Chapter 5

The Mathematics Curriculum

The first part of Chapter 5 presents information about the curricular goals in the TIMSS 2003 countries, referred to as the intended curriculum. Data are provided about whether the participating countries have national curricula and public examinations in mathematics, how the curriculum is supported and monitored within each country, whether countries differentiate the curriculum 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 mathematics topics in the intended curriculum for each country, as well as teachers' reports about the mathematics 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 mathematics they have studied. Students' opportunity to learn the content, skills, and processes tested in the TIMSS 2003 mathematics assessment depends to a large degree on the curricular goals and intentions inherent in each country's policies for mathematics 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 mathematics students are taught.

This chapter presents information about the curricular goals in mathematics in the TIMSS 2003 countries and teachers' reports about the mathematics studied. Teachers' instructional programs for their classes are usually guided by an "official curriculum" that describes the mathematics 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 mathematics 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 mathematics teachers of the students tested in TIMSS 2003 completed questionnaires about whether the students had been taught the various mathematics topics included in the assessment.

Which Countries Have a National Curriculum and Public Examinations in Mathematics?

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 5.1 shows that, of the 47 countries that participated in TIMSS 2003 at the eighth grade,[1] all but 3 reported that the specifications for students' curricular goals in mathematics 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 mathematics 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 mathematics 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 varies by state and is a generally ongoing process.

At the fourth grade, Exhibit 5.1 shows that of the 26 countries that participated in TIMSS 2003 at this level, all but 3 reported having national curricula in fourth-grade mathematics. Similar to the eighth grade, fourth-grade mathematics 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,

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.

Exhibit 5.1: Intended Mathematics Curriculum

MATHEMATICS Grade 8

Countries	National Curriculum	Year Curriculum Introduced	Curriculum Under Revision	Public Exams with Consequences for Individual Students	Grades Tested in Public Exams
Armenia	●	2000	●	●	3,8,10
Australia	○	Varies by state; generally ongoing process	●	●	12
Bahrain	●	2000-2001	●	●	9,10,11,12
[1] Belgium (Flemish)	○	1997	○	○	–
Botswana	●	1996	●	●	7,10,12
Bulgaria	●	1998	○	●	7,12
Chile	●	2002	●	●	12
Chinese Taipei	●	1997	●	●	9,12
Cyprus	●	1997	○	●	7-12
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	●	2002	○	●	11,13
Hungary	●	2000	○	●	12
Indonesia	●	1994	●	●	6,9,12
Iran, Islamic Rep. of	●	1985	○	●	5,8,11,12
Israel	●	1980	●	●	11,12
[2] Italy	●	1979, revised 2002	○	●	5,8,13
Japan	●	2002	○	○	–
Jordan	●	1994	●	●	12
Korea, Rep. of	●	2002	○	●	9,12
Latvia	●	1992	●	●	6,9,12
Lebanon	●	1999	●	○	–
Lithuania	●	1997, revised 2003	○	●	10,12
Macedonia, Rep. of	●	1994	○	●	12
Malaysia	●	1990	●	●	6,9,11,13
Moldova, Rep. of	●	2003-2004	○	●	4,9,11,12
Morocco	●	1992-1993	●	●	12
Netherlands	●	1998	●	●	10,11,12
New Zealand	●	Introduced 1993, implemented 1994	●	●	10,11,12
Norway	●	1997	○	○	–
Palestinian Nat'l Auth.	●	2002	●	●	12
Philippines	●	2002	○	○	–
Romania	●	1999	●	●	8,12
Russian Federation	●	2000	●	●	9,11
Saudi Arabia	●	1980	●	●	12
Scotland	●	1991	○	●	10,11,12
Serbia	●	1984-1985	●	●	8
Singapore	●	2002	●	●	6,10,12
Slovak Republic	●	1997	●	●	9,12
Slovenia	●	1999 for sample of schools; 2003 for all schools	●	●	3,6,9,12
South Africa	●	2001 (introduced in 1998 for prior grades)	●	●	12
Sweden	●	1994, revised 2000	○	○	–
Syrian Arab Republic	●	1984	●	●	9,12
Tunisia	●	2000	●	●	9,12
United States	○	Varies by state; generally ongoing process	●	○	–
Benchmarking Participants					
Basque Country, Spain	●	1992	●	○	–
Indiana State, US	●	2000	○	●	10
Ontario Province, Can.	●	1997	●	●	3,6,9
Quebec Province, Can.	●	1995	●	●	10,11

● 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.

1 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.

2 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 5.1: Intended Mathematics Curriculum

MATHEMATICS Grade 4

Countries	National Curriculum	Year Curriculum Introduced	Curriculum Under Revision	Public Exams with Consequences for Individual Students	Grades Tested in Public Exams
Armenia	●	2000	○	●	3,8,10
Australia	○	Varies by state; generally ongoing process	●	●	12
[1] Belgium (Flemish)	○	1998-1999	○	○	-
Chinese Taipei	●	2002	●	●	9,12
Cyprus	●	1995	○	●	7-12
England	●	2000	○	●	10,11,12
Hong Kong, SAR	●	1983	●	●	11,13
Hungary	●	2000	○	●	12
Iran, Islamic Rep. of	●	1983	○	●	5,8,11,12
[2] Italy	●	1985, revised 2002	●	●	5,8,13
Japan	●	2002	○	○	-
Latvia	●	2001	○	●	6,9,12
Lithuania	●	1997, revised 2003	○	●	10,12
Moldova, Rep. of	●	1999-2000	○	●	4,9,11,12
Morocco	●	2002-2003	●	●	12
Netherlands	●	1998	●	●	10,11,12
New Zealand	●	Introduced 1993, implemented 1994	●	●	10,11,12
Norway	●	1997	○	○	-
Philippines	●	2002 (pilot)	●	○	-
Russian Federation	●	2001	○	●	9,11
Scotland	●	1991	○	●	10,11,12
Singapore	●	1999	●	●	6,10,12
Slovenia	●	1999 for sample of schools; 2003 for all schools	●	●	3,6,9,12
Tunisia	●	2000	●	●	9,12
United States	○	Varies by state; generally ongoing process	●	○	-
Yemen	●	2000-2001	●	●	9,12
Benchmarking Participants					
Indiana State, US	●	2000	○	●	10
Ontario Province, Can.	●	1997	●	●	3,6,9
Quebec Province, Can.	●	2001	○	●	10,11

● 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.

1 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.

2 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.

Ontario, and Quebec had system-wide curricula determined at the state and provincial level, respectively.

At the time of the TIMSS 2003 assessment, the official fourth-grade mathematics 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 mathematics 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 policy makers, 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 mathematics at one or more grades. Grade 12 was the most prevalent, with 33 countries giving students public examinations in mathematics at this level.

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 5.2, 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 5.2, at the eighth grade, 12 participants reported using all 7, and an additional 22 used 5 or 6. The most widely used methods were ministry notes and directives (42 participants), instructional or pedagogical guides (41 participants), and a system of school or audit (40 participants)

The use of mandated or recommended textbooks as a means of supporting eighth-grade mathematics curriculum implementation was reported by 38 participants. Curriculum evaluation during or after implementation was used by 35 participating entities, and the use of specifically developed or recommended instructional activities by 33 participants. The least widely used method was national assessments based on student samples (25 participants).

At the fourth grade, four participants reported using all seven methods shown in Exhibit 5.2 to support and monitor curriculum implementation, and 16 participants used five or six. The most widely used methods were instructional or pedagogical guides (24 participants), ministry notes and directives (24 participants), and curriculum evaluation during or after implementation (23 participants).

A system of school inspection or audit as a means of monitoring fourth-grade mathematics curriculum implementation was used by 21 participants. The use of specifically developed or recommended instructional activities was reported by 21 participants and mandated or recommended textbooks by 20 participants. Similar to the eighth grade, the least widely used method at the fourth grade was national assessments based on student samples (12 participants).

An additional method countries often use to support curriculum implementation is to provide mathematics teachers with specific

Exhibit 5.2: Methods Used to Support or Monitor Implementation of the Intended Mathematics Curriculum

MATHEMATICS Grade 8

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	●	●	○	●	●	●	○
Benchmarking Participants							
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

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 5.2: Methods Used to Support or Monitor Implementation of the Intended Mathematics 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	●	●	●	●	●	●	●
Benchmarking Participants							
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.

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.

How Much Instructional Time is Intended for Mathematics?

Many countries designate in their intended curriculum the percentage of total instructional time that should be devoted to mathematics and other subjects at different grade levels. The percentage of instructional time designated for mathematics in the intended curriculum for grades 2, 4, 6, and 8 is shown in Exhibit 5.3 for all TIMSS 2003 participants. These data provide a good estimate of students' intended instructional time for mathematics across the primary and middle school years. The general pattern across countries shows that the percentage of time remains the same or decreases from grade 2 to grade 4, from grade 4 to grade 6, and from grade 6 to grade 8, with the largest decline usually between grades 6 and 8. Interestingly, the reverse pattern holds for science.[2] Where increases occurred in the percentage of instructional time designated for mathematics, 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 mathematics ranged from 10 to 25 percent at second grade, from 12 to 29 percent at fourth grade, from 11 to 25 percent at sixth grade, and from 8 to 25 percent at eighth grade. Schools' and teachers' reports of the percentage of instructional time actually devoted to mathematics at grades 4 and 8, shown in Exhibit 7.3, generally correspond with the intended percentages reported in Exhibit 5.3, although slightly more so at eighth grade than at fourth grade.

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

Exhibit 5.3: Percentage of Total Instructional Time Intended for Mathematics

Countries	Grade 2	Grade 4	Grade 6	Grade 8
Armenia	5 hours per week	5 hours per week	5 hours per week	5 hours per week
Australia	○	○	○	○
Bahrain	-	16	16	16
Belgium (Flemish)	25	25	25	12.5-15
Botswana	16	13	13	13
Bulgaria	17.5	13	12	12
Chile	20	20	17	15
Chinese Taipei	10	12	19	12
Cyprus	16	17	17	8
Egypt	-	20	18	18
England	○	○	○	○
Estonia	-	17.3	14.4	13.5
Ghana	-	25	25	25
Hong Kong, SAR	13	12-15	12-15	12-15
Hungary	20	13	12	11
Indonesia	-	17	17	15
Iran, Islamic Rep. of	15.8	15.8	14.3	14.3
Israel	-	20	20	16
Italy	15	15	20	20
Japan	18.5	15.9	15.9	10.7
Jordan	20	18	15	12
Korea, Rep. of	-	13.8	12.5	12.5
Latvia	17	15	16	14
Lebanon	-	17	17	15
Lithuania	20	20	17	13
Macedonia, Rep. of	-	19	15.4	9
Malaysia	-	15	15	9
Moldova, Rep. of	17.5	17	14	13
Morocco	17	15	15	15
Netherlands	○	○	○	10
New Zealand	○	○	○	○
Norway	17.5	18	14	12
Palestinian Nat'l Auth.	17	17	15	15
Philippines	20	15	○	15
Romania	-	15	12	12
Russian Federation	18	18	17	15
Saudi Arabia	14	16	16	12
Scotland	15	15	15	10
Serbia	-	29	16	16
Singapore	18	22	20	15
Slovak Republic	-	20	18	14
Slovenia	19	21	15	13
South Africa	-	15	15	13
[1] Sweden	-	13.5	13.5	13.5
Syrian Arab Republic	-	15	15	12
Tunisia	10	15	15	17
United States	○	○	○	○
Yemen	17.3	-	-	-
Benchmarking Participants				
Basque Country, Spain	-	12	12	10
Indiana State, US	15	15	11	13
Ontario Province, Can.	○	○	○	○
Quebec Province, Can.	21	17	17	17

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

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.

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

Do Countries Differentiate the Intended Mathematics 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 5.4 indicates how countries addressed this issue in organizing the intended mathematics 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 38 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 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 provided different levels of difficulty for students of differing ability levels.

Exhibit 5.4: The Way the Intended Mathematics Curriculum Addresses the Issue of Students with Different Levels of Ability

MATHEMATICS Grade 8

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	○	●	○
Benchmarking Participants			
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

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

Background data provided by National Research Coordinators.

Exhibit 5.4: The Way the Intended Mathematics Curriculum Addresses the Issue of Students with Different Levels of Ability

MATHEMATICS Grade 4

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	●	○	○
Benchmarking Participants			
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 Mathematics Curriculum?

Exhibit 5.5 indicates the relative emphasis given to various aspects of mathematics instruction in the intended curriculum of participating countries, for both eighth and fourth grade. At the eighth grade, as might be anticipated for students at this point in their education, "a lot of emphasis" was most commonly placed on understanding mathematical concepts and principles (32 participants) and mastering basic skills (30 participants). Not a single participant reported giving "very little" or "no" emphasis in the intended curriculum to understanding mathematical concepts and principles, and mastering basic skills received very little or no emphasis in only five countries.

Applying mathematics in real-life contexts was given a lot of emphasis in the intended eighth-grade curriculum of 17 participants. Botswana, the Netherlands, and South Africa reported placing more emphasis on this approach than on mastering basic skills or understanding mathematics concepts. Communicating mathematically received a lot of emphasis in 13 participating entities, and reasoning mathematically in 14 entities.

Relative to the other approaches and processes, participants reported placing less emphasis on integrating mathematics with other subjects, deriving formal proofs, and incorporating the experiences of different ethnic/cultural groups. Only two countries – Ghana and South Africa – reported placing a lot of emphasis on this multicultural approach in the intended curriculum.

In the intended mathematics curriculum at the fourth grade, most emphasis was placed on mastering basic skills and understanding mathematical concepts and principles, with applying mathematics in real-life contexts next in terms of emphasis. Communicating mathematically and reasoning mathematically were given a lot of emphasis in about half the participants. Integrating mathematics with other subjects and incorporating the experiences of different ethnic/cultural groups were given least emphasis in the fourth-grade mathematics curriculum.

Exhibit 5.5: Emphasis on Approaches and Processes in the Intended Mathematics Curriculum

MATHEMATICS Grade 8

Countries	Mastering Basic Skills	Understanding Mathematical Concepts and Principles	Applying Mathematics in Real-life Contexts	Communicating Mathematically	Reasoning Mathematically	Integrating Mathematics with Other Subjects	Deriving Formal Proofs	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	◎	●	●	●	●	⊙	⊙	⊙
Benchmarking Participants								
Basque Country, Spain	●	●	●	◎	●	◎	⊙	⊙
Indiana State, US	●	●	◎	◎	◎	◎	⊙	⊙
Ontario Province, Can.	◎	●	●	●	●	⊙	○	○
Quebec Province, Can.	◎	◎	◎	◎	◎	⊙	⊙	⊙

● A Lot of Emphasis ◎ Some Emphasis ⊙ Very Little Emphasis ○ No Emphasis

Background data provided by National Research Coordinators.

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

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

Exhibit 5.5: Emphasis on Approaches and Processes in the Intended Mathematics Curriculum

MATHEMATICS Grade 4

Countries	Mastering Basic Skills	Understanding Mathematical Concepts and Principles	Applying Mathematics in Real-life Contexts	Communicating Mathematically	Reasoning Mathematically	Integrating Mathematics with Other Subjects	Incorporating the Experiences of Different Ethnic/Cultural Groups
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	●	●	●	◉	●	◉	◉
Benchmarking Participants							
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.

Are the TIMSS Mathematics Topics Included in the Intended Curriculum?

The ability of policy makers to make sound judgments about relative strengths and weaknesses of mathematics and 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 mathematics assessment.[3] It delineates the mathematics 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 mathematics 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 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 mathematics 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.[4]

National Research Coordinators were asked to indicate whether each of the TIMSS 2003 mathematics topics was included in their countries' intended curriculum through the target grade (eighth or fourth grade), and if so, whether the topics were intended to be taught to "all or almost all students" or "only the more able students." They were also asked to indicate the grade(s) at which each topic was primarily intended to be taught to students.

Exhibit 5.6 shows that, for most countries, a great deal of the mathematics content addressed by the TIMSS 2003 assessment was included in their intended curricula. On average, across participants at

3 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.

4 For a full description of the TIMSS 2003 test development effort, please see Neidorf, T.S. 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.

the eighth grade, 70 percent of the assessment topics were intended for all or almost all students, and a further six percent for only the more able students. In only six countries were less than half of the topics included in the eighth-grade curriculum: Botswana, Indonesia, Lebanon, Morocco, the Philippines, and Tunisia.

Not surprisingly, at this level, the content area with the greatest coverage was number, with 96 percent of the topics, on average, included in participants' intended curriculum for all or almost all students. For all but three participants, at least nine of the ten topics in number (90%) were included in the curriculum. The mathematics content area with the next greatest coverage was measurement, with 78 percent of the topics, on average, included in the intended curriculum for all or almost all students. Sixteen participants included all eight measurement topics in their curricula, and a further 30 participants included seven of the eight topics. Countries with low emphasis on measurement in the curriculum included Botswana, Indonesia, Lebanon, Morocco, South Africa, and Tunisia, where at least half of the measurement topics were not included in the curriculum.

Geometry and algebra had similar levels of coverage across participating countries, with about two-thirds of the topics (67 percent of the geometry topics and 63 percent of the algebra topics) included in the intended curriculum for all or almost all students. In geometry, relatively high levels of coverage (11 of 13 percent of the topics) were reported for the intended curricula of 21 participants, although there also were several (Botswana, Indonesia, Latvia, Morocco, the Philippines, South Africa, Sweden, and Tunisia) where fewer than half of the geometry topics were included in the eighth-grade curriculum. For algebra, most of the topics (5 out of 6) were included in the intended curricula of 22 participants. However, in 14 of the TIMSS participants, no more than half of the algebra topics were included. One country, Chile, included none of the algebra topics in its intended curriculum.

The content area with the least coverage was data, with only 39 percent of the topics on average included in the intended curriculum for all or almost all students. All eight topics were included in the curriculum of just two countries (New Zealand and the United States) and two benchmarking participants (Indiana and Ontario). In contrast, 30 participants had no more than half of the data topics in their curricula, and in four countries – Chinese Taipei, the Philippines, Syria, and Tunisia – none of the data topics was included.

Consistent with few countries indicating that they had different curricula for students of different ability levels, the percentages of topics that were included in the intended curriculum for only the more able students were generally low, with only 6 percent of eighth-grade mathematics topics, on average, intended for the top track of students. The percentage ranged from 2 percent for number to 10 percent for data.

Although the relationship between inclusion in the intended curriculum and student achievement was not perfect, it was notable that several of the higher-performing countries reported high levels of emphasis on the mathematics topics in their intended curricula and that those with the lowest levels of curricular coverage came from the lower half of the achievement distribution. For example, five of the six top-performing countries (Chinese Taipei being the exception) included 80 percent or more of the topics for all or almost all of their students, while the six countries with fewer than half of the topics in their curricula all had average mathematics achievement below the international mean. However, high-performing Chinese Taipei and the Netherlands had relatively low coverage of the mathematics topics (69 and 53 percent, respectively) in their intended curricula, whereas lower-performing Ghana and Bahrain had 96 and 89 percent of topics, respectively, included in their intended curricula. Clearly the intended curriculum is only one of the factors that impact achievement.

