●	3-8	76 (3.0)
Japan	○	6,7,10-12	5 (1.8)	○	5,8,10-12	34 (4.0)	●	4,7,10-12	27 (3.6)	●	4,7,10-12	15 (3.0)
Latvia	●	3-4	x x	●	3-4	x x	○	--	x x	●	--	x x
Lithuania	○	7-8	66 (3.4)	●	3-4	96 (1.1)	○	5-6	87 (2.8)	●	3-4	90 (2.4)
Moldova, Rep. of	●	--	r 86 (3.1)	●	--	r 96 (1.8)	●	--	r 99 (0.9)	●	--	r 94 (2.2)
Morocco	○	--	x x	○	--	x x	○	--	x x	○	--	x x
Netherlands	●	--	31 (4.6)	●	--	59 (5.0)	○	--	47 (4.6)	●	--	71 (4.4)
New Zealand	●	2-5	r 43 (3.6)	●	4-5	r 65 (3.6)	●	3-9	r 41 (3.8)	●	2-3	r 64 (3.7)
Norway	●	2	16 (3.0)	●	4	62 (4.5)	○	8	56 (4.2)	●	3-4	62 (4.3)
Philippines	●	3,5,7	72 (4.6)	●	3-4,7	74 (4.4)	●	3-4,7	73 (4.2)	●	3,7	83 (3.7)
Russian Federation	●	2-4	--	●	2-4	--	○	6	--	●	3-4	--
Scotland	○	--	s 15 (3.5)	●	--	s 54 (5.4)	○	--	s 33 (4.2)	○	--	s 51 (4.6)
Singapore	○	--	5 (1.6)	○	--	45 (3.9)	○	--	84 (2.7)	○	--	7 (1.8)
Slovenia	●	2	11 (2.6)	○	5	77 (4.0)	○	5	62 (4.4)	●	3	66 (4.4)
Tunisia	○	11	r 15 (3.0)	○	11	r 27 (4.0)	○	10	r 87 (2.5)	○	10	r 46 (4.4)
United States	●	--	76 (2.8)	●	--	82 (2.2)	○	--	62 (2.9)	●	--	86 (2.0)
Yemen	●	4,10-12	--	○	5,10,12	--	●	--	--	●	--	--
<b>International Avg.</b>			<b>41 (0.8)</b>			<b>63 (0.9)</b>			<b>65 (0.8)</b>			<b>61 (0.8)</b>
<b>Benchmarking Participants</b>												
Indiana State, US	●	--	72 (5.1)	●	--	80 (5.7)	●	--	63 (6.5)	○	6,7	86 (4.3)
Ontario Province, Can.	●	4	62 (5.0)	●	2	54 (4.8)	○	6	48 (4.5)	●	4	79 (4.0)
Quebec Province, Can.	○	6	50 (5.0)	○	6	44 (4.4)	●	--	47 (4.5)	○	6	71 (4.4)

● 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) 2003

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Exhibit 5.16: Intended and Taught TIMSS Earth Science Topics (Continued...)