At fourth grade, Exhibit 5.6 shows that on average, internationally, 59 percent of the TIMSS 2003 mathematics topics were included in the intended curricula for all or almost all students, and a further

9 percent for only the more able students. More than eighty percent of the mathematics topics were included in the intended curriculum for all or almost all students in Armenia, England, Italy, Moldova, the United States, Indiana, and Ontario.

Although measurement had fewer topics than number at the fourth grade (6 vs 12), it had a greater percentage of topics included in the intended curricula of participating countries – 81 percent for all or almost all students compared with 68 percent. Nineteen of the twenty-nine fourth-grade participants included at least five of the six measurement topics in their curricula. Comparable coverage of number topics (10 out of 12 topics) was reported in just 10 of the 29 participants.

The data content area was next at fourth grade in terms of inclusion in the intended curriculum, with 62 percent of its topics, on average, intended for all or almost all students. Five or more of the seven data topics were included in the intended curricula of 19 participants for all or almost all students. For patterns and relationships, on average, 54 percent of the topics were included in the intended curriculum for all or almost all students. At least four of the six topics in patterns and relationships were included in the intended curricula of 14 participants for all or almost all students. The content area with the least coverage was geometry, with only 38 percent of the topics on average included in the intended curriculum for all or almost all students. In 17 of the 29 participants, fewer than half of the 11 geometry topics were included in the curriculum.

As at the eighth grade, the percentages of topics included in the intended curriculum for only the more able students at fourth grade were generally low, consistent with few countries indicating that they had different curricula for different groups of students depending on ability level. Only 9 percent of fourth-grade mathematics topics on average were intended for the top track of students, with a range of 8 percent for measurement and geometry to 11 percent for patterns and relationships.

Exhibit 5.6: Summary of TIMSS Mathematics Topics in the Intended Curriculum

MATHEMATICS Grade 8

Countries	Percentage of TIMSS Mathematics Topics Intended to be Taught Up to and Including Eighth Grade*								
	Overall (45 topics)			Number (10 topics)			Algebra (6 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	69	31	0	90	10	0	67	33	0
Australia	69	29	2	90	0	10	50	50	0
Bahrain	89	0	11	100	0	0	67	0	33
Belgium (Flemish)	80	13	7	100	0	0	83	0	17
Botswana	44	0	56	90	0	10	17	0	83
Bulgaria	78	0	22	100	0	0	83	0	17
Chile	64	0	36	100	0	0	0	0	100
Chinese Taipei	69	0	31	100	0	0	67	0	33
Cyprus	64	27	9	100	0	0	50	33	17
Egypt	87	0	13	100	0	0	100	0	0
England	89	11	0	100	0	0	100	0	0
Estonia	73	0	27	100	0	0	100	0	0
Ghana	96	0	4	100	0	0	100	0	0
Hong Kong, SAR	82	0	18	100	0	0	50	0	50
Hungary	82	0	18	100	0	0	83	0	17
Indonesia	49	0	51	100	0	0	67	0	33
Iran, Islamic Rep. of	73	0	27	100	0	0	50	0	50
Israel	69	7	24	100	0	0	83	0	17
Italy	87	0	13	100	0	0	67	0	33
Japan	80	0	20	100	0	0	100	0	0
Jordan	76	0	24	100	0	0	83	0	17
Korea, Rep. of	84	0	16	90	0	10	83	0	17
Latvia	67	0	33	100	0	0	83	0	17
Lebanon	36	0	64	90	0	10	17	0	83
Lithuania	76	2	22	100	0	0	67	0	33
Macedonia, Rep. of	78	2	20	100	0	0	100	0	0
Malaysia	73	0	27	100	0	0	33	0	67
Moldova, Rep. of	82	0	18	100	0	0	100	0	0
Morocco	33	0	67	70	0	30	17	0	83
Netherlands	53	22	24	90	10	0	50	33	17
New Zealand	76	22	2	60	40	0	33	67	0
Norway	71	0	29	90	0	10	33	0	67
Palestinian Nat'l Auth.	76	0	24	100	0	0	50	0	50
Philippines	47	0	53	100	0	0	50	0	50
Romania	84	0	16	100	0	0	100	0	0
Russian Federation	76	0	24	100	0	0	83	0	17
Saudi Arabia	64	0	36	100	0	0	67	0	33
Scotland	58	29	13	70	30	0	17	50	33
Serbia	76	7	18	100	0	0	83	17	0
Singapore	80	9	11	100	0	0	83	17	0
Slovak Republic	62	33	4	100	0	0	50	33	17
Slovenia	80	0	20	100	0	0	100	0	0
South Africa	33	20	47	90	10	0	33	17	50
Sweden	53	13	33	90	0	10	0	33	67
Syrian Arab Republic	49	2	49	90	10	0	33	0	67
Tunisia	42	0	58	100	0	0	33	0	67
United States	98	2	0	100	0	0	83	17	0
International Avg.	70	6	24	96	2	2	63	9	29
Benchmarking Participants									
Basque Country, Spain	49	29	22	90	10	0	17	67	17
Indiana State, US	96	0	4	100	0	0	100	0	0
Ontario Province, Can.	98	0	2	100	0	0	83	0	17
Quebec Province, Can.	78	2	20	100	0	0	50	17	33

Background data provided by National Research Coordinators.

* Percentages may not add to 100 due to rounding.

See Exhibits 5.8 through 5.12 for data on individual topics.

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

Exhibit 5.6: Summary of TIMSS Mathematics Topics in the Intended Curriculum

MATHEMATICS Grade 8

Countries	Percentage of TIMSS Mathematics Topics Intended to be Taught Up to and Including Eighth Grade								
	Measurement (8 topics)			Geometry (13 topics)			Data (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	38	63	0	77	23	0	63	38	0
Australia	88	13	0	54	46	0	63	38	0
Bahrain	100	0	0	92	0	8	75	0	25
Belgium (Flemish)	88	13	0	85	0	15	38	63	0
Botswana	50	0	50	38	0	62	13	0	88
Bulgaria	100	0	0	85	0	15	13	0	88
Chile	100	0	0	54	0	46	50	0	50
Chinese Taipei	100	0	0	69	0	31	0	0	100
Cyprus	88	13	0	69	23	8	0	75	25
Egypt	75	0	25	100	0	0	50	0	50
England	88	13	0	85	15	0	75	25	0
Estonia	88	0	13	62	0	38	25	0	75
Ghana	100	0	0	100	0	0	75	0	25
Hong Kong, SAR	100	0	0	92	0	8	50	0	50
Hungary	63	0	38	92	0	8	63	0	38
Indonesia	50	0	50	15	0	85	25	0	75
Iran, Islamic Rep. of	88	0	13	85	0	15	25	0	75
Israel	63	0	38	46	8	46	63	25	13
Italy	100	0	0	85	0	15	75	0	25
Japan	88	0	13	77	0	23	38	0	63
Jordan	75	0	25	77	0	23	38	0	63
Korea, Rep. of	100	0	0	92	0	8	50	0	50
Latvia	88	0	13	38	0	62	38	0	63
Lebanon	13	0	88	23	0	77	25	0	75
Lithuania	88	0	13	69	8	23	50	0	50
Macedonia, Rep. of	75	0	25	100	0	0	0	13	88
Malaysia	100	0	0	77	0	23	38	0	63
Moldova, Rep. of	100	0	0	92	0	8	13	0	88
Morocco	13	0	88	38	0	62	13	0	88
Netherlands	63	13	25	23	38	38	50	13	38
New Zealand	100	0	0	77	15	8	100	0	0
Norway	88	0	13	54	0	46	88	0	13
Palestinian Nat'l Auth.	100	0	0	69	0	31	50	0	50
Philippines	100	0	0	0	0	100	0	0	100
Romania	75	0	25	92	0	8	50	0	50
Russian Federation	88	0	13	85	0	15	13	0	88
Saudi Arabia	75	0	25	62	0	38	13	0	88
Scotland	75	13	13	62	15	23	50	50	0
Serbia	75	13	13	92	8	0	13	0	88
Singapore	88	0	13	85	15	0	38	13	50
Slovak Republic	50	38	13	62	38	0	38	63	0
Slovenia	88	0	13	77	0	23	38	0	63
South Africa	13	38	50	23	15	62	0	25	75
Sweden	100	0	0	23	15	62	50	25	25
Syrian Arab Republic	63	0	38	46	0	54	0	0	100
Tunisia	38	0	63	31	0	69	0	0	100
United States	100	0	0	100	0	0	100	0	0
International Avg.	78	5	17	67	6	27	39	10	51
Benchmarking Participants									
Basque Country, Spain	75	13	13	38	31	31	13	38	50
Indiana State, US	88	0	13	92	0	8	100	0	0
Ontario Province, Can.	100	0	0	100	0	0	100	0	0
Quebec Province, Can.	75	0	25	85	0	15	63	0	38

Background data provided by National Research Coordinators.

* Percentages may not add to 100 due to rounding.

See Exhibits 5.8 through 5.12 for data on individual topics.

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

Exhibit 5.6: Summary of TIMSS Mathematics Topics in the Intended Curriculum

MATHEMATICS Grade 4

Countries	Percentage of TIMSS Mathematics Topics Intended to be Taught Up to and Including Fourth Grade								
	Overall (42 topics)			Number (12 topics)			Patterns and Relationships (6 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	81	14	5	83	17	0	83	17	0
Australia	74	0	26	67	0	33	83	0	17
Belgium (Flemish)	38	31	31	58	42	0	33	33	33
Chinese Taipei	57	0	43	83	0	17	50	0	50
Cyprus	45	48	7	75	25	0	83	17	0
England	81	12	7	92	0	8	50	50	0
Hong Kong, SAR	52	0	48	100	0	0	17	0	83
Hungary	69	0	31	58	0	42	83	0	17
Iran, Islamic Rep. of	60	0	40	67	0	33	50	0	50
Italy	86	0	14	92	0	8	67	0	33
Japan	69	0	31	67	0	33	100	0	0
Latvia	52	0	48	50	0	50	50	0	50
Lithuania	48	12	40	33	25	42	50	33	17
Moldova, Rep. of	81	0	19	92	0	8	100	0	0
Morocco	21	67	12	8	92	0	0	83	17
Netherlands	43	0	57	42	0	58	0	0	100
New Zealand	69	24	7	50	33	17	83	17	0
Norway	55	0	45	75	0	25	50	0	50
Philippines	48	0	52	92	0	8	0	0	100
Russian Federation	50	0	50	50	0	50	83	0	17
Scotland	52	12	36	58	17	25	33	17	50
Singapore	71	0	29	100	0	0	33	0	67
Slovenia	71	0	29	58	0	42	67	0	33
Tunisia	19	0	81	25	0	75	17	0	83
United States	83	17	0	100	0	0	83	17	0
Yemen	57	0	43	92	0	8	50	0	50
International Avg.	59	9	32	68	10	22	54	11	35
Benchmarking Participants									
Indiana State, US	83	2	14	100	0	0	83	17	0
Ontario Province, Can.	88	0	12	75	0	25	100	0	0
Quebec Province, Can.	79	0	21	75	0	25	67	0	33

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

Background data provided by National Research Coordinators.

* Percentages may not add to 100 due to rounding.

See Exhibits 5.13 through 5.17 for data on individual topics.

Exhibit 5.6: Summary of TIMSS Mathematics Topics in the Intended Curriculum

Countries	Percentage of TIMSS Mathematics Topics Intended to be Taught Up to and Including Fourth Grade								
	Measurement (6 topics)			Geometry (11 topics)			Data (7 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	100	0	0	55	27	18	100	0	0
Australia	100	0	0	45	0	55	100	0	0
Belgium (Flemish)	67	33	0	27	18	55	0	29	71
Chinese Taipei	50	0	50	27	0	73	71	0	29
Cyprus	50	50	0	0	73	27	29	71	0
England	100	0	0	73	9	18	86	14	0
Hong Kong, SAR	83	0	17	9	0	91	43	0	57
Hungary	100	0	0	36	0	64	100	0	0
Iran, Islamic Rep. of	83	0	17	45	0	55	57	0	43
Italy	100	0	0	73	0	27	100	0	0
Japan	83	0	17	27	0	73	100	0	0
Latvia	100	0	0	9	0	91	86	0	14
Lithuania	83	0	17	18	0	82	86	0	14
Moldova, Rep. of	83	0	17	64	0	36	71	0	29
Morocco	17	83	0	64	27	9	0	57	43
Netherlands	83	0	17	27	0	73	71	0	29
New Zealand	67	33	0	82	9	9	71	29	0
Norway	67	0	33	55	0	45	14	0	86
Philippines	67	0	33	9	0	91	57	0	43
Russian Federation	100	0	0	18	0	82	29	0	71
Scotland	67	17	17	36	9	55	71	0	29
Singapore	100	0	0	45	0	55	71	0	29
Slovenia	100	0	0	64	0	36	86	0	14
Tunisia	67	0	33	0	0	100	0	0	100
United States	100	0	0	64	36	0	71	29	0
Yemen	100	0	0	18	0	82	29	0	71
International Avg.	81	8	10	38	8	54	62	9	30
Benchmarking Participants									
Indiana State, US	100	0	0	45	0	55	100	0	0
Ontario Province, Can.	100	0	0	100	0	0	71	0	29
Quebec Province, Can.	67	0	33	91	0	9	86	0	14

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

Background data provided by National Research Coordinators.

* Percentages may not add to 100 due to rounding.

See Exhibits 5.13 through 5.17 for data on individual topics.

At the fourth grade, as at the eighth grade, the relationship between the coverage of the TIMSS mathematics topics in participants' intended curricula and student achievement in mathematics is a moderately positive one. Higher-performing countries had generally greater levels of coverage, and lower-performing countries lesser levels. For example, high-performing Singapore and Japan had 71 and 69 percent, respectively, of mathematics topics included in their intended curricula for all or almost all students, whereas low-performing Morocco and Tunisia had just 21 and 19 percent, respectively. However, as at the eighth grade, this relationship did not hold true for all countries at the fourth grade. For example, higher-performing Hong Kong, SAR and Belgium (Flemish) had 52 and 38 percent, respectively, of mathematics topics overall included in their intended curricula for all or almost all students, and lower-performing Iran had 60 percent included in its intended curriculum.

Are the TIMSS Mathematics Topics Taught in School?

The previous section described the coverage of the TIMSS mathematics 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 mathematics coverage in the implemented curricula of participating countries, the mathematics teachers[5] of the students assessed were asked to indicate whether each of the TIMSS 2003 mathematics topics was "mostly taught before this year," "mostly taught this year," or "not yet taught or just introduced." Exhibit 5.7 presents for eighth and fourth grade the percentage of students whose teachers reported that the students had been taught the TIMSS mathematics topics either prior to or during the year of the assessment. The

5 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.

exhibit shows for each TIMSS participant, averaged across mathematics 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 mathematics teachers of the students who took the TIMSS 2003 test.[6] 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 students, an "s" is included. Where teacher responses are available for less than 50 percent, an "x" replaces the data.

Exhibit 5.7 shows that, according to their teachers, on average 72 percent of the eighth-grade students tested in TIMSS 2003 had been taught the TIMSS mathematics topics. In Armenia and Macedonia almost all students (90 % or more) had been taught the topics, as had the majority of students in every country except Botswana.

Consistent with the information on the intended curriculum presented in the previous section, number was the content area with the greatest coverage, with 95 percent of students across countries having been taught the TIMSS number topics by the eighth grade. This was followed by measurement (78%), geometry (69%), algebra (66%), and data (46%). All but 5 countries had 90 percent or more of their students taught the number topics, while 25 participating entities had less than half their students taught the data topics.

The agreement between the average percentages of TIMSS topics in countries' eighth-grade intended mathematics curricula and the percentages of students actually taught the TIMSS mathematics topics by the eighth grade is rather striking. The differences in these percentages were a mere two percentage points for the mathematics topics overall, one percentage point for number, three percentage points for algebra,

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

Exhibit 5.7: Summary of Students Taught the TIMSS Mathematics Topics

MATHEMATICS Grade 8

Countries	Average Percentage of Students Taught the TIMSS Mathematics Topics											
	Overall (45 topics)		Number (10 topics)		Algebra (6 topics)		Measurement (8 topics)		Geometry (13 topics)		Data (8 topics)	
Armenia	r	90 (0.7)	r	100 (0.2)	r	93 (1.0)	r	95 (0.8)	r	92 (0.8)	s	65 (3.0)
Australia		71 (1.1)		95 (0.7)		61 (2.1)		79 (1.4)		61 (1.7)		57 (2.7)
Bahrain		66 (0.6)		100 (0.1)		42 (1.6)		69 (1.8)		72 (0.8)		28 (1.3)
Belgium (Flemish)		62 (1.0)		93 (0.8)		42 (1.9)		69 (1.9)		61 (1.0)		35 (2.0)
Botswana		40 (1.1)		88 (0.6)		26 (2.0)		49 (2.4)		26 (1.8)		6 (1.3)
Bulgaria		75 (0.7)		99 (0.3)		86 (1.3)		93 (1.1)		70 (0.9)		24 (2.0)
Chile		66 (1.2)		93 (0.8)		55 (1.9)		59 (2.4)		64 (1.3)		47 (2.6)
Chinese Taipei		72 (0.7)		99 (0.6)		89 (1.1)		88 (1.5)		73 (1.3)		6 (1.6)
Cyprus		53 (0.5)		89 (0.8)		34 (1.1)		62 (1.2)		59 (0.5)		4 (0.7)
Egypt		88 (0.6)		99 (0.4)		91 (1.0)		92 (1.4)		94 (0.6)		60 (1.8)
Estonia		80 (0.8)		98 (0.9)		82 (1.2)		92 (1.0)		69 (1.1)		62 (2.5)
Ghana		60 (1.6)		83 (1.6)		59 (2.2)		53 (2.9)		51 (2.4)		55 (2.7)
Hong Kong, SAR		77 (1.0)		98 (0.5)		66 (2.1)		86 (1.8)		81 (1.3)		45 (2.5)
Hungary		85 (0.8)		100 (0.1)		93 (1.2)		98 (0.5)		83 (1.0)		54 (2.7)
Indonesia		79 (1.0)		98 (0.7)		72 (1.8)		88 (1.4)		69 (1.3)		68 (2.5)
Iran, Islamic Rep. of		75 (1.0)		95 (0.8)		65 (2.2)		64 (2.2)		91 (0.8)		43 (2.2)
Israel		61 (1.2)		96 (0.6)		69 (1.5)		60 (2.5)		45 (1.4)		41 (2.4)
Italy		79 (0.8)		99 (0.2)		62 (1.9)		88 (1.2)		85 (0.9)		50 (2.3)
Japan		74 (0.8)		98 (0.8)		92 (1.0)		79 (1.9)		75 (0.8)		21 (2.3)
Jordan		77 (0.9)		99 (0.4)		63 (1.7)		89 (1.8)		80 (1.0)		44 (2.4)
Korea, Rep. of	s	81 (1.2)	s	92 (1.1)	s	87 (1.4)	s	81 (1.9)	s	85 (1.5)	s	59 (2.5)
Latvia	s	67 (1.1)	s	98 (0.5)	s	52 (2.4)	s	63 (2.4)	s	61 (1.7)	s	48 (3.0)
Lebanon		68 (1.4)		92 (1.1)		58 (2.7)		72 (2.1)		71 (1.6)		38 (3.0)
Lithuania		82 (0.8)		99 (0.2)		69 (2.0)		92 (0.9)		76 (1.1)		69 (2.0)
Macedonia, Rep. of		95 (0.7)		99 (0.7)		98 (0.6)		90 (1.6)		99 (0.5)		– –
Malaysia		72 (1.1)		99 (0.3)		54 (2.1)		72 (1.9)		80 (1.4)		40 (2.5)
Moldova, Rep. of	r	82 (1.3)	r	94 (1.9)	r	89 (1.8)	r	81 (1.8)	r	82 (1.5)	r	57 (3.7)
Morocco	s	63 (1.4)	s	96 (0.9)	s	46 (3.2)	s	76 (3.0)	s	56 (2.0)		x x
Netherlands		71 (1.1)		93 (1.0)		71 (2.7)		81 (1.6)		64 (1.8)		43 (2.1)
New Zealand		75 (1.5)		94 (1.0)		67 (2.5)		80 (2.2)		62 (1.8)		69 (2.5)
Norway		55 (1.1)		87 (1.4)		23 (1.5)		66 (2.3)		41 (1.4)		53 (2.6)
Palestinian Nat'l Auth.		71 (0.9)		98 (0.7)		42 (2.1)		77 (2.0)		71 (1.0)		54 (1.6)
Philippines		60 (1.7)		98 (1.0)		85 (1.9)		67 (2.9)		33 (3.2)		30 (3.1)
Romania		89 (0.7)		100 (0.0)		94 (1.2)		94 (1.0)		95 (0.5)		59 (2.6)
Russian Federation		– –		– –		– –		– –		– –		– –
Saudi Arabia		62 (1.3)		92 (1.6)		55 (2.3)		66 (3.1)		65 (1.3)		18 (2.1)
Scotland		68 (1.3)		93 (1.0)		47 (2.9)		79 (1.6)		56 (1.7)		62 (2.1)
Serbia		89 (1.3)		94 (2.2)		95 (1.0)		93 (1.5)		92 (1.9)		65 (2.7)
Singapore		83 (0.5)		100 (0.1)		89 (0.8)		86 (0.7)		82 (1.0)		54 (1.1)
Slovak Republic		69 (0.6)		100 (0.1)		54 (1.4)		90 (1.1)		71 (0.8)		18 (1.9)
Slovenia		66 (0.7)		92 (0.5)		40 (1.9)		81 (1.6)		69 (0.9)		31 (1.8)
South Africa	r	55 (1.6)	r	77 (1.9)	r	57 (2.4)	r	49 (2.5)	r	48 (2.0)	r	40 (2.6)
Sweden		60 (0.9)		93 (0.5)		43 (2.1)		78 (1.1)		40 (1.3)		47 (1.9)
Syrian Arab Republic		– –		– –		– –		– –		– –		– –
Tunisia		64 (1.1)		93 (0.9)		44 (2.2)		75 (2.0)		60 (1.2)		37 (2.3)
United States		83 (0.8)		100 (0.2)		80 (1.3)		84 (1.2)		72 (1.6)		83 (1.3)
‡ England	s	83 (1.5)	s	99 (0.5)	s	73 (3.1)	s	84 (2.3)	s	77 (2.1)	s	79 (2.2)
International Avg.		72 (0.2)		95 (0.1)		66 (0.3)		78 (0.3)		69 (0.2)		46 (0.4)
Benchmarking Participants												
Basque Country, Spain		67 (1.4)		98 (0.4)		57 (3.0)		76 (2.0)		65 (2.1)		30 (3.5)
Indiana State, US		81 (1.8)		99 (0.3)		74 (2.9)		86 (2.0)		66 (3.5)		82 (2.7)
Ontario Province, Can.		80 (1.0)		93 (1.1)		60 (2.2)		86 (1.2)		75 (2.1)		82 (2.3)
Quebec Province, Can.		68 (1.2)		99 (0.5)		58 (2.6)		66 (2.0)		66 (2.0)		42 (2.4)

Background data provided by teachers at the time of testing.

‡ Did not satisfy guidelines for sample participation rates.

( ) 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 5.8 through 5.12 for data on individual topics.

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

Exhibit 5.7: Summary of Students Taught the TIMSS Mathematics Topics

MATHEMATICS Grade 4

Countries	Average Percentage of Students Taught the TIMSS Mathematics Topics											
	Overall (42 topics)		Number (12 topics)		Patterns and Relationships (6 topics)		Measurement (6 topics)		Geometry (11 topics)		Data (7 topics)	
Armenia	r	73 (1.1)	r	91 (0.9)	r	86 (1.4)	r	93 (1.3)	r	38 (2.5)	r	67 (2.4)
Australia		77 (1.5)		74 (1.7)		79 (3.1)		89 (1.5)		69 (1.5)		81 (2.4)
Belgium (Flemish)		81 (1.0)		93 (1.1)		83 (1.6)		93 (1.0)		62 (1.8)		79 (1.6)
Chinese Taipei		78 (1.1)		86 (1.0)		80 (1.8)		96 (1.0)		53 (2.3)		89 (1.9)
Cyprus		86 (0.9)		95 (0.7)		87 (1.4)		95 (1.0)		72 (1.9)		86 (1.7)
England	r	88 (0.9)	r	87 (1.2)	r	80 (1.9)	r	95 (0.9)	r	87 (1.5)	r	89 (1.5)
Hong Kong, SAR		73 (1.2)		90 (1.1)		55 (2.7)		84 (2.1)		53 (2.5)		83 (1.9)
Hungary		73 (1.2)		68 (1.1)		92 (1.0)		89 (1.3)		61 (2.1)		74 (2.9)
Iran, Islamic Rep. of		68 (1.4)		70 (1.4)		65 (2.3)		85 (1.8)		58 (1.9)		68 (2.4)
Italy		78 (0.9)		88 (1.0)		73 (1.7)		71 (2.0)		72 (1.6)		83 (1.7)
Japan		54 (1.0)		59 (1.4)		63 (1.9)		80 (1.7)		21 (1.1)		69 (2.0)
Latvia	s	72 (1.4)	s	67 (2.1)	s	89 (1.7)	s	93 (1.1)	s	45 (2.7)	s	87 (1.9)
Lithuania		78 (1.2)		77 (1.4)		83 (1.6)		93 (0.9)		63 (1.9)		87 (1.8)
Moldova, Rep. of	r	88 (0.9)	r	94 (0.9)	r	93 (1.3)	r	98 (0.5)	r	71 (2.1)	r	89 (1.8)
Morocco		x x		x x		x x		x x		x x		x x
Netherlands		54 (1.1)		63 (1.5)		67 (2.2)		78 (1.9)		13 (1.6)		67 (2.6)
New Zealand		77 (1.0)		76 (1.2)		84 (1.7)		85 (1.4)		65 (1.7)		87 (1.4)
Norway		52 (1.3)		54 (1.6)		53 (2.2)		78 (2.1)		32 (2.5)		54 (2.8)
Philippines		79 (1.9)		95 (0.9)		73 (3.2)		78 (3.2)		71 (2.8)		72 (3.1)
Russian Federation		– –		– –		– –		– –		– –		– –
Scotland	r	75 (1.2)	r	67 (1.8)	r	84 (1.9)	r	86 (2.6)	r	65 (1.8)	r	86 (1.9)
Singapore		82 (0.8)		97 (0.5)		87 (1.5)		95 (0.9)		51 (1.8)		90 (1.5)
Slovenia		59 (1.1)		54 (0.9)		86 (1.5)		59 (1.9)		34 (1.5)		84 (2.1)
Tunisia	r	58 (1.0)	r	40 (0.9)	r	85 (1.9)	r	82 (1.9)	r	43 (1.6)	r	71 (2.7)
United States		82 (0.8)		83 (1.1)		89 (1.0)		81 (1.3)		74 (1.5)		90 (1.2)
Yemen		– –		– –		– –		– –		– –		– –
International Avg.		73 (0.2)		77 (0.3)		79 (0.4)		86 (0.3)		55 (0.4)		80 (0.4)
Benchmarking Participants												
Indiana State, US		75 (1.5)		79 (2.1)		84 (2.2)		78 (3.2)		57 (3.5)		87 (1.7)
Ontario Province, Can.		80 (1.1)		75 (2.1)		83 (1.7)		86 (1.8)		75 (2.3)		91 (1.9)
Quebec Province, Can.		68 (1.3)		67 (1.6)		83 (1.5)		70 (2.6)		59 (1.8)		69 (2.9)

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

Background data provided 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.

See Exhibits 5.13 through 5.17 for data on individual topics.

no difference for measurement, two percentage points for geometry, and seven percentage points for data.

Although there was great agreement between coverage in the intended curriculum and the implemented curriculum internationally at the eighth grade, there was wide variation among individual countries. Agreement between the percentage of TIMSS mathematics topics included in a country's intended curriculum and the percentage of students taught the TIMSS mathematics topics in that country by the eighth grade was within 5 percentage points in 19 countries spanning the entire spectrum of achievement: Australia, Botswana, Bulgaria, Chile, Chinese Taipei, Egypt, Hong Kong SAR, Hungary, Iran, Jordan, Korea, Latvia, Malaysia, Moldova, New Zealand, the Palestinian National Authority, Romania, Saudi Arabia, and Singapore. However, there were also several participants where the level of agreement between coverage of the intended and implemented curricula was much less.

At the fourth grade, Exhibit 5.7 shows that internationally, on average, 73 percent of the students tested in TIMSS 2003 had been taught the TIMSS mathematics topics, with the percentage ranging from 88 percent in England and Moldova to 52 percent in Norway. The majority of students in every country had been taught the topics.

Consistent with the data reported on the intended mathematics curriculum at the fourth grade (Exhibit 5.6), measurement was the content area with the greatest percentage of students taught the topics (86%). The percentages of fourth-grade students internationally, on average, taught the TIMSS mathematics topics in the content areas of data, patterns and relationships, and number were rather similar. A full 80 percent of the students across countries had been taught the data topics by the fourth grade, 79 percent of students had been taught the patterns and relationships topics, and 77 percent of students had been taught the number topics. Across countries, the range for data was from 90 percent in the United States to 54 percent in Norway, for patterns and relationships from 93 percent in Moldova to 53 percent in Norway, and for number from 97 percent in Singapore to 40 percent in Tunisia.

There was much less agreement at fourth grade than at eighth grade between the average percentages of TIMSS topics in countries' intended mathematics curricula and the percentages of students actually taught the TIMSS mathematics topics.

Which TIMSS Mathematics Topics Are in the Intended and Implemented Curriculum?

For first the eighth grade and then the fourth grade, this section presents information about the coverage of each individual mathematics topic in each country's intended and implemented curriculum. 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 5.8 through 5.12 present these data for the mathematics content areas at eighth grade, and Exhibits 5.13 through 5.17 for those at fourth grade.

Exhibit 5.8 presents information on the ten number topics at eighth grade. As shown in this exhibit, the TIMSS number topics were included in the intended curriculum of almost all participants. In particular, three topics – "common fractions," "decimal fractions," and "computations with decimals" – were included by all participants for all or almost all students. Exhibit 5.8 shows, however, that there was great variation among participants in the grade(s) at which the number 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 are taught. According to the exhibit, teachers reported that the TIMSS number topics had been taught to almost all students, with more than 90 percent of students taught each of the topics except "ratios," where the figure was 86 percent.

Exhibit 5.8: Intended and Taught TIMSS Number Topics

MATHEMATICS Grade 8

Number

Countries	Whole numbers including place value, factorization, and the four operations			Computations, estimations, or approximations involving whole numbers			Common fractions			Decimal fractions		
	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 100 (0.0)	●	--	r 98 (1.2)	●	--	r 100 (0.0)	●	--	r 100 (0.0)
Australia	●	3-6	100 (0.1)	●	5-8	96 (2.1)	●	5-8	100 (0.2)	●	5-8	98 (0.9)
Bahrain	●	1-6	100 (0.0)	●	1-6	99 (0.6)	●	3-4	100 (0.0)	●	5	100 (0.0)
Belgium (Flemish)	●	--	99 (0.5)	●	--	100 (0.0)	●	--	98 (1.1)	●	--	90 (2.3)
Botswana	●	8	100 (0.0)	●	8	94 (2.1)	●	6	99 (0.6)	●	8	99 (0.7)
Bulgaria	●	4	99 (0.9)	●	4	88 (3.0)	●	5	100 (0.0)	●	5	100 (0.0)
Chile	●	4	99 (0.9)	●	4	98 (0.9)	●	5	97 (1.1)	●	8	98 (1.0)
Chinese Taipei	●	7	99 (0.6)	●	7	99 (0.6)	●	7	99 (0.6)	●	7	99 (0.6)
Cyprus	●	4-7	87 (1.8)	●	4-7	62 (2.3)	●	4-7	96 (1.2)	●	4-7	84 (1.7)
Egypt	●	1-4	100 (0.0)	●	1-5	100 (0.0)	●	4-5	100 (0.0)	●	5	96 (1.6)
Estonia	●	5	98 (1.1)	●	5	98 (1.1)	●	6	98 (1.0)	●	6	98 (1.0)
Ghana	●	--	96 (1.8)	●	--	77 (3.9)	●	--	91 (2.8)	●	--	89 (3.2)
Hong Kong, SAR	●	1-4	99 (0.9)	●	4	97 (1.5)	●	4	97 (1.7)	●	5	99 (1.1)
Hungary	●	4	100 (0.0)	●	4	99 (0.7)	●	5	100 (0.0)	●	6	100 (0.0)
Indonesia	●	4-6	98 (1.3)	●	5-8	96 (2.1)	●	6-8	98 (1.5)	●	6-8	99 (1.3)
Iran, Islamic Rep. of	●	1-9	93 (2.2)	●	1-9	90 (2.8)	●	5-6	98 (1.1)	●	6	95 (1.7)
Israel	●	1-3	98 (1.0)	●	1-3	95 (1.2)	●	4-5	98 (1.0)	●	5-7	98 (1.0)
Italy	●	2-6	100 (0.0)	●	1-6	99 (0.7)	●	4-7	100 (0.0)	●	4-7	100 (0.0)
Japan	●	1-4	100 (0.0)	●	4-6	97 (1.6)	●	5	98 (1.4)	●	5	98 (1.4)
Jordan	●	1-6	100 (0.0)	●	1-6	99 (0.8)	●	2-5	99 (0.8)	●	4-8	99 (0.8)
Korea, Rep. of	○	9	s 71 (3.3)	●	--	99 (0.8)	●	--	s 95 (1.4)	●	--	s 99 (0.9)
Latvia	●	6-7	s 100 (0.0)	●	6-7	85 (4.5)	●	6	s 100 (0.0)	●	6-7	s 100 (0.0)
Lebanon	●	8	99 (1.0)	○	9-10	88 (3.0)	●	--	98 (1.2)	●	--	95 (1.8)
Lithuania	●	1-6	100 (0.0)	●	1-5	97 (1.3)	●	6	100 (0.0)	●	6	100 (0.0)
Macedonia, Rep. of	●	1-5	99 (1.0)	●	1-5	99 (0.7)	●	5	99 (0.7)	●	5	99 (1.0)
Malaysia	●	1-7	97 (1.6)	●	3-7	99 (0.7)	●	4	100 (0.0)	●	4-7	99 (1.0)
Moldova, Rep. of	●	5-6	r 94 (2.3)	●	5-6	r 94 (2.2)	●	5	r 92 (2.5)	●	5-6	r 92 (2.7)
Morocco	●	--	s 99 (0.7)	●	--	99 (1.0)	●	--	s 100 (0.0)	●	--	s 97 (2.1)
Netherlands	●	K-6	65 (4.2)	●	K-6	94 (2.0)	●	K-6	98 (1.3)	●	K-6	97 (1.6)
New Zealand	●	2-7	100 (0.1)	●	4-7	95 (2.7)	●	4-9	99 (0.8)	●	5-9	98 (1.2)
Norway	●	2-10	99 (0.7)	●	3-10	98 (1.3)	●	4-10	90 (2.6)	●	4-10	94 (2.0)
Palestinian Nat'l Auth.	●	1-5	99 (0.6)	●	1-6	95 (2.1)	●	1-5	98 (1.4)	●	1-6	100 (0.0)
Philippines	●	7	98 (1.2)	●	7	98 (1.4)	●	--	98 (1.3)	●	--	99 (1.0)
Romania	●	1-5	100 (0.0)	●	1-5	100 (0.0)	●	4-6	100 (0.0)	●	5-7	100 (0.0)
Russian Federation	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Saudi Arabia	●	1-7	90 (3.5)	●	4	88 (3.7)	●	4-5	98 (1.2)	●	4-6	94 (4.3)
Scotland	●	--	96 (1.7)	●	--	99 (0.6)	●	--	95 (1.4)	●	--	97 (1.6)
Serbia	●	6	94 (2.2)	●	6	94 (2.2)	●	5	94 (2.2)	●	5	95 (2.1)
Singapore	●	1-5	100 (0.0)	●	1-5	99 (0.4)	●	3-5	100 (0.0)	●	4-5	100 (0.3)
Slovak Republic	●	6	100 (0.0)	●	5	100 (0.0)	●	6	100 (0.0)	●	5	100 (0.0)
Slovenia	●	8	99 (0.7)	●	5	97 (1.4)	●	6	100 (0.0)	●	7	100 (0.0)
South Africa	●	--	r 87 (2.5)	●	--	r 73 (3.3)	●	--	89 (2.5)	●	--	r 77 (3.2)
Sweden	●	7	100 (0.4)	●	7	99 (0.7)	●	7	98 (0.7)	●	7	98 (0.8)
Syrian Arab Republic	⊙	--	– –	●	--	– –	●	--	– –	●	--	– –
Tunisia	●	--	99 (0.6)	●	--	96 (1.7)	●	--	98 (1.1)	●	--	97 (1.4)
United States	●	--	100 (0.0)	●	--	99 (0.5)	●	--	100 (0.3)	●	--	100 (0.1)
‡ England	●	K-7	s 100 (0.0)	●	K-8	100 (0.0)	●	2-5	s 100 (0.0)	●	3-6	s 99 (1.4)
International Avg.			97 (0.2)			95 (0.3)			98 (0.2)			97 (0.2)
Benchmarking Participants												
Basque Country, Spain	⊙	10	100 (0.0)	●	--	100 (0.5)	●	--	100 (0.0)	●	--	98 (1.3)
Indiana State, US	●	--	100 (0.0)	●	--	100 (0.0)	●	--	100 (0.0)	●	--	100 (0.0)
Ontario Province, Can.	●	6-8	100 (0.1)	●	1-6	100 (0.0)	●	5-6	96 (2.0)	●	4-7	97 (1.7)
Quebec Province, Can.	●	1-6	97 (1.6)	●	1-6	98 (1.6)	●	4-7	98 (1.4)	●	2-7	97 (1.9)

● All or almost all students ⊙ Only the more able students ○ Not included in the curriculum through eighth grade

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

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

‡ 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.