Earth Science	Use and conservation of Earth's natural resources			Earth's water cycle			Weather conditions from day to day or over the seasons			Fossils of animals and plants		
	Countries	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	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught
Armenia	○	9	x x	●	--	x x	●	K-4	x x	●	--	x x
Australia	○	--	r 65 (4.0)	○	--	r 70 (4.8)	○	5	r 78 (4.1)	○	--	r 30 (3.4)
Belgium (Flemish)	○	6	30 (3.8)	●	--	88 (2.4)	●	--	93 (1.5)	○	6	13 (2.8)
Chinese Taipei	○	7	79 (2.9)	○	7	77 (3.6)	○	7	81 (3.4)	○	8	11 (2.5)
Cyprus	○	6	31 (4.8)	●	2	92 (2.3)	●	2	76 (3.7)	○	--	16 (3.3)
England	○	--	r 37 (4.5)	●	4	r 86 (3.1)	●	2	r 79 (3.8)	○	--	r 30 (4.8)
Hong Kong, SAR	○	5	r 56 (4.3)	●	3	r 80 (3.8)	●	2	84 (3.5)	○	7	r 7 (2.9)
Hungary	○	8	54 (4.3)	○	5	94 (2.1)	●	1	91 (2.4)	○	8	17 (3.3)
Iran, Islamic Rep. of	●	4	75 (4.1)	●	3-4	70 (4.6)	○	6	50 (4.1)	○	5,8	18 (3.4)
Italy	●	4,6-8	63 (3.4)	●	3,6	95 (1.5)	●	3,6	84 (2.5)	●	4,8	62 (3.4)
Japan	○	9-12	5 (1.7)	○	5,8,10-12	41 (4.0)	○	5,8,10-12	29 (3.8)	○	6,7,10-12	1 (1.0)
Latvia	●	--	x x	○	--	x x	●	3-4	x x	○	--	x x
Lithuania	●	3-4	77 (3.1)	●	3-4	96 (1.4)	●	1-4	98 (1.1)	○	5-6	64 (3.7)
Moldova, Rep. of	●	--	r 92 (2.7)	●	--	r 96 (1.7)	●	--	r 97 (1.5)	●	--	r 62 (4.7)
Morocco	○	--	x x	○	--	x x	○	--	x x	○	--	x x
Netherlands	●	--	34 (4.8)	○	--	79 (4.0)	●	--	72 (4.4)	○	--	26 (3.9)
New Zealand	○	8-9	r 61 (3.9)	●	4-5	r 70 (3.3)	○	6-7	r 75 (3.0)	●	2-3	r 41 (3.5)
Norway	●	3-4	57 (4.5)	●	3-4	79 (3.1)	●	3	96 (1.6)	○	8	30 (3.7)
Philippines	●	3-5,7	84 (3.6)	○	5,7	89 (3.2)	●	3-5,7	92 (2.6)	○	--	54 (5.2)
Russian Federation	●	3-4	--	●	3-4	--	●	2-3	--	●	3-4	--
Scotland	○	--	s 35 (4.4)	●	--	s 73 (4.5)	●	--	s 76 (4.5)	○	--	s 10 (2.8)
Singapore	○	6	43 (4.2)	●	4	87 (2.3)	○	--	28 (3.7)	○	--	4 (1.8)
Slovenia	○	5	51 (4.5)	○	5	88 (2.7)	○	5	71 (3.8)	○	8	4 (1.9)
Tunisia	○	--	r 40 (3.9)	○	10	r 62 (4.6)	○	10	r 61 (4.5)	○	11	r 5 (1.8)
United States	○	--	80 (2.3)	●	--	80 (2.3)	●	--	80 (2.5)	●	--	r 58 (2.9)
Yemen	○	5	--	●	4,11	--	○	5	--	○	10,12	--
<b>International Avg.</b>			<b>55 (0.8)</b>			<b>81 (0.7)</b>			<b>76 (0.7)</b>			<b>27 (0.7)</b>
<b>Benchmarking Participants</b>												
Indiana State, US	○	6	85 (3.8)	○	6	75 (5.4)	●	4	79 (4.7)	○	7	63 (5.4)
Ontario Province, Can.	○	5	68 (4.3)	○	5	63 (5.1)	○	5	61 (5.0)	●	4	55 (5.1)
Quebec Province, Can.	○	6	62 (3.8)	●	--	81 (3.1)	○	6	77 (3.7)	●	--	32 (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) 2003

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Exhibit 5.16: Intended and Taught TIMSS Earth Science Topics (...Continued)

Earth Science	Earth's solar system		
	Countries	Student population intended to be taught topic through 4th grade	Grade(s) topic is intended to be taught
Armenia	●	8	x x
Australia	○	5	r 69 (4.1)
Belgium (Flemish)	○	6	39 (4.0)
Chinese Taipei	○	7	46 (3.8)
Cyprus	○	--	13 (2.7)
England	●	4	r 83 (4.1)
Hong Kong, SAR	○	6	r 19 (3.7)
Hungary	○	6	67 (4.0)
Iran, Islamic Rep. of	●	4	99 (0.8)
Italy	○	5,8	27 (3.2)
Japan	●	4,9-12	60 (3.9)
Latvia	●	2-4	x x
Lithuania	●	1-4	92 (2.4)
Moldova, Rep. of	●	--	r 92 (2.5)
Morocco	○	--	x x
Netherlands	●	--	18 (3.6)
New Zealand	●	1-5	r 80 (2.6)
Norway	●	4,8	97 (1.2)
Philippines	○	5,7	80 (4.3)
Russian Federation	●	3-4	--
Scotland	○	--	s 59 (4.9)
Singapore	○	5	26 (3.6)
Slovenia	●	3,6	32 (4.6)
Tunisia	○	11	r 12 (3.0)
United States	●	--	74 (2.6)
Yemen	●	4,7	--
<b>International Avg.</b>			<b>56 (0.8)</b>
<b>Benchmarking Participants</b>			
Indiana State, US	○	5,6	58 (4.7)
Ontario Province, Can.	○	6	23 (4.5)
Quebec Province, Can.	○	6	42 (4.4)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

● 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.

( ) 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.