Exhibit 5.8: Intended and Taught TIMSS Number Topics *(Continued...)*

MATHEMATICS Grade 8

Number	Representing decimals and fractions			Computations with fractions			Computations with decimals			Integers including words, numbers, or models		
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	●	--	r 99 (0.7)	●	--	r 100 (0.0)	●	--	r 100 (0.0)	●	--	r 99 (0.7)
Australia	●	5-8	98 (1.1)	●	5-8	97 (1.1)	●	5-8	98 (0.9)	●	8	97 (1.2)
Bahrain	●	4-6	100 (0.5)	●	4-7	100 (0.0)	●	5-7	100 (0.0)	●	7	100 (0.0)
Belgium (Flemish)	●	--	92 (1.9)	●	--	98 (1.1)	●	--	99 (0.9)	●	--	90 (1.5)
Botswana	●	6	89 (2.9)	●	8	95 (1.7)	●	8	97 (1.4)	●	8	95 (2.1)
Bulgaria	●	6	100 (0.2)	●	5	100 (0.0)	●	5	100 (0.0)	●	6	100 (0.0)
Chile	●	8	96 (1.4)	●	5-6	97 (1.0)	●	6-7	98 (0.9)	●	8	96 (1.6)
Chinese Taipei	●	7	99 (0.9)	●	7	99 (0.6)	●	7	99 (0.6)	●	7	99 (0.7)
Cyprus	●	4-7	82 (1.9)	●	4-7	99 (0.6)	●	4-7	91 (1.3)	●	4-8	94 (1.3)
Egypt	●	5	99 (0.9)	●	5	99 (0.9)	●	5	98 (1.3)	●	7	99 (0.5)
Estonia	●	6	98 (1.0)	●	6	98 (1.0)	●	5	98 (1.0)	●	6-7	97 (1.3)
Ghana	●	--	90 (3.1)	●	--	82 (4.2)	●	--	72 (3.9)	●	--	92 (2.7)
Hong Kong, SAR	●	7	95 (1.9)	●	6	99 (0.7)	●	5	99 (0.7)	●	7-9	98 (1.3)
Hungary	●	6	100 (0.0)	●	7	100 (0.0)	●	7	100 (0.0)	●	7	100 (0.0)
Indonesia	●	6-8	98 (1.1)	●	5-8	100 (0.0)	●	6-8	100 (0.0)	●	4-8	98 (1.2)
Iran, Islamic Rep. of	●	6	98 (1.3)	●	6	99 (0.7)	●	6	98 (1.0)	●	6	99 (0.8)
Israel	●	4-7	96 (1.3)	●	5-7	98 (0.5)	●	5-7	98 (1.0)	●	2-7	99 (0.8)
Italy	●	4-6	100 (0.3)	●	4-8	100 (0.0)	●	4-8	100 (0.0)	●	6-8	100 (0.3)
Japan	●	4	98 (1.2)	●	5-6	100 (0.0)	●	4-5	100 (0.0)	●	7	99 (0.6)
Jordan	●	4-7	100 (0.0)	●	4-7	99 (0.8)	●	4-7	99 (0.8)	●	7-10	99 (0.5)
Korea, Rep. of	●	--	s 96 (1.3)	●	--	94 (2.0)	●	--	s 96 (1.8)	●	--	s 95 (1.5)
Latvia	●	6-7	s 100 (0.0)	●	6	100 (0.0)	●	6	s 100 (0.0)	●	6-7	s 100 (0.0)
Lebanon	●	8	92 (2.4)	●	--	97 (1.4)	●	--	97 (1.5)	●	--	96 (1.8)
Lithuania	●	4-6	100 (0.0)	●	6	100 (0.0)	●	5-6	100 (0.0)	●	6-8	100 (0.0)
Macedonia, Rep. of	●	5-6	99 (0.7)	●	5	99 (0.7)	●	6	99 (0.7)	●	6-7	99 (0.9)
Malaysia	●	4-7	99 (0.7)	●	4-7	100 (0.0)	●	4-7	100 (0.0)	●	7	100 (0.0)
Moldova, Rep. of	●	5	r 95 (2.2)	●	5-7	r 95 (2.0)	●	5,7	r 95 (2.1)	●	6	r 94 (2.2)
Morocco	○	--	s 93 (3.2)	●	--	100 (0.0)	●	--	s 100 (0.0)	●	--	s 99 (0.9)
Netherlands	●	K-6	95 (2.0)	●	K-6	95 (2.1)	●	K-6	97 (1.5)	●	K-6	97 (2.7)
New Zealand	●	2-5	98 (1.1)	⦿	8-9	95 (1.5)	●	5-9	98 (0.9)	⦿	6-9	95 (2.3)
Norway	●	4-10	84 (3.1)	●	5-10	85 (2.8)	●	5-10	97 (1.4)	●	6-10	98 (1.2)
Palestinian Nat'l Auth.	●	3-6	99 (0.7)	●	3-6	99 (1.1)	●	3-6	98 (1.2)	●	6-7	99 (1.1)
Philippines	●	--	97 (1.5)	●	--	99 (0.8)	●	--	97 (1.6)	●	7	98 (1.2)
Romania	●	5-8	100 (0.0)	●	4-6	100 (0.0)	●	5-7	100 (0.0)	●	5-9	100 (0.0)
Russian Federation	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Saudi Arabia	●	4-6	95 (1.7)	●	4-8	100 (0.4)	●	4-6	97 (1.9)	●	7	98 (1.1)
Scotland	●	--	96 (2.0)	⦿	--	78 (3.6)	●	--	98 (1.1)	⦿	--	90 (2.6)
Serbia	●	5	93 (2.4)	●	5	93 (2.4)	●	5	94 (2.2)	●	6	94 (2.2)
Singapore	●	4-5	100 (0.3)	●	4-7	100 (0.0)	●	4-5	100 (0.0)	●	7	99 (0.5)
Slovak Republic	●	6	100 (0.0)	●	7	100 (0.0)	●	5	100 (0.0)	●	6	100 (0.0)
Slovenia	●	7	100 (0.0)	●	7	100 (0.0)	●	6	99 (0.6)	●	4	99 (0.8)
South Africa	●	--	r 76 (3.3)	●	--	r 71 (3.8)	●	--	r 68 (3.9)	●	--	r 94 (1.7)
Sweden	●	7	96 (1.0)	○	9	94 (1.3)	●	7	99 (0.4)	●	5	98 (0.9)
Syrian Arab Republic	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Tunisia	●	--	95 (1.9)	●	--	99 (0.6)	●	--	100 (0.0)	●	--	99 (0.6)
United States	●	--	100 (0.0)	●	--	100 (0.3)	●	--	100 (0.3)	●	--	99 (0.5)
‡ England	●	3-5	s 100 (0.0)	●	6-8	98 (1.5)	●	4-8	s 99 (0.6)	●	K-7	s 100 (0.0)
International Avg.			96 (0.2)			97 (0.2)			97 (0.2)			98 (0.2)
Benchmarking Participants												
Basque Country, Spain	●	--	96 (2.3)	●	--	100 (0.0)	●	--	99 (0.8)	●	--	100 (0.0)
Indiana State, US	●	--	99 (1.1)	●	--	100 (0.0)	●	--	99 (0.5)	●	--	98 (1.2)
Ontario Province, Can.	●	4-6	97 (1.8)	●	7-8	96 (2.0)	●	4-8	99 (1.0)	●	7-8	88 (3.0)
Quebec Province, Can.	●	4-7	99 (1.0)	●	5-7	100 (0.0)	●	4-7	99 (0.8)	●	6-8	100 (0.2)

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.

‡ 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.

Exhibit 5.8: Intended and Taught TIMSS Number Topics *(...Continued)*

MATHEMATICS Grade 8

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

Number	Ratios			Conversion of percents to fractions or decimals, and vice versa		
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	⦿	--	r 99 (0.5)	●	--	r 100 (0.4)
Australia	○	9-10	75 (3.8)	●	5-7	93 (1.9)
Bahrain	●	6-7	98 (0.6)	●	6-7	100 (0.0)
Belgium (Flemish)	●	--	72 (3.5)	●	--	89 (2.6)
Botswana	○	9	15 (3.2)	●	8	99 (1.0)
Bulgaria	●	6	100 (0.4)	●	5	100 (0.0)
Chile	●	8	83 (2.6)	●	7	74 (2.8)
Chinese Taipei	●	7	99 (0.9)	●	7	99 (0.6)
Cyprus	●	5-8	98 (1.3)	●	4-7	98 (0.1)
Egypt	●	5	96 (1.6)	●	5	99 (0.9)
Estonia	●	7	97 (1.1)	●	6	97 (1.6)
Ghana	●	--	61 (5.0)	●	--	82 (3.7)
Hong Kong, SAR	●	7-9	94 (2.0)	●	7-9	99 (0.7)
Hungary	●	6	100 (0.0)	●	6	100 (0.5)
Indonesia	●	7-8	97 (1.5)	●	6-8	99 (1.1)
Iran, Islamic Rep. of	●	6	94 (2.0)	●	6	87 (2.6)
Israel	●	6-8	88 (2.4)	●	6-8	95 (1.6)
Italy	●	6-7	100 (0.0)	●	6-7	93 (2.1)
Japan	●	6	91 (2.4)	●	5	98 (1.4)
Jordan	●	6-8	100 (0.0)	●	6-8	99 (0.7)
Korea, Rep. of	●	--	s 85 (2.4)	●	--	91 (2.2)
Latvia	●	6-7	s 99 (1.3)	●	6-7	100 (0.0)
Lebanon	●	8	82 (3.5)	●	--	79 (3.6)
Lithuania	●	6	97 (1.7)	●	5-6	100 (0.0)
Macedonia, Rep. of	●	6-7	98 (1.0)	●	6	99 (0.7)
Malaysia	●	8-9	97 (1.9)	●	6-7	99 (0.8)
Moldova, Rep. of	●	6	r 93 (2.5)	●	6-7	r 97 (1.4)
Morocco	○	--	s 89 (3.9)	○	--	87 (4.7)
Netherlands	●	--	91 (3.0)	⦿	--	96 (2.2)
New Zealand	⦿	8-9	66 (4.5)	⦿	6-7	96 (2.5)
Norway	○	9-10	40 (4.7)	●	8-10	82 (3.3)
Palestinian Nat'l Auth.	●	6-7	98 (0.9)	●	6	97 (1.6)
Philippines	●	--	94 (2.2)	●	--	97 (1.6)
Romania	●	5-9	100 (0.0)	●	5-9	100 (0.0)
Russian Federation	●	--	– –	●	--	– –
Saudi Arabia	●	4-8	83 (5.1)	●	--	80 (5.5)
Scotland	⦿	--	87 (2.7)	●	--	94 (1.9)
Serbia	●	7	94 (2.2)	●	6	94 (2.2)
Singapore	●	5-7	100 (0.3)	●	5-7	100 (0.3)
Slovak Republic	●	7	100 (0.0)	●	7	99 (0.6)
Slovenia	●	8	22 (3.9)	●	7	99 (0.6)
South Africa	⦿	--	r 60 (4.1)	●	--	r 73 (3.3)
Sweden	●	8	49 (3.3)	●	7	96 (1.1)
Syrian Arab Republic	●	--	– –	●	--	– –
Tunisia	●	--	74 (3.7)	●	--	75 (3.8)
United States	●	--	98 (0.7)	●	--	99 (0.4)
‡ England	●	4-7	s 98 (1.3)	●	5-6	96 (2.7)
International Avg.			86 (0.4)			94 (0.3)
Benchmarking Participants						
Basque Country, Spain	●	--	95 (2.1)	●	--	96 (2.1)
Indiana State, US	●	--	98 (1.5)	●	--	96 (1.9)
Ontario Province, Can.	●	8-10	71 (4.6)	●	8	89 (2.9)
Quebec Province, Can.	●	7-8	100 (0.0)	●	6-7	97 (1.8)

● 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.

‡ 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.

The algebra topics were included in their intended eighth-grade curricula by somewhat fewer participants, as shown in Exhibit 5.9. The most frequently reported topic – "sums, products, and powers of expressions containing variables" – was included for all or almost all students in 42 of the participating entities. In contrast, "attributes of a graph" was included in the intended curriculum of just 19 participants. Although when most topics were included, they were intended for all or almost all students, "simple linear equations and equalities, and simultaneous (two variables) equations" and "proportional, linear, and nonlinear relationships" were intended for the top-track students only in 9 and 7 entities, respectively. Countries frequently indicated that algebra topics would primarily be taught in later grades. Exhibit 5.9 also shows that the percentages of students whose teachers reported having taught the algebra topics generally is in line with the inclusion of the topics in the intended curriculum. The percentage of students ranged from 88 percent for "sums, products, and powers of expressions containing variables" to 44 percent for "attributes of a graph."

As noted earlier in this chapter, most TIMSS participants included good coverage of measurement in their eighth-grade intended curriculum. Exhibit 5.10 provides more detail, showing that five of the eight measurement topics are included in the intended curriculum of at least 40 of the participants. These topics include standard units of measure, relationship among conversion units, using standard measurement tools, estimation of measurements, and measurement formulas. Also, teachers reported that these topics had been well covered in the classroom, with more than 80 percent of students having been taught each one, on average. The other three topics were included in fewer participants' curricula and had received less attention in the classroom. "Precision of measurements" was included in the intended curriculum of just 22 participants, and on average, 57 percent of students had teachers reporting that the topic had been taught.

With 13 topics, geometry was the TIMSS mathematics content area with the most topics. However, as shown in Exhibit 5.11, just three

Exhibit 5.9: Intended and Taught TIMSS Algebra Topics

MATHEMATICS Grade 8

Algebra

Countries	Numeric, algebraic, and geometric patterns or sequences			Sums, products, and powers of expressions containing variables			Simple linear equations and equalities, and simultaneous (two variables) equations			Equivalent representations of functions as ordered pairs, tables, graphs, words, or equations		
	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 98 (0.9)	●	--	r 100 (0.0)	●	--	r 99 (0.5)	⦿	--	r 88 (2.6)
Australia	●	5-7	89 (2.7)	●	8-9	76 (3.3)	⦿	9-10	42 (3.9)	●	7-9	72 (3.7)
Bahrain	●	1-8	58 (3.2)	●	7-9	97 (1.4)	●	7-9	28 (3.5)	○	9-12	48 (3.3)
Belgium (Flemish)	●	--	56 (3.8)	●	--	78 (2.4)	●	--	28 (3.4)	●	--	40 (4.2)
Botswana	●	8	70 (4.2)	○	9	47 (4.8)	○	9	16 (3.7)	○	11	13 (3.2)
Bulgaria	○	--	47 (4.5)	●	7-8	99 (0.9)	●	6-8	98 (1.2)	●	8	97 (0.8)
Chile	○	9	67 (3.3)	○	9	76 (3.1)	○	10	58 (3.6)	○	10	54 (3.4)
Chinese Taipei	○	9	76 (3.4)	●	8	99 (0.6)	●	8	98 (1.4)	●	8	97 (1.4)
Cyprus	●	4-8	25 (2.3)	●	6-8	85 (2.3)	⦿	7-9	72 (2.8)	●	5-8	9 (1.9)
Egypt	●	8	84 (3.0)	●	6-7	99 (0.8)	●	6-8	99 (0.7)	●	8	98 (1.3)
Estonia	●	4-9	58 (3.9)	●	8-9	99 (1.0)	●	7-8	98 (1.1)	●	7,9	88 (2.9)
Ghana	●	--	81 (3.8)	●	--	88 (2.8)	●	--	77 (3.8)	●	--	54 (4.1)
Hong Kong, SAR	●	7-9	76 (3.8)	●	7-9	95 (1.8)	●	7-9	89 (2.2)	○	12	70 (4.4)
Hungary	●	4	82 (3.3)	●	5	96 (1.6)	●	7-10	92 (2.2)	●	8	97 (1.4)
Indonesia	●	7-8	60 (4.3)	●	7-8	81 (3.6)	●	7-8	100 (0.2)	●	8-9	97 (1.4)
Iran, Islamic Rep. of	●	8-9	64 (4.1)	●	6-7,9	93 (2.0)	●	8-9	91 (2.3)	○	9-11	67 (4.2)
Israel	●	4-9	91 (2.1)	●	8-9	89 (1.9)	●	8-9	93 (1.8)	●	8-9	58 (3.8)
Italy	●	8-9	62 (3.5)	●	8-10	89 (2.6)	●	8-10	59 (4.0)	●	8-10	69 (3.4)
Japan	●	7	77 (3.5)	●	7-8	96 (1.3)	●	7-8	95 (1.9)	●	7-8	93 (1.8)
Jordan	●	4-11	49 (4.4)	●	7-11	99 (0.7)	●	6-9	97 (1.5)	●	8-10	99 (1.1)
Korea, Rep. of	●	--	s 62 (3.7)	●	--	92 (1.9)	●	--	s 97 (0.9)	●	--	s 97 (1.0)
Latvia	○	9	s 3 (1.7)	●	7	95 (0.5)	●	7	s 64 (4.7)	●	7	s 53 (5.5)
Lebanon	○	11-12	70 (4.3)	●	8	97 (1.5)	○	9	49 (4.5)	○	9-12	56 (4.4)
Lithuania	○	11-12	37 (4.1)	●	8-12	98 (1.3)	●	4-8	82 (3.6)	●	8-12	73 (3.8)
Macedonia, Rep. of	●	7	r 87 (3.1)	●	7	98 (1.0)	●	5-8	99 (0.8)	●	5-8	100 (0.0)
Malaysia	●	7	83 (3.1)	○	9	89 (2.3)	●	8-10	58 (4.3)	○	9	50 (4.5)
Moldova, Rep. of	●	6-7	s 85 (3.6)	●	7	r 97 (1.4)	●	7-8	r 93 (2.4)	●	7-8	r 92 (2.5)
Morocco	○	--	x x	●	--	94 (3.1)	○	--	s 48 (6.5)	○	--	s 28 (5.8)
Netherlands	○	--	67 (5.2)	⦿	--	78 (3.9)	⦿	--	68 (4.6)	●	--	77 (4.3)
New Zealand	●	8-9	92 (2.8)	⦿	8-9	92 (2.6)	⦿	8-10	47 (4.8)	●	4-9	75 (3.9)
Norway	○	9-10	48 (4.2)	●	8-10	30 (4.3)	●	8-10	6 (1.7)	○	9-10	30 (3.8)
Palestinian Nat'l Auth.	●	6-8	46 (4.3)	●	7-8	97 (1.7)	●	7-8	44 (4.5)	○	9	39 (4.6)
Philippines	●	8	65 (4.5)	●	8	94 (2.4)	●	8	98 (1.3)	○	10	93 (2.4)
Romania	●	6-9	83 (3.5)	●	6-9	95 (1.8)	●	7-9	100 (0.0)	●	7-11	98 (1.1)
Russian Federation	○	9	——	●	--	——	●	--	——	●	--	——
Saudi Arabia	○	11	59 (5.9)	●	8	96 (1.8)	●	7-8	40 (4.8)	●	8	85 (3.6)
Scotland	●	--	82 (3.2)	⦿	--	60 (4.8)	⦿	--	r 32 (4.6)	○	--	38 (5.1)
Serbia	●	7	83 (3.2)	●	7	95 (2.1)	●	8	99 (0.9)	●	8	98 (1.2)
Singapore	●	6-8	97 (1.0)	⦿	7-10	96 (1.1)	●	7-8	92 (1.4)	●	8-10	92 (1.4)
Slovak Republic	⦿	9	28 (3.6)	●	8	99 (0.5)	●	7	62 (4.7)	○	9	25 (3.5)
Slovenia	●	4	45 (4.6)	●	6	84 (3.1)	●	7	18 (3.4)	●	7	44 (4.3)
South Africa	●	--	r 76 (3.8)	●	--	r 92 (2.2)	⦿	--	r 59 (3.9)	○	--	r 50 (3.8)
Sweden	○	9	64 (3.9)	○	9	61 (4.0)	⦿	7-9	28 (3.5)	○	9	37 (3.8)
Syrian Arab Republic	●	10	——	●	--	——	○	9	——	○	9	——
Tunisia	●	--	76 (3.8)	●	--	81 (3.5)	○	11	23 (3.5)	○	11	36 (4.0)
United States	●	--	95 (1.3)	●	--	93 (1.2)	⦿	--	80 (2.4)	●	--	85 (1.9)
‡ England	●	6-8	s 95 (2.4)	●	6-7	86 (3.8)	●	6-9	s 63 (5.5)	●	6-7	s 81 (4.4)
International Avg.			68 (0.5)			88 (0.4)			68 (0.5)			68 (0.5)
Benchmarking Participants												
Basque Country, Spain	●	--	70 (4.6)	⦿	10	86 (3.5)	⦿	10	65 (5.6)	⦿	10	40 (5.4)
Indiana State, US	●	--	92 (3.5)	●	--	94 (2.3)	●	--	72 (5.5)	●	--	78 (3.8)
Ontario Province, Can.	●	6-8	89 (2.6)	●	7-8	86 (3.5)	●	7-8	64 (4.0)	●	8	60 (4.8)
Quebec Province, Can.	●	1-7	92 (2.8)	●	8-11	68 (4.7)	●	8-11	22 (3.9)	○	9-11	66 (4.8)

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

‡ 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.

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

Exhibit 5.9: Intended and Taught TIMSS Algebra Topics

MATHEMATICS Grade 8

Algebra

Countries	Proportional, linear, and nonlinear relationships			Attributes of a graph		
	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 98 (0.9)	●	--	r 76 (3.6)
Australia	⦿	9-11	46 (3.8)	⦿	9-11	39 (4.6)
Bahrain	●	6-9	18 (2.9)	○	10-12	4 (1.2)
Belgium (Flemish)	●	--	39 (3.5)	○	--	10 (1.8)
Botswana	○	9	7 (2.5)	○	9	1 (1.0)
Bulgaria	●	8	93 (2.1)	●	8	80 (3.2)
Chile	○	11	45 (4.0)	○	--	30 (3.8)
Chinese Taipei	●	8	86 (3.1)	○	9	75 (3.4)
Cyprus	⦿	6-9	6 (2.2)	○	9	4 (1.5)
Egypt	●	5,11	70 (3.2)	●	8	98 (0.9)
Estonia	●	7,9	93 (2.2)	●	6-7, 9	58 (3.2)
Ghana	●	--	28 (4.3)	●	--	27 (4.3)
Hong Kong, SAR	○	10-11	42 (4.9)	○	12	21 (3.4)
Hungary	●	8	97 (1.3)	○	11	90 (2.5)
Indonesia	○	10	56 (4.3)	○	10	38 (4.0)
Iran, Islamic Rep. of	○	9-11	42 (4.2)	○	10-11	32 (3.9)
Israel	○	9	49 (3.6)	●	8-9	30 (3.5)
Italy	○	9-10	59 (3.6)	○	9-13	38 (3.3)
Japan	●	7-8	92 (2.1)	●	8	97 (1.5)
Jordan	●	7-9	24 (3.9)	○	10-12	14 (3.1)
Korea, Rep. of	○	9	s 80 (3.5)	●	--	91 (2.0)
Latvia	●	7	s 75 (4.4)	●	7,9	26 (4.7)
Lebanon	○	9	37 (4.4)	○	10-12	36 (4.8)
Lithuania	●	8-12	79 (3.2)	○	9-12	44 (4.0)
Macedonia, Rep. of	●	7-8	98 (1.1)	●	7-8	99 (0.6)
Malaysia	○	9	27 (3.7)	○	9	14 (3.0)
Moldova, Rep. of	●	7	r 86 (3.2)	●	8	r 79 (3.4)
Morocco	○	--	x x	○	--	10 (4.2)
Netherlands	●	--	62 (4.9)	●	--	75 (4.5)
New Zealand	⦿	8-10	54 (4.9)	⦿	9	43 (4.7)
Norway	○	9-10	8 (2.0)	○	12-13	15 (2.7)
Palestinian Nat'l Auth.	○	9-10	14 (3.0)	○	10	12 (2.8)
Philippines	○	10	76 (4.3)	○	10	81 (3.6)
Romania	●	7-11	91 (2.7)	●	7-11	94 (2.1)
Russian Federation	●	--	– –	●	8-9	– –
Saudi Arabia	●	8	33 (5.0)	○	10,12	14 (2.4)
Scotland	⦿	--	40 (4.5)	○	--	26 (4.2)
Serbia	●	7	96 (1.7)	⦿	8	98 (1.1)
Singapore	●	8-10	88 (1.7)	●	8-10	65 (2.3)
Slovak Republic	●	7	98 (0.8)	⦿	9	10 (2.2)
Slovenia	●	7	38 (4.0)	●	7	9 (2.7)
South Africa	○	--	r 32 (3.8)	○	--	r 34 (3.6)
Sweden	⦿	8-9	49 (3.9)	○	9	18 (2.8)
Syrian Arab Republic	○	9	– –	○	12	– –
Tunisia	○	11	20 (3.2)	○	11	21 (3.7)
United States	●	--	62 (2.5)	●	--	67 (2.2)
‡ England	●	7-12	s 57 (6.0)	●	7-11	54 (5.2)
International Avg.			57 (0.5)			44 (0.5)
Benchmarking Participants						
Basque Country, Spain	⦿	10	60 (5.2)	○	11	20 (4.6)
Indiana State, US	●	--	54 (5.4)	●	--	54 (4.6)
Ontario Province, Can.	●	8	27 (4.7)	○	9	34 (4.4)
Quebec Province, Can.	⦿	10-11	54 (4.3)	○	9	44 (4.5)

○ Not included in the curriculum through eighth grade
⦿ Only the more able students
● All or almost all students

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.

‡ 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 Measurement Topics

MATHEMATICS Grade 8

Measurement

Countries	Standard units for measures of length, area, volume, perimeter, circumference, time, speed, density, angle, mass/weight			Relationships among units of conversions within systems of units, and for rates			Use standard tools to measure length, time, speed, angle, and temperature			Estimations of length, circumference, area, volume, weight, time, angle, and a speed in problem situations		
	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 100 (0.3)	●	--	r 97 (1.4)	●	--	r 99 (0.9)	⊙	--	r 99 (0.5)
Australia	●	5-8	98 (1.0)	●	5-8	92 (2.2)	●	5-8	93 (2.1)	●	5-8	90 (2.1)
Bahrain	●	3-8	88 (2.6)	●	4-6	85 (3.2)	●	3-8	60 (3.4)	●	2-8	69 (3.7)
Belgium (Flemish)	●	--	94 (1.7)	●	--	71 (3.2)	●	--	70 (3.7)	●	--	73 (3.6)
Botswana	●	7	74 (3.8)	●	8	79 (4.1)	●	8	81 (3.6)	●	8	43 (4.5)
Bulgaria	●	4	100 (0.3)	●	4	100 (0.3)	●	4	96 (1.5)	●	6	97 (1.5)
Chile	●	1-8	78 (3.1)	●	1-8	72 (3.6)	●	1-8	64 (3.7)	●	1-8	59 (3.9)
Chinese Taipei	●	6	89 (2.6)	●	6	91 (2.4)	●	6	89 (2.7)	●	6	92 (2.1)
Cyprus	●	4-7	98 (0.8)	●	4-8	74 (2.6)	●	4-8	29 (2.4)	●	4-8	87 (2.1)
Egypt	●	3-5	97 (1.7)	●	3-5	86 (2.9)	●	3-5	86 (3.1)	●	3-5	91 (2.6)
Estonia	●	1-4	99 (0.5)	●	4-6	96 (1.4)	●	1-6	99 (0.8)	○	--	96 (1.6)
Ghana	●	--	74 (4.4)	●	--	55 (4.7)	●	--	64 (5.0)	●	--	56 (4.1)
Hong Kong, SAR	●	6	93 (2.3)	●	5	92 (2.6)	●	6	87 (3.0)	●	6	89 (2.9)
Hungary	●	7	99 (0.7)	●	2-5	100 (0.0)	●	2-6	99 (0.8)	○	--	99 (0.9)
Indonesia	●	5-8	99 (0.8)	●	8-9	79 (4.0)	●	7-8	83 (3.2)	●	7-9	98 (1.1)
Iran, Islamic Rep. of	●	5,7-8	77 (3.5)	●	5,7	62 (4.0)	●	3-5	61 (3.9)	●	7-8	75 (3.3)
Israel	●	2-8	80 (2.9)	●	4,7	77 (3.1)	●	3-6	63 (4.1)	○	--	66 (3.8)
Italy	●	6-7	100 (0.0)	●	4-7	85 (2.6)	●	4-7	92 (1.9)	●	8-10	90 (2.3)
Japan	●	2-6	96 (1.7)	●	2-6	91 (2.5)	●	2-6	90 (2.6)	●	5-6	89 (2.4)
Jordan	●	4-8	96 (2.1)	●	5-6	98 (1.3)	●	4-7	89 (3.1)	○	--	91 (2.7)
Korea, Rep. of	●	--	s 89 (2.6)	●	--	79 (3.1)	●	--	s 69 (3.9)	●	--	s 82 (3.1)
Latvia	●	6-7	s 83 (4.4)	●	--	84 (4.3)	●	6	s 93 (2.7)	●	--	s 64 (6.2)
Lebanon	○	--	91 (2.4)	○	--	74 (3.6)	○	--	76 (4.0)	○	--	76 (3.1)
Lithuania	●	4-12	99 (0.8)	●	5-6	98 (1.3)	●	5-8	97 (1.4)	●	5-12	91 (2.4)
Macedonia, Rep. of	●	3-8	97 (1.5)	●	5-8	96 (1.8)	●	4-8	94 (2.0)	●	7-8	91 (2.1)
Malaysia	●	3-7	93 (2.1)	●	4-7	87 (2.9)	●	4-8	91 (2.5)	●	4-8	85 (3.4)
Moldova, Rep. of	●	5-6	r 91 (2.9)	●	6	r 90 (2.7)	●	6	r 93 (2.5)	●	6	r 83 (4.0)
Morocco	○	--	s 85 (3.9)	●	--	90 (4.1)	○	--	s 82 (5.4)	○	--	s 87 (3.4)
Netherlands	●	--	93 (2.7)	○	--	78 (4.0)	●	--	92 (2.6)	●	--	88 (3.5)
New Zealand	●	4-7	96 (2.5)	●	6-9	93 (2.5)	●	4-7	92 (2.9)	●	6-9	81 (4.5)
Norway	●	2-10	80 (3.6)	●	8-10	83 (3.6)	●	2-10	80 (3.2)	●	8-10	72 (3.8)
Palestinian Nat'l Auth.	●	2-6	96 (1.7)	●	3-6	88 (2.5)	●	4-6	78 (3.7)	●	4-6	79 (3.6)
Philippines	●	7	82 (3.3)	●	7	82 (3.0)	●	7	75 (3.7)	●	7	72 (4.1)
Romania	●	2-5	100 (0.0)	●	2-5	100 (0.0)	●	2-6	99 (0.8)	●	3-8	97 (1.5)
Russian Federation	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Saudi Arabia	●	4-6	87 (2.8)	●	4-6	80 (4.3)	●	3-6	69 (5.9)	○	--	65 (6.0)
Scotland	●	--	95 (1.9)	●	--	89 (2.7)	●	--	94 (2.2)	●	--	80 (3.5)
Serbia	●	4-7	94 (2.1)	●	6	94 (2.0)	●	4-7	91 (2.6)	●	7	95 (1.8)
Singapore	●	2-7	99 (0.5)	●	3-8	98 (0.7)	●	2-6	94 (1.5)	●	2-6	96 (1.0)
Slovak Republic	●	8	100 (0.0)	●	7	100 (0.0)	●	7	98 (1.1)	●	7	97 (1.3)
Slovenia	●	3-5	100 (0.0)	●	6	95 (1.9)	●	5-6	99 (0.7)	●	5-6	80 (3.5)
South Africa	●	--	r 69 (3.6)	○	--	r 50 (4.1)	⊙	--	r 63 (4.2)	⊙	--	r 58 (4.2)
Sweden	●	8	97 (1.2)	●	7	82 (2.6)	●	7	91 (1.8)	●	8	90 (1.9)
Syrian Arab Republic	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Tunisia	●	--	92 (2.4)	○	12	87 (2.7)	●	--	84 (2.9)	○	9	80 (3.1)
United States	●	--	96 (1.2)	●	--	92 (1.4)	●	--	95 (1.2)	●	--	90 (1.8)
‡ England	●	K-8	s 96 (2.6)	●	3-8	89 (3.9)	●	K-6	s 96 (2.6)	●	1-8	s 88 (3.4)
International Avg.			92 (0.3)			86 (0.4)			84 (0.4)			83 (0.5)
Benchmarking Participants												
Basque Country, Spain	●	--	93 (2.4)	●	--	91 (2.9)	○	10	89 (2.9)	⊙	9	83 (3.5)
Indiana State, US	●	--	97 (1.6)	●	--	96 (2.0)	●	--	96 (1.6)	●	--	86 (3.6)
Ontario Province, Can.	●	2-8	99 (0.4)	●	4-8	89 (2.8)	●	2-8	97 (1.6)	●	2-9	95 (1.7)
Quebec Province, Can.	●	1-9	71 (4.7)	●	4-9	93 (2.5)	●	2-6	81 (3.6)	●	2-8	67 (4.6)

● All or almost all students ⊙ Only the more able students ○ Not included in the curriculum through eighth grade

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

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

‡ 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.

Exhibit 5.10: Intended and Taught TIMSS Measurement Topics

MATHEMATICS Grade 8

Measurement

Countries	Computations with measurements in problem situations: Student population intended to be taught topic through 8th grade	Computations with measurements in problem situations: Grade(s) topic is intended to be taught	Computations with measurements in problem situations: Percent of students taught the topic	Measurement formulas for perimeter of a rectangle, circumference of a circle, areas of plane figures, surface area and volume of rectangular solids, and rates: Student population intended to be taught topic through 8th grade	Measurement formulas for perimeter of a rectangle, circumference of a circle, areas of plane figures, surface area and volume of rectangular solids, and rates: Grade(s) topic is intended to be taught	Measurement formulas for perimeter of a rectangle, circumference of a circle, areas of plane figures, surface area and volume of rectangular solids, and rates: Percent of students taught the topic	Measures of irregular or compound areas: Student population intended to be taught topic through 8th grade	Measures of irregular or compound areas: Grade(s) topic is intended to be taught	Measures of irregular or compound areas: Percent of students taught the topic	Precision of measurements: Student population intended to be taught topic through 8th grade	Precision of measurements: Grade(s) topic is intended to be taught	Precision of measurements: Percent of students taught the topic
Armenia	⦿	--	r 97 (1.6)	⦿	--	r 95 (1.7)	⦿	--	r 81 (3.1)	⦿	--	r 88 (2.6)
Australia	●	5-8	65 (4.4)	⦿	8-10	87 (2.8)	●	5-8	70 (3.6)	●	7-8	33 (4.0)
Bahrain	●	4-8	39 (3.2)	●	4-8	97 (0.8)	●	4-8	48 (3.5)	●	4-8	70 (3.3)
Belgium (Flemish)	⦿	--	59 (3.9)	●	--	95 (1.3)	●	--	44 (3.9)	●	--	42 (4.1)
Botswana	○	9	19 (3.7)	○	9	38 (4.7)	○	11	30 (4.5)	○	11	30 (4.3)
Bulgaria	●	6-7	99 (0.8)	●	5-6	99 (0.7)	●	5-6	87 (3.4)	●	5-6	68 (4.1)
Chile	●	1-8	51 (4.1)	●	8	73 (2.9)	●	7-8	39 (3.1)	●	8	38 (3.9)
Chinese Taipei	●	6	83 (2.7)	●	6	99 (0.9)	●	6	66 (3.7)	●	8	96 (1.6)
Cyprus	●	5-8	19 (2.6)	●	5-8	100 (0.2)	●	5-8	56 (1.9)	⦿	6-9	30 (2.5)
Egypt	○	--	x x	●	4-8	99 (0.7)	●	4	85 (3.2)	○	--	97 (1.9)
Estonia	●	4-12	94 (2.1)	●	4-6	96 (1.7)	●	4-12	80 (3.3)	●	8,10	79 (3.5)
Ghana	●	--	45 (4.8)	●	--	58 (4.7)	●	--	23 (4.0)	●	--	45 (4.7)
Hong Kong, SAR	●	7-9	69 (4.4)	●	7-9	92 (2.5)	●	6	88 (3.1)	●	7-9	76 (3.9)
Hungary	●	2-7	96 (1.6)	●	3-8	99 (0.8)	○	--	92 (2.0)	○	--	100 (0.0)
Indonesia	○	9	94 (2.3)	○	9	98 (0.8)	○	10	77 (3.5)	○	10	73 (3.9)
Iran, Islamic Rep. of	●	7-8	54 (3.8)	●	7	95 (1.6)	○	10-11	56 (4.1)	●	4-9	33 (3.7)
Israel	○	--	51 (4.3)	●	2-9	71 (3.6)	●	4-6	38 (4.0)	○	--	34 (3.7)
Italy	●	6-9	82 (3.2)	●	8-10	99 (0.7)	●	7-9	80 (2.4)	●	7-9	72 (3.5)
Japan	●	5-6	61 (4.1)	●	4-7	95 (1.8)	●	5	70 (3.9)	○	10-12	43 (4.3)
Jordan	●	6-8	74 (3.8)	●	4-8	97 (2.2)	●	7	81 (4.0)	○	--	84 (3.0)
Korea, Rep. of	●	--	s 83 (3.1)	●	--	95 (1.5)	●	--	s 57 (3.5)	●	--	s 96 (1.6)
Latvia	●	--	s 69 (5.2)	●	6-7	41 (4.9)	●	--	s 26 (4.1)	○	--	s 47 (5.3)
Lebanon	●	--	55 (4.3)	○	--	91 (2.5)	○	--	49 (4.6)	○	--	60 (4.2)
Lithuania	●	4-12	92 (2.4)	●	4-6	97 (1.6)	●	6	90 (2.5)	○	--	76 (3.3)
Macedonia, Rep. of	●	5-7	90 (2.4)	●	6-7	95 (1.9)	○	11	79 (3.6)	○	10	74 (3.8)
Malaysia	●	4-8	28 (3.6)	●	4-9	96 (2.1)	●	5-7	46 (4.8)	●	7	47 (4.6)
Moldova, Rep. of	●	6	r 89 (2.6)	●	6	r 83 (3.7)	●	8	r 69 (4.2)	●	6,8	r 52 (4.4)
Morocco	○	--	s 72 (5.6)	○	--	83 (3.9)	○	--	s 62 (5.4)	○	--	s 46 (7.1)
Netherlands	●	--	74 (4.3)	●	--	93 (2.5)	⦿	--	78 (3.8)	○	--	55 (4.9)
New Zealand	●	6-9	72 (4.5)	●	6-9	93 (2.4)	●	6-7	80 (3.6)	●	8-9	34 (5.1)
Norway	●	7-10	85 (3.0)	●	8-10	67 (3.8)	●	8-10	30 (3.8)	○	9-10	31 (4.4)
Palestinian Nat'l Auth.	●	5-6	50 (4.7)	●	6-8	97 (1.6)	●	4-6	58 (4.4)	●	5-6	67 (4.3)
Philippines	●	7	67 (4.5)	●	7	69 (4.3)	●	7	39 (4.2)	●	7	52 (4.3)
Romania	●	3-8	92 (2.1)	●	4-7	99 (1.2)	○	--	80 (3.5)	○	--	87 (3.0)
Russian Federation	●	--	– –	●	4-9	– –	○	--	– –	●	--	– –
Saudi Arabia	●	6	37 (4.4)	●	4-6	75 (5.2)	●	6	50 (5.5)	○	--	63 (4.2)
Scotland	●	--	61 (4.7)	⦿	--	82 (3.2)	●	--	81 (3.6)	○	--	50 (4.2)
Serbia	●	6-7	93 (2.3)	●	6-8	98 (1.3)	⦿	7-8	91 (2.0)	○	9	89 (2.4)
Singapore	●	6-8	93 (1.1)	●	3-8	99 (0.7)	●	3	55 (2.8)	○	--	52 (2.8)
Slovak Republic	○	9	79 (3.3)	⦿	9	99 (0.8)	⦿	9	87 (2.7)	⦿	9	61 (4.1)
Slovenia	●	5-6	64 (4.2)	●	8	65 (4.0)	●	8	69 (4.3)	○	--	75 (3.3)
South Africa	○	--	r 31 (3.3)	⦿	--	r 58 (3.8)	○	--	r 26 (2.9)	○	--	r 32 (3.9)
Sweden	●	8	82 (2.7)	●	8-9	80 (3.1)	●	8	68 (3.2)	●	8	31 (2.9)
Syrian Arab Republic	○	--	– –	●	--	– –	○	12	– –	○	12	– –
Tunisia	○	10	62 (4.2)	●	--	94 (2.1)	○	11	61 (4.0)	○	12	40 (4.2)
United States	●	--	85 (2.3)	●	--	92 (1.4)	●	--	61 (2.9)	●	--	58 (3.0)
‡ England	●	4-8	s 71 (6.1)	●	4-8	96 (2.0)	●	5-7	s 88 (3.9)	⦿	8-10	s 52 (6.0)
International Avg.			69 (0.6)			87 (0.4)			64 (0.6)			59 (0.6)
Benchmarking Participants												
Basque Country, Spain	●	--	73 (4.8)	●	--	86 (3.0)	●	--	48 (5.7)	●	--	39 (4.8)
Indiana State, US	●	--	92 (2.6)	●	--	91 (2.8)	●	--	68 (5.0)	○	--	56 (6.3)
Ontario Province, Can.	●	2-8	86 (3.0)	●	5-9	93 (2.6)	●	5-8	72 (4.4)	●	4-5	58 (4.8)
Quebec Province, Can.	○	--	63 (4.1)	●	6-8	61 (4.4)	●	7-8	46 (4.7)	○	--	44 (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.

‡ 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 Geometry Topics

MATHEMATICS Grade 8

Geometry

Countries	Angles-acute, right, straight, obtuse, reflex, complementary, and supplementary			Relationships for angles at a point, angles on a line, vertically opposite angles, angles associated with a transversal cutting parallel lines, and perpendicularity			Properties of angle bisectors and perpendicular bisectors of lines			Properties of geometric shapes: triangles and quadrilaterals		
	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 100 (0.0)	●	--	r 99 (0.6)	●	--	r 100 (0.0)	●	--	r 99 (0.5)
Australia	●	7-8	93 (1.8)	●	8	83 (3.1)	⦿	9	50 (4.0)	●	7-8	89 (2.6)
Bahrain	●	4-5	100 (0.0)	●	5-7	100 (0.0)	●	7-9	95 (1.6)	●	5-9	99 (0.3)
Belgium (Flemish)	●	--	98 (0.8)	●	--	86 (1.8)	●	--	82 (2.0)	●	--	90 (2.0)
Botswana	●	8	70 (3.9)	●	8	49 (5.0)	○	9	11 (2.7)	○	9	60 (4.6)
Bulgaria	●	7	100 (0.0)	●	7	100 (0.0)	●	7	100 (0.0)	●	7	100 (0.0)
Chile	●	3-8	98 (1.1)	●	8	96 (1.5)	○	--	84 (2.3)	●	5-6	93 (1.6)
Chinese Taipei	●	8	99 (0.8)	●	8	79 (3.0)	●	8	93 (2.2)	○	9	93 (2.3)
Cyprus	●	4-8	98 (0.9)	●	4-7	98 (0.9)	⦿	8	95 (1.2)	●	5-8	92 (1.7)
Egypt	●	4-6	100 (0.0)	●	6	99 (0.9)	●	6	100 (0.0)	●	5-8	100 (0.0)
Estonia	●	5,8	96 (1.5)	●	5,8	97 (1.3)	●	6	97 (1.4)	●	6,8	98 (1.3)
Ghana	●	--	85 (3.8)	●	--	73 (4.8)	●	--	74 (3.8)	●	--	75 (4.3)
Hong Kong, SAR	●	7-9	97 (1.4)	●	7-9	98 (1.2)	●	7-9	75 (4.2)	●	7-9	89 (2.7)
Hungary	●	5-6	100 (0.0)	●	6	98 (1.2)	●	6	100 (0.0)	●	6	100 (0.0)
Indonesia	●	7-8	98 (1.1)	○	9	96 (1.5)	○	10	95 (1.9)	○	9	92 (2.4)
Iran, Islamic Rep. of	●	5-6	100 (0.0)	●	6-7	97 (1.5)	●	5-6	99 (0.6)	●	6-8	100 (0.5)
Israel	●	4-8	98 (1.0)	●	8	78 (2.9)	●	7-8	88 (2.6)	●	7-9	74 (3.0)
Italy	●	4-9	100 (0.0)	●	6-9	98 (1.2)	●	6-9	93 (2.0)	●	4-10	100 (0.0)
Japan	●	8	91 (2.3)	●	8	98 (1.1)	●	7	98 (1.2)	●	8	97 (1.5)
Jordan	●	4-5,7	99 (0.7)	●	5,7	97 (1.6)	●	8-10	95 (2.0)	●	6-8	100 (0.0)
Korea, Rep. of	●	--	s 94 (1.7)	●	--	95 (1.7)	●	--	s 94 (1.7)	●	--	s 96 (1.6)
Latvia	●	7	s 99 (1.0)	●	7	100 (0.0)	●	7	s 62 (5.3)	●	7	s 99 (0.9)
Lebanon	○	--	96 (1.8)	○	--	97 (1.4)	○	--	96 (1.6)	●	--	98 (1.2)
Lithuania	●	5-7	100 (0.0)	●	5-8	98 (1.1)	●	7-8	95 (2.0)	●	7-10	100 (0.0)
Macedonia, Rep. of	●	6-7	99 (0.7)	●	6-7	99 (0.7)	●	6	99 (0.7)	●	6-7	99 (0.7)
Malaysia	●	7	88 (2.8)	●	7	88 (2.8)	●	7	96 (1.8)	●	7,9	97 (1.5)
Moldova, Rep. of	●	8	r 95 (2.0)	●	8	r 85 (3.6)	●	8	r 94 (2.2)	●	8	r 95 (2.1)
Morocco	●	--	s 98 (2.0)	●	--	96 (2.7)	●	--	s 99 (0.9)	●	--	x x
Netherlands	⦿	--	94 (2.4)	⦿	--	85 (3.3)	○	--	52 (5.0)	⦿	--	84 (4.1)
New Zealand	●	6-9	96 (2.3)	●	6-8	86 (4.2)	⦿	8-9	45 (5.4)	●	4-8	89 (2.5)
Norway	●	8-10	90 (2.5)	●	8-10	56 (3.9)	●	8-10	90 (2.6)	●	8-10	89 (2.8)
Palestinian Nat'l Auth.	●	3-7	98 (1.1)	●	5-7	98 (1.0)	●	5-7	86 (3.1)	●	2-8	99 (0.9)
Philippines	○	9	52 (4.5)	○	9	36 (4.5)	○	9	28 (4.1)	○	9	35 (4.7)
Romania	●	6-7	100 (0.0)	●	6-8	100 (0.0)	●	6-7	100 (0.0)	●	6-7	100 (0.0)
Russian Federation	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Saudi Arabia	●	4-7	100 (0.2)	●	8	100 (0.0)	●	7	99 (0.9)	●	7-8	100 (0.2)
Scotland	●	--	97 (1.1)	●	--	92 (1.8)	○	--	24 (3.8)	●	--	87 (3.2)
Serbia	●	5	94 (2.2)	●	5	94 (2.2)	●	5-6	94 (2.3)	●	6	94 (2.2)
Singapore	●	3-7	96 (1.1)	●	5-8	97 (0.9)	●	7	84 (1.9)	●	5-7	99 (0.7)
Slovak Republic	●	5	99 (0.8)	●	6	99 (0.9)	●	6	99 (0.8)	●	6	100 (0.0)
Slovenia	●	6	100 (0.1)	●	6	99 (0.7)	●	5	99 (0.8)	●	6	100 (0.0)
South Africa	●	--	r 90 (2.2)	●	--	r 88 (2.5)	○	--	r 46 (4.1)	●	--	r 74 (3.5)
Sweden	●	8	91 (2.1)	⦿	8	55 (3.4)	⦿	8-9	20 (2.6)	●	8	94 (1.6)
Syrian Arab Republic	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Tunisia	●	--	100 (0.0)	●	--	100 (0.0)	●	--	100 (0.0)	●	--	96 (1.6)
United States	●	--	91 (1.8)	●	--	74 (2.5)	●	--	47 (2.9)	●	--	87 (2.2)
‡ England	●	2-6	s 100 (0.3)	●	4-6	96 (1.7)	●	7	s 66 (5.9)	●	K-7	s 94 (3.2)
International Avg.			95 (0.3)			90 (0.3)			81 (0.4)			92 (0.3)
Benchmarking Participants												
Basque Country, Spain	●	--	92 (2.3)	⦿	9	86 (3.6)	⦿	10	76 (3.7)	●	--	91 (2.7)
Indiana State, US	●	4	85 (3.7)	●	--	70 (4.7)	●	--	51 (4.7)	●	--	81 (4.1)
Ontario Province, Can.	●	4-8	97 (2.1)	●	7-8	88 (3.6)	●	7-8	72 (4.7)	●	1-6	97 (1.9)
Quebec Province, Can.	●	4-7	94 (2.7)	●	7-8	83 (4.3)	●	7	86 (3.9)	●	4-6	89 (3.4)

● All or almost all students ⦿ Only the more able students ○ Not included in the curriculum through eighth grade

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

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

‡ 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 Geometry Topics** *(Continued...)*

MATHEMATICS Grade 8

Geometry	Properties of other polygons			Construct or draw triangles and rectangles of given dimensions			Pythagorean theorem to find length of a side			Congruent figures and their corresponding measures		
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	●	--	r 99 (0.7)	●	--	r 98 (1.2)	●	--	r 99 (1.0)	●	--	r 99 (1.1)
Australia	●	7-8	65 (4.2)	●	8	72 (3.1)	⦿	9	51 (3.1)	⦿	9	43 (4.5)
Bahrain	●	7	83 (2.5)	●	4-5	96 (0.1)	●	8	97 (1.0)	●	8	99 (0.7)
Belgium (Flemish)	●	--	21 (2.5)	●	--	93 (1.7)	○	--	3 (1.4)	●	--	82 (2.0)
Botswana	●	8	47 (4.5)	○	9	17 (3.5)	○	10	2 (1.1)	○	9	14 (3.2)
Bulgaria	●	6-9	76 (3.9)	●	7	97 (1.5)	○	9	2 (0.8)	●	7	99 (0.6)
Chile	●	8	74 (3.1)	●	8	88 (2.1)	●	8	66 (3.0)	○	9	72 (3.3)
Chinese Taipei	○	9	94 (2.1)	●	8	93 (2.2)	●	8	98 (1.2)	○	9	80 (3.3)
Cyprus	●	5-8	44 (2.7)	●	4-8	84 (1.7)	●	6	100 (0.0)	●	6-8	91 (1.3)
Egypt	●	7	x x	●	4-6	99 (0.9)	●	7	100 (0.0)	●	7	100 (0.0)
Estonia	●	8	75 (3.6)	●	6	98 (1.3)	○	9	3 (1.3)	●	6	67 (3.0)
Ghana	●	--	35 (4.2)	●	--	74 (3.6)	●	--	27 (4.1)	●	--	48 (4.5)
Hong Kong, SAR	○	--	77 (3.5)	●	7-9	80 (3.8)	●	7-9	94 (2.0)	●	7-9	87 (3.1)
Hungary	●	8	95 (1.8)	●	6	100 (0.0)	●	8	97 (1.6)	●	6-7	92 (2.3)
Indonesia	○	10	35 (4.4)	○	11	71 (4.3)	●	8	98 (0.7)	○	9	63 (4.4)
Iran, Islamic Rep. of	○	10	89 (2.5)	●	5-6	96 (1.8)	●	8	99 (0.6)	●	6	98 (1.0)
Israel	○	--	22 (3.0)	○	--	37 (3.4)	○	9	12 (2.6)	●	8	68 (3.2)
Italy	●	4-10	96 (1.4)	●	6-7	96 (1.4)	●	7-9	100 (0.0)	●	7-9	100 (0.3)
Japan	●	8	94 (1.9)	●	7-8	92 (1.9)	○	9	2 (0.0)	●	8	97 (1.5)
Jordan	●	7	88 (3.1)	●	5-6	99 (0.9)	●	8	98 (1.2)	●	7	100 (0.0)
Korea, Rep. of	●	--	s 87 (2.5)	●	--	91 (2.2)	○	9	s 28 (3.8)	●	--	s 97 (1.4)
Latvia	○	--	s 22 (4.3)	○	9	85 (3.2)	○	9	s 92 (2.9)	●	7	s 78 (4.7)
Lebanon	○	--	29 (4.4)	○	--	96 (1.6)	●	--	86 (3.0)	○	--	91 (2.6)
Lithuania	○	9-10	24 (3.4)	⦿	6-8	97 (1.2)	●	8	99 (1.0)	●	7	99 (0.9)
Macedonia, Rep. of	●	7	99 (0.9)	●	6	99 (0.7)	●	7-8	100 (0.0)	●	6	100 (0.0)
Malaysia	○	9	62 (4.2)	●	8	90 (2.8)	●	8	95 (1.9)	●	8	88 (2.9)
Moldova, Rep. of	●	8	r 83 (3.0)	●	8	r 96 (1.7)	●	8	r 97 (1.6)	●	8	r 96 (1.8)
Morocco	○	--	s 29 (6.2)	●	--	87 (4.5)	○	--	x x	○	--	x x
Netherlands	○	--	38 (4.6)	○	--	88 (3.2)	●	--	91 (2.9)	⦿	--	46 (4.9)
New Zealand	●	6-8	64 (4.8)	●	6-9	62 (4.8)	○	9-10	23 (3.9)	●	6-9	40 (5.0)
Norway	○	9-10	13 (2.8)	●	8-10	94 (1.9)	○	9-10	5 (2.0)	○	10	10 (2.6)
Palestinian Nat'l Auth.	●	6	76 (4.0)	●	6-7	97 (1.6)	●	7	100 (0.0)	●	7	99 (0.8)
Philippines	○	9	32 (4.4)	○	9	30 (3.9)	○	9	34 (4.4)	○	9	29 (4.1)
Romania	●	7	93 (2.1)	●	3-7	100 (0.0)	●	7-9	100 (0.0)	●	--	100 (0.0)
Russian Federation	○	9	– –	●	--	– –	●	--	– –	●	--	– –
Saudi Arabia	○	10	52 (5.4)	●	5-8	99 (0.8)	○	9	8 (2.6)	●	8	98 (1.3)
Scotland	⦿	--	37 (4.4)	●	--	87 (2.6)	⦿	--	33 (4.6)	●	--	44 (5.2)
Serbia	●	7	94 (2.2)	●	6	94 (2.2)	●	7	96 (1.8)	●	6	95 (2.0)
Singapore	●	8	97 (0.9)	●	5-7	92 (1.4)	⦿	8	64 (3.2)	●	8-9	81 (2.1)
Slovak Republic	⦿	9	75 (3.1)	●	7	100 (0.0)	●	7	100 (0.0)	●	7	96 (1.8)
Slovenia	●	8	88 (2.7)	●	7	100 (0.1)	●	8	37 (4.0)	●	7	82 (3.1)
South Africa	○	--	r 44 (4.2)	⦿	--	r 58 (4.1)	⦿	--	r 54 (3.6)	○	--	r 32 (4.0)
Sweden	○	9	31 (3.8)	●	8	92 (1.9)	○	9	7 (1.7)	○	11	36 (3.8)
Syrian Arab Republic	●	8	– –	●	--	– –	○	9	– –	○	10	– –
Tunisia	○	9	49 (4.2)	○	9	98 (1.2)	○	10	7 (1.9)	○	10	90 (2.6)
United States	●	--	77 (2.4)	●	--	64 (3.2)	●	--	81 (2.5)	●	--	81 (2.7)
‡ England	●	7-10	s 85 (4.2)	●	4-8	89 (3.8)	⦿	8-10	r 71 (5.3)	●	6-10	s 60 (5.3)
International Avg.			63 (0.5)			86 (0.4)			63 (0.4)			77 (0.4)
Benchmarking Participants												
Basque Country, Spain	●	--	84 (3.3)	●	--	81 (4.2)	⦿	9	88 (3.2)	●	--	84 (3.6)
Indiana State, US	○	--	68 (5.8)	●	--	61 (5.1)	●	--	71 (5.1)	●	--	67 (5.0)
Ontario Province, Can.	●	6-8	86 (2.7)	●	5-6	84 (3.8)	●	8	71 (4.6)	●	2-7	85 (3.7)
Quebec Province, Can.	●	7-8	66 (4.6)	●	7	90 (3.2)	○	9-11	9 (2.6)	●	8-9	69 (4.8)

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.

‡ 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 Geometry Topics** *(...Continued)*

MATHEMATICS Grade 8

Geometry

Countries	Similar triangles and recall their properties			Cartesian plane-ordered pairs, equations, intercepts, intersections, and gradient			Relationships between two-dimensional and three-dimensional shapes			Line and rotational symmetry for two-dimensional shapes		
	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 99 (1.0)	●	--	r 94 (2.1)	◉	--	r 54 (3.9)	◉	--	r 87 (2.9)
Australia	◉	9	33 (4.7)	◉	9-10	46 (4.6)	●	5-8	52 (4.1)	●	5-8	58 (3.2)
Bahrain	○	9	26 (3.1)	●	8	52 (3.7)	●	6-8	33 (3.7)	●	7-9	38 (2.9)
Belgium (Flemish)	○	--	50 (3.8)	●	--	8 (1.9)	●	--	22 (2.8)	●	--	70 (2.8)
Botswana	○	11	24 (4.0)	○	9	2 (1.5)	○	9	3 (1.7)	●	8	25 (4.1)
Bulgaria	○	9	8 (2.3)	●	6	65 (3.9)	●	6,10	25 (3.5)	●	8	67 (4.4)
Chile	○	10	56 (3.6)	○	10	36 (3.6)	●	1-8	30 (3.3)	○	9	21 (2.8)
Chinese Taipei	○	9	16 (3.1)	●	8	57 (4.0)	●	8	75 (3.7)	●	8	42 (4.1)
Cyprus	◉	8	1 (0.0)	○	9	1 (0.0)	●	8	32 (2.7)	●	8	19 (1.9)
Egypt	●	8	97 (1.8)	●	7	99 (0.7)	●	8,11	67 (3.9)	●	8	78 (3.5)
Estonia	○	9	14 (2.9)	●	6-10	75 (3.4)	○	12	42 (4.0)	○	--	76 (3.6)
Ghana	●	--	51 (4.7)	●	--	33 (4.3)	●	--	31 (4.0)	●	--	37 (4.8)
Hong Kong, SAR	●	7-9	87 (3.1)	●	7-9	45 (4.3)	●	7-9	54 (4.6)	●	7-9	80 (3.1)
Hungary	○	9	50 (4.0)	●	7-11	39 (4.6)	●	6	54 (4.2)	●	6-7	66 (3.7)
Indonesia	○	9	47 (4.4)	○	10	95 (1.8)	○	10	18 (3.4)	○	10	85 (3.1)
Iran, Islamic Rep. of	●	8	99 (0.6)	●	7-8	95 (1.7)	○	11-12	46 (4.3)	●	7	81 (2.7)
Israel	◉	10	17 (2.8)	●	7-10	44 (4.1)	○	--	12 (2.5)	○	--	17 (3.0)
Italy	●	7-9	83 (2.8)	●	8-13	73 (3.1)	●	5-10	73 (3.0)	○	9-13	45 (3.4)
Japan	○	9	4 (1.2)	●	7-8	96 (1.6)	●	7	51 (3.8)	●	7	88 (2.7)
Jordan	●	7	99 (0.6)	●	8-10	83 (3.7)	○	10	44 (4.3)	○	9	16 (3.7)
Korea, Rep. of	●	--	s 96 (1.6)	●	--	96 (1.6)	●	--	86 (2.3)	●	--	73 (3.1)
Latvia	○	9	s 57 (5.7)	○	--	47 (5.1)	○	9	3 (1.8)	○	9	13 (3.6)
Lebanon	○	9	48 (5.0)	○	--	38 (4.7)	●	--	35 (5.1)	○	--	67 (4.6)
Lithuania	○	9-10	39 (4.1)	●	6-12	69 (3.9)	●	3-6	31 (3.6)	●	8	95 (2.0)
Macedonia, Rep. of	●	8	100 (0.0)	●	8	99 (0.6)	●	8	93 (1.9)	●	5	99 (1.0)
Malaysia	○	9	91 (2.5)	●	8	50 (3.8)	○	10	46 (4.1)	●	8	71 (3.9)
Moldova, Rep. of	●	8	r 88 (2.4)	○	11	r 83 (3.6)	●	8	r 49 (5.0)	●	7,11	r 55 (5.2)
Morocco	○	--	s 5 (3.0)	○	--	12 (5.0)	○	--	25 (6.0)	○	--	27 (6.8)
Netherlands	◉	--	53 (4.6)	○	--	27 (4.0)	●	--	24 (4.1)	●	--	74 (4.8)
New Zealand	●	6-9	32 (4.6)	◉	8-12	52 (5.1)	●	5-7	56 (4.5)	●	4-7	83 (2.3)
Norway	○	10	16 (2.8)	●	8-10	31 (4.3)	○	11-13	7 (2.1)	○	11-13	16 (3.1)
Palestinian Nat'l Auth.	●	7	96 (1.8)	○	9	23 (4.0)	○	9	27 (3.8)	○	9	13 (2.4)
Philippines	○	9	28 (3.9)	○	9	77 (3.5)	○	9	16 (3.5)	○	9	15 (3.2)
Romania	●	4-7	100 (0.0)	●	--	93 (2.4)	○	9-10	98 (1.0)	●	4-10	97 (1.4)
Russian Federation	●	8 or 9	– –	●	--	– –	○	--	– –	●	--	– –
Saudi Arabia	○	9-10	35 (4.6)	○	9-10	53 (4.6)	○	12	14 (3.5)	●	8	14 (2.8)
Scotland	●	--	8 (2.3)	○	--	14 (3.1)	○	--	67 (4.8)	●	--	91 (2.3)
Serbia	●	7	93 (2.3)	●	7-8	94 (2.1)	●	8	88 (2.5)	●	5-6	92 (2.5)
Singapore	●	8-9	77 (2.1)	●	7-9	75 (2.2)	●	6	55 (2.8)	●	7-8	94 (1.3)
Slovak Republic	●	8	28 (3.3)	◉	9	24 (3.1)	◉	9	37 (4.2)	◉	9	41 (4.3)
Slovenia	○	9	12 (2.7)	○	9	14 (3.0)	○	9	12 (3.0)	●	4	63 (4.2)
South Africa	○	--	r 36 (4.0)	○	--	r 31 (3.8)	○	--	r 25 (3.4)	○	--	r 28 (2.9)
Sweden	○	9	47 (3.8)	○	9	21 (3.3)	○	11	9 (1.9)	○	11	4 (1.5)
Syrian Arab Republic	○	9	– –	○	12	– –	○	12	– –	○	--	– –
Tunisia	○	9	60 (4.3)	○	11	13 (2.8)	○	11	32 (4.1)	○	11	23 (3.7)
United States	●	--	77 (2.6)	●	--	75 (2.5)	●	--	52 (2.6)	●	--	63 (2.9)
‡ England	◉	8-10	s 44 (4.7)	●	4-10	61 (5.4)	●	3-8	51 (6.2)	●	K-6	99 (0.8)
International Avg.			52 (0.5)			54 (0.5)			41 (0.6)			56 (0.5)
Benchmarking Participants												
Basque Country, Spain	○	10	63 (5.6)	◉	9	41 (4.7)	○	10	32 (4.8)	○	10	13 (2.8)
Indiana State, US	●	--	63 (4.9)	●	--	69 (4.9)	●	--	53 (6.3)	●	--	58 (5.7)
Ontario Province, Can.	●	8	80 (4.1)	●	5-9	22 (3.6)	●	3-8	75 (4.0)	●	2-6	64 (4.5)
Quebec Province, Can.	●	8-9	54 (4.7)	○	10-11	61 (4.3)	●	4-12	13 (2.8)	●	4	44 (4.9)

● All or almost all students ◉ Only the more able students ○ Not included in the curriculum through eighth grade

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

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

‡ 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.

Exhibit 5.11: **Intended and Taught TIMSS Geometry Topics**

MATHEMATICS Grade 8

Geometry

Translation, reflection, rotation, and enlargement

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
Armenia	◉	--	r 60 (3.8)
Australia	◉	9	58 (3.6)
Bahrain	●	7-9	16 (2.7)
Belgium (Flemish)	●	--	85 (2.3)
Botswana	●	8	15 (3.6)
Bulgaria	●	8	65 (4.6)
Chile	○	9-10	16 (2.2)
Chinese Taipei	●	8	25 (3.6)
Cyprus	◉	4-6,10	8 (1.6)
Egypt	●	8	94 (2.1)
Estonia	○	--	53 (4.0)
Ghana	●	--	22 (3.8)
Hong Kong, SAR	●	7-9	83 (3.1)
Hungary	●	7-9	79 (3.2)
Indonesia	○	9	4 (1.4)
Iran, Islamic Rep. of	●	7-11	89 (2.6)
Israel	○	--	16 (2.8)
Italy	○	9-10	47 (3.4)
Japan	○	9	67 (4.2)
Jordan	○	9	15 (3.5)
Korea, Rep. of	●	--	s 65 (3.5)
Latvia	○	--	s 28 (5.1)
Lebanon	○	9-11	42 (4.5)
Lithuania	○	--	35 (4.0)
Macedonia, Rep. of	●	5,7	99 (0.7)
Malaysia	●	8-9	76 (3.5)
Moldova, Rep. of	●	7,11	r 48 (5.0)
Morocco	○	--	– –
Netherlands	○	--	69 (4.6)
New Zealand	●	2-9	82 (2.7)
Norway	●	2-10	13 (2.6)
Palestinian Nat'l Auth.	○	9	5 (1.9)
Philippines	○	9	10 (2.8)
Romania	●	4-10	47 (4.1)
Russian Federation	●	8 or 9	– –
Saudi Arabia	●	5-8	68 (5.1)
Scotland	●	--	50 (4.6)
Serbia	◉	5-6	81 (3.4)
Singapore	◉	8-10	54 (3.1)
Slovak Republic	◉	9	22 (3.3)
Slovenia	●	7	83 (3.2)
South Africa	○	--	r 21 (3.0)
Sweden	○	9	11 (2.3)
Syrian Arab Republic	○	11	– –
Tunisia	○	10	11 (2.7)
United States	●	--	64 (3.1)
‡ England	●	2-10	s 89 (3.2)
International Avg.			47 (0.5)
Benchmarking Participants			
Basque Country, Spain	○	10	14 (3.8)
Indiana State, US	●	--	60 (6.0)
Ontario Province, Can.	●	2-8	62 (4.5)
Quebec Province, Can.	●	4-8	94 (2.2)

○ 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.

‡ 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.

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

of these topics were included in the intended curricula of almost all participants and taught to virtually all students (90% or more). These topics were: "angles – acute, right, straight, obtuse, reflex, complementary, and supplementary," "relationships for angles on a point or on a line," and "properties of geometric shapes: triangles and quadrilaterals." Two other topics were included in most participants' curricula and taught to more than 80 percent of students: "construct or draw triangles or rectangles of given dimensions," and "properties of angle bisectors and perpendicular bisectors of lines." Inclusion of the other geometry topics in the intended curriculum was more varied, as was the percentage of students taught the topics. The topics with least coverage in the classroom were "translation, reflection, rotation, and enlargement," and "relationships between two-dimensional and three-dimensional shapes," where less than half the students (47% and 41% , respectively) were taught the topics. In countries where geometry topics were not in the intended curriculum at eighth grade, they often were intended primarily for later grades.

As shown in Exhibit 5.12, only two of the eight TIMSS data topics – "organizing a set of data by one or more characteristics using a tally chart, table, or graph" and "drawing and interpreting graphs, tables, pictographs, bar graphs, pie charts, and line graphs" – were included in the intended eighth-grade mathematics curriculum for more than half of the participants. These topics also were the only ones taught to more than half of the students (68 and 72 percent, respectively). TIMSS participants varied considerably in the extent to which they included the other data topics in their intended curriculum and taught them in the classroom. The two topics receiving least attention, in both the intended and implemented curriculum, were "sources of error in collecting and organizing data" and "evaluating interpretations of data with respect to correctness and completeness of interpretation." These were included in the curriculum of just a few countries, and had been taught to relatively few students, on average (32% and 29%, respectively).

At the fourth grade, 12 of the 42 TIMSS mathematics topics were in the number content area. As shown in Exhibit 5.13, there was generally good coverage of the topics both in the intended curriculum and in the classroom. Five of the topics – "whole numbers including place value and ordering," "represent whole numbers using words, diagrams, or symbols," "properties of whole numbers," "computation with whole numbers," and "estimation with whole numbers" – appear in the intended curricula of almost all participants and have been taught to almost all students (more than 90%). Four of the number topics appear in the intended curricula of less than half the participants – "equivalent fractions," "compare and order fractions," "adding and subtracting fractions with the same denominator," and "simple and proportional reasoning." These topics were taught to between one half and two-thirds of the students, on average.

As shown in Exhibit 5.14, of the six TIMSS patterns and relationships topics, only "missing number in an equation" was included in the intended fourth-grade curriculum of almost all TIMSS participants. Practically all students had been taught this topic, including those in the countries where it was not part of the intended curriculum! "Patterns of numbers or shapes" and "pairs of numbers following a given rule" were in the intended curriculum of at least half of the participants, and were taught to 81 percent and 76 percent of students, respectively. "Simple equations" and "finding a rule for a relationship given some pairs of numbers" were included in the curriculum of relatively few participants (10 and 12, respectively) but were taught to surprisingly large percentages of students (87% and 71%).

As described earlier in this chapter, the fourth-grade mathematics curriculum included a strong emphasis on measurement topics in many countries. Exhibit 5.15 shows that four of the six TIMSS measurement topics were included in the intended curriculum of almost all participating entities. These included "standard units to measure length, area, mass/weight, angle, and time," "non-standard units to measure length, area, volume, and time," conversion factors between standard

Exhibit 5.12: Intended and Taught TIMSS Data Topics

MATHEMATICS Grade 8

Data

Countries	Organizing a set of data by one or more characteristics using a tally chart, table, or graph			Sources of error in collecting and organizing data			Data collection methods			Drawing and interpreting graphs, tables, pictographs, bar graphs, pie charts, and line graphs		
	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	Student population intended to be taught topic through 8th grade	Grade(s) topic is intended to be taught	Percent of students taught the topic	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 83 (3.2)	●	--	60 (4.8)	●	--	s 72 (4.1)	●	--	r 74 (3.6)
Australia	●	4-7	83 (3.5)	⦿	9-10	45 (4.5)	●	5-8	66 (3.9)	●	5-8	86 (3.1)
Bahrain	●	1-8	75 (3.2)	○	--	5 (1.7)	●	7-8	11 (2.2)	●	4-8,10	87 (2.9)
Belgium (Flemish)	●	--	73 (3.2)	⦿	--	8 (2.2)	●	--	7 (2.0)	●	--	73 (3.7)
Botswana	●	7	12 (2.5)	○	Tertiary	3 (1.7)	○	Tertiary	8 (2.4)	○	9	13 (3.0)
Bulgaria	●	5-6	59 (4.3)	○	--	18 (3.8)	○	--	19 (3.5)	○	10-11	56 (4.5)
Chile	●	6-7	68 (3.6)	○	--	36 (3.5)	●	6	57 (3.4)	●	7-8	67 (3.6)
Chinese Taipei	○	9	12 (2.9)	○	11	9 (2.5)	○	11	7 (2.1)	○	11	8 (2.3)
Cyprus	⦿	4-6,12	8 (1.5)	○	12	2 (1.1)	○	12	3 (1.5)	⦿	4-6,12	1 (0.6)
Egypt	●	2-5	96 (1.7)	○	--	24 (3.3)	○	--	29 (3.4)	●	3-5	83 (3.2)
Estonia	●	6,12	84 (2.9)	○	12	59 (4.5)	○	12	62 (4.1)	●	6,12	90 (2.5)
Ghana	●	--	76 (3.7)	○	--	52 (4.3)	●	--	65 (4.3)	●	--	73 (3.6)
Hong Kong, SAR	●	6-8	75 (3.7)	○	10-11	45 (4.2)	○	--	69 (4.0)	●	6-9	79 (3.3)
Hungary	●	6	80 (3.5)	○	--	39 (4.4)	○	--	39 (4.4)	●	6	85 (3.0)
Indonesia	●	8-9	87 (2.7)	○	10	45 (4.3)	○	11	64 (4.1)	●	8-11	93 (2.3)
Iran, Islamic Rep. of	●	6-10	71 (3.9)	○	10	34 (4.2)	○	10	35 (3.8)	●	6,8,10	74 (3.2)
Israel	●	3-10	68 (3.9)	○	--	25 (3.3)	●	3-10	37 (3.8)	●	3-10	54 (3.9)
Italy	●	6	78 (3.4)	○	9-13	24 (3.1)	●	6-7	60 (3.5)	●	4,7-9	86 (3.0)
Japan	●	3-5	24 (3.9)	○	10-12	12 (2.9)	○	10-12	19 (3.4)	●	3-5	55 (4.5)
Jordan	○	9	58 (4.8)	○	11	16 (3.4)	○	11	26 (3.6)	●	6-7	85 (3.2)
Korea, Rep. of	●	--	s 84 (2.7)	○	--	55 (3.7)	○	--	s 59 (3.8)	●	--	s 74 (3.2)
Latvia	●	7	s 70 (5.2)	○	--	27 (5.0)	○	--	s 37 (4.9)	●	6-7	s 94 (2.0)
Lebanon	●	--	63 (4.8)	○	--	29 (4.2)	○	--	47 (4.9)	●	8	49 (5.0)
Lithuania	●	4-10	96 (1.6)	○	--	54 (4.0)	○	--	85 (2.8)	●	6-12	96 (1.4)
Macedonia, Rep. of	○	--	– –	○	--	– –	○	--	– –	○	--	– –
Malaysia	●	8	69 (4.1)	○	10	33 (4.3)	○	10	49 (4.0)	●	6,8-9	80 (3.8)
Moldova, Rep. of	○	--	r 75 (4.3)	○	--	r 51 (5.4)	○	--	r 69 (4.3)	○	--	r 74 (4.7)
Morocco	●	--	s 53 (6.0)	○	--	x x	○	--	x x	○	--	s 61 (5.5)
Netherlands	●	--	83 (3.9)	○	--	11 (3.7)	○	--	28 (5.1)	●	--	96 (1.8)
New Zealand	●	3-9	90 (2.4)	●	6-9	52 (3.8)	●	6-9	73 (4.3)	●	3-9	88 (2.4)
Norway	●	7-10	71 (4.1)	●	8-10	48 (4.9)	●	8-10	54 (4.5)	●	6-10	83 (3.2)
Palestinian Nat'l Auth.	●	2-6	64 (4.0)	○	10	12 (2.9)	○	10	28 (4.1)	●	3-8	97 (1.7)
Philippines	○	10	42 (4.7)	○	10	29 (4.2)	○	10	30 (4.2)	○	10	50 (4.1)
Romania	●	4-12	89 (2.8)	○	11-12	44 (4.3)	○	10-12	61 (4.7)	●	4-12	81 (3.2)
Russian Federation	○	--	– –	○	--	– –	○	--	– –	●	--	– –
Saudi Arabia	○	10	41 (6.2)	○	--	7 (2.8)	○	10	9 (3.0)	●	5-6	40 (5.1)
Scotland	●	--	96 (1.5)	⦿	--	31 (4.5)	●	--	74 (3.9)	●	--	95 (1.6)
Serbia	●	8	86 (3.1)	○	12	58 (3.7)	○	12	56 (3.8)	○	12	90 (2.5)
Singapore	●	1-8	92 (1.2)	○	--	30 (2.1)	○	--	62 (2.8)	●	3-8	94 (1.0)
Slovak Republic	⦿	9	25 (4.0)	⦿	9	10 (2.8)	⦿	9	15 (3.2)	●	7	42 (4.3)
Slovenia	●	3-4	71 (4.2)	○	--	18 (2.9)	●	4-5	31 (3.6)	●	3-4	76 (3.7)
South Africa	⦿	--	r 55 (3.9)	○	--	r 36 (3.7)	○	--	r 44 (3.7)	⦿	--	r 55 (3.8)
Sweden	●	8	75 (3.0)	⦿	8	23 (3.5)	●	8	45 (3.7)	●	8	84 (2.8)
Syrian Arab Republic	○	11	– –	○	--	– –	○	--	– –	○	--	– –
Tunisia	○	--	58 (3.9)	○	--	23 (3.3)	○	--	33 (3.9)	○	--	55 (4.3)
United States	●	--	96 (1.2)	●	--	65 (2.6)	●	--	80 (2.3)	●	--	97 (1.0)
‡ England	●	K-6	s 99 (0.8)	⦿	8-10	55 (6.6)	●	6-10	s 80 (5.4)	●	6-10	s 100 (0.0)
International Avg.			68 (0.5)			32 (0.6)			44 (0.6)			72 (0.5)
Benchmarking Participants												
Basque Country, Spain	●	--	45 (5.2)	○	10	17 (4.6)	○	10	39 (5.9)	⦿	9	43 (5.4)
Indiana State, US	●	--	92 (2.9)	●	--	69 (5.7)	●	--	80 (4.2)	●	--	94 (2.2)
Ontario Province, Can.	●	1-8	97 (1.7)	●	5-8	76 (3.9)	●	3-8	91 (3.0)	●	1-8	94 (2.4)
Quebec Province, Can.	●	1-7,9-10	84 (3.6)	○	10-11	23 (3.7)	●	1-6,10	50 (5.2)	●	1-7,10	81 (4.0)

● All or almost all students ⦿ Only the more able students ○ Not included in the curriculum through eighth grade

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

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

‡ 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 Data Topics**

MATHEMATICS Grade 8

Data	Characteristics of data sets including mean, median, range, and shape of distribution			Interpreting data sets			Evaluating interpretations of data with respect to correctness and completeness of interpretation			Simple probability including using data from experiments to estimate probabilities for favorable outcomes		
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	●	--	s 64 (4.3)	⦿	--	65 (4.3)	⦿	--	s 58 (4.2)	⦿	--	s 43 (5.1)
Australia	●	8	63 (4.9)	⦿	9-10	45 (4.6)	⦿	9-10	30 (4.0)	●	7-10	33 (3.6)
Bahrain	●	6-7,10	23 (2.8)	●	2-8,10	10 (1.9)	●	5-8	12 (1.3)	○	11	4 (1.2)
Belgium (Flemish)	⦿	--	56 (4.1)	⦿	--	25 (3.7)	⦿	--	23 (3.5)	⦿	--	13 (2.8)
Botswana	○	9	5 (2.0)	○	Tertiary	4 (1.9)	○	Tertiary	2 (1.1)	○	10	0 (0.0)
Bulgaria	○	10-11	21 (3.3)	○	10-11	11 (2.5)	○	--	5 (1.6)	○	10	6 (1.8)
Chile	●	6-8	51 (3.8)	○	12	47 (4.1)	○	12	32 (3.7)	○	10	21 (3.0)
Chinese Taipei	○	11	5 (1.8)	○	11	3 (1.4)	○	11	4 (1.5)	○	11	2 (1.0)
Cyprus	⦿	4-6,12	1 (0.6)	⦿	5-6,12	9 (1.4)	⦿	5-6,12	7 (1.2)	⦿	4-6,9,12	2 (0.4)
Egypt	●	8	100 (0.1)	○	--	50 (4.4)	○	--	39 (4.5)	●	8	63 (3.8)
Estonia	○	12	56 (4.5)	○	12	33 (4.0)	○	12	35 (4.4)	○	12	76 (3.5)
Ghana	●	--	73 (3.7)	●	--	35 (4.5)	○	--	31 (4.6)	●	--	38 (4.8)
Hong Kong, SAR	●	7-9	25 (4.1)	○	--	30 (4.3)	○	10-11	23 (3.7)	●	7-9	9 (2.7)
Hungary	●	8	53 (3.8)	●	8	60 (3.8)	○	--	46 (4.4)	●	7	33 (3.4)
Indonesia	○	10-12	91 (2.5)	○	11	52 (4.6)	○	11	36 (4.4)	○	10	73 (3.9)
Iran, Islamic Rep. of	○	10	47 (3.7)	○	10	34 (3.6)	○	10	25 (3.2)	○	10	24 (3.6)
Israel	●	7,10	43 (3.6)	⦿	10	36 (3.5)	⦿	7	r 23 (3.0)	●	8-11	39 (3.7)
Italy	●	8-10	42 (3.3)	●	8-13	36 (3.5)	○	10-13	35 (3.6)	●	8-10	38 (3.5)
Japan	○	10-12	9 (2.5)	○	10-12	6 (2.2)	○	10-12	4 (1.8)	●	8	33 (3.7)
Jordan	●	6-10	42 (4.7)	○	11	32 (4.3)	○	--	29 (4.2)	●	8-12	66 (4.1)
Korea, Rep. of	○	--	s 53 (4.0)	●	--	41 (3.6)	○	--	s 39 (4.0)	●	--	s 66 (3.8)
Latvia	●	6	s 62 (5.6)	○	--	34 (4.9)	○	--	s 29 (5.1)	○	9	s 36 (5.4)
Lebanon	○	9-12	36 (4.1)	○	11-12	42 (4.4)	○	--	23 (4.0)	○	11-12	18 (3.3)
Lithuania	●	8-12	91 (2.4)	○	--	60 (4.4)	○	--	42 (4.4)	●	8-12	27 (3.7)
Macedonia, Rep. of	○	--	– –	○	--	– –	○	--	– –	⦿	12	45 (4.4)
Malaysia	○	10	27 (3.7)	●	8-9	26 (4.0)	○	10	23 (3.8)	○	11	9 (2.2)
Moldova, Rep. of	○	--	r 51 (5.3)	○	--	r 57 (5.3)	○	--	r 46 (5.5)	●	8	r 43 (5.3)
Morocco	○	--	x x	○	--	15 (5.0)	○	--	s 33 (6.4)	○	--	x x
Netherlands	●	--	43 (5.2)	●	--	26 (4.2)	○	--	11 (3.2)	⦿	--	45 (5.2)
New Zealand	●	6-9	85 (2.8)	●	6-10	55 (5.1)	●	8-9	39 (5.3)	●	5-9	69 (4.4)
Norway	●	8-10	82 (3.2)	●	8-10	39 (4.2)	●	8-10	30 (4.3)	○	9-10	18 (3.3)
Palestinian Nat'l Auth.	●	8	97 (1.6)	○	9	25 (3.8)	○	9	22 (4.0)	●	8	89 (2.8)
Philippines	○	10	29 (3.8)	○	10	21 (3.2)	○	10	22 (3.5)	○	--	18 (3.5)
Romania	○	10-12	35 (3.7)	●	6-10	32 (3.6)	○	--	48 (4.4)	●	4-12	86 (2.9)
Russian Federation	○	--	– –	○	--	– –	○	--	– –	○	--	– –
Saudi Arabia	○	10	9 (2.5)	○	--	10 (2.6)	○	--	20 (4.3)	○	11	8 (2.2)
Scotland	⦿	--	74 (3.9)	●	--	45 (4.0)	⦿	--	28 (4.0)	⦿	--	56 (4.8)
Serbia	○	12	72 (3.9)	○	12	61 (4.0)	○	12	59 (3.8)	○	12	39 (4.0)
Singapore	●	8	89 (1.6)	○	--	34 (2.5)	○	--	25 (2.1)	⦿	10	5 (1.1)
Slovak Republic	●	8	10 (2.6)	⦿	9	7 (2.1)	⦿	9	7 (1.6)	●	7	29 (4.1)
Slovenia	○	9	17 (2.8)	○	9	19 (3.4)	○	--	15 (3.4)	○	10	4 (1.9)
South Africa	○	--	r 38 (3.9)	○	--	r 39 (3.6)	○	--	r 34 (3.6)	○	--	r 22 (3.4)
Sweden	●	8	64 (3.9)	○	9	34 (3.6)	⦿	8	18 (2.8)	○	9	29 (3.3)
Syrian Arab Republic	○	--	– –	○	--	– –	○	--	– –	○	11	– –
Tunisia	○	--	r 18 (3.1)	○	--	37 (3.9)	○	--	45 (4.2)	○	--	26 (3.4)
United States	●	--	96 (1.0)	●	--	84 (2.3)	●	--	67 (2.8)	●	--	80 (2.1)
‡ England	●	5-10	s 98 (1.3)	●	6-10	65 (5.4)	⦿	8-10	s 35 (4.9)	●	4-8	s 97 (1.8)
International Avg.			50 (0.5)			35 (0.6)			29 (0.6)			36 (0.5)
Benchmarking Participants												
Basque Country, Spain	○	9	27 (4.7)	○	10	27 (4.7)	⦿	9	25 (4.4)	⦿	9	21 (4.3)
Indiana State, US	●	--	95 (2.4)	●	--	78 (4.3)	●	--	69 (5.1)	●	--	79 (4.0)
Ontario Province, Can.	●	5-8	88 (3.3)	●	1-8	85 (3.3)	●	5-8	71 (4.6)	●	2-8	56 (4.8)
Quebec Province, Can.	○	9-11	18 (3.4)	●	1-7,9-10	28 (4.1)	○	9-11	14 (2.8)	●	8,11	35 (4.8)

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.

‡ 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 Number Topics**

MATHEMATICS Grade 4

Number	Whole numbers including place value and ordering			Represent whole numbers using words, diagrams, or symbols			Properties of whole numbers such as odd and even, multiples, or factors			Computation with whole numbers		
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	Percent of students taught the topic
Armenia	●	--	r 100 (0.0)	●	--	r 92 (2.1)	●	--	r 95 (1.6)	●	--	r 99 (1.1)
Australia	●	--	100 (0.3)	●	--	96 (1.4)	●	--	97 (1.1)	●	--	100 (0.1)
Belgium (Flemish)	●	--	99 (0.6)	●	--	94 (1.9)	●	--	97 (1.4)	●	--	100 (0.0)
Chinese Taipei	●	3	100 (0.0)	●	1	92 (2.4)	●	4	53 (4.1)	●	3	100 (0.0)
Cyprus	●	3-7	100 (0.3)	●	2-7	99 (0.7)	●	2-7	93 (2.3)	⦿	6	99 (0.7)
England	●	K-4	r 100 (0.0)	●	K-4	r 95 (2.1)	●	K-4	r 100 (0.0)	●	K-4	r 100 (0.0)
Hong Kong, SAR	●	3	100 (0.0)	●	3	83 (3.5)	●	4	99 (0.8)	●	3	100 (0.0)
Hungary	●	1	99 (0.6)	●	1	98 (1.2)	●	3	100 (0.0)	●	4	99 (0.6)
Iran, Islamic Rep. of	●	4	99 (0.6)	●	2-3	98 (1.2)	●	3-4	90 (3.0)	●	2-4	84 (2.9)
Italy	●	2-5	99 (0.6)	●	1-5	97 (1.2)	●	1-8	95 (1.3)	●	1-8	100 (0.4)
Japan	●	1-4	100 (0.0)	●	1-3	84 (3.2)	○	5-6	24 (3.4)	●	1-4	100 (0.0)
Latvia	●	--	s 96 (2.4)	●	--	s 96 (1.8)	●	--	s 95 (1.6)	●	--	s 99 (1.0)
Lithuania	●	1-4	99 (0.5)	●	1-6	91 (2.4)	○	5-6	91 (1.8)	●	1	100 (0.5)
Moldova, Rep. of	●	--	r 96 (1.7)	●	--	r 93 (2.3)	●	--	r 97 (1.7)	●	--	r 97 (1.6)
Morocco	⦿	--	x x	⦿	--	x x	⦿	--	x x	⦿	--	x x
Netherlands	●	--	99 (0.7)	●	--	r 83 (3.9)	○	6	88 (3.1)	●	--	100 (0.0)
New Zealand	●	K-5	100 (0.0)	●	K-5	98 (1.0)	⦿	3	93 (1.5)	●	K-5	100 (0.2)
Norway	●	2-7	100 (0.3)	●	2-7	74 (3.6)	●	2-7	88 (2.7)	●	2-7	100 (0.0)
Philippines	●	--	100 (0.0)	●	--	97 (1.7)	●	--	98 (1.3)	●	--	99 (1.1)
Russian Federation	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Scotland	●	--	r 100 (0.0)	●	--	s 87 (3.7)	●	--	r 99 (0.8)	●	--	r 100 (0.3)
Singapore	●	1-5	100 (0.0)	●	1-5	98 (1.0)	●	3-4	99 (0.9)	●	1-5	100 (0.0)
Slovenia	●	2	99 (0.9)	●	2	97 (1.3)	●	3	98 (1.3)	●	2	100 (0.0)
Tunisia	●	--	r 98 (1.3)	○	7	r 91 (2.6)	●	--	98 (1.0)	●	--	r 98 (1.4)
United States	●	--	100 (0.0)	●	--	98 (0.7)	●	--	98 (0.8)	●	--	100 (0.0)
Yemen	●	--	– –	●	--	– –	●	2,5	– –	●	--	– –
International Avg.			99 (0.2)			93 (0.5)			91 (0.4)			99 (0.2)
Benchmarking Participants												
Indiana State, US	●	--	100 (0.0)	●	--	100 (0.0)	●	--	97 (2.0)	●	--	100 (0.0)
Ontario Province, Can.	●	1-6	100 (0.0)	●	1-6	99 (1.0)	●	3,6-7	93 (2.5)	●	1-6	100 (0.0)
Quebec Province, Can.	●	1-6	99 (0.8)	●	1-6	100 (0.2)	●	1-6	90 (2.9)	●	1-6	100 (0.1)

● All or almost all students ⦿ Only the more able students ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 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 5.13: **Intended and Taught TIMSS Number Topics** *(Continued...)*

MATHEMATICS Grade 4

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

Number	Estimation with whole numbers			Fractions			Equivalent fractions			Compare and order fractions		
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	Percent of students taught the topic
Armenia	●	--	r 81 (3.1)	●	--	r 96 (1.7)	●	4	r 92 (2.3)	⦿	--	r 98 (1.1)
Australia	●	--	98 (0.6)	●	--	83 (2.7)	○	6	50 (4.4)	●	--	57 (4.3)
Belgium (Flemish)	●	--	99 (0.8)	●	--	99 (0.6)	●	--	91 (2.2)	⦿	5	95 (1.9)
Chinese Taipei	●	4	96 (1.5)	●	2	98 (1.0)	○	5	64 (4.2)	●	4	94 (1.7)
Cyprus	⦿	6	99 (0.8)	●	2-7	100 (0.0)	●	4-7	98 (1.2)	⦿	6	93 (2.2)
England	●	K-4	r 100 (0.0)	●	2-4	r 100 (0.4)	●	2-4	r 91 (2.7)	●	3-4	r 90 (3.3)
Hong Kong, SAR	●	4	96 (2.5)	●	3	95 (1.7)	●	4	95 (2.0)	●	4	92 (2.6)
Hungary	●	1	99 (0.6)	●	4	86 (3.2)	○	5	71 (3.7)	○	5	71 (3.7)
Iran, Islamic Rep. of	○	6	64 (4.2)	●	3,6	76 (3.9)	○	8	86 (2.9)	●	4-6	49 (4.7)
Italy	●	3	78 (3.2)	●	4	98 (1.0)	●	4-8	88 (2.5)	●	4-8	91 (2.1)
Japan	●	4	89 (2.4)	●	4	64 (3.9)	○	5	32 (3.7)	○	5-6	48 (4.3)
Latvia	○	--	s 89 (3.8)	●	--	s 68 (4.6)	○	5	s 69 (5.4)	○	5	s 23 (4.2)
Lithuania	○	5	83 (2.8)	●	4-6	92 (2.2)	○	6	84 (2.7)	⦿	6	87 (2.1)
Moldova, Rep. of	●	--	r 97 (1.5)	●	--	r 99 (0.6)	●	--	r 96 (1.8)	●	--	r 99 (1.0)
Morocco	⦿	--	x x	⦿	--	x x	⦿	--	x x	⦿	--	x x
Netherlands	●	--	100 (0.4)	○	5	85 (3.5)	○	5	54 (4.8)	○	5	36 (4.9)
New Zealand	●	K-9	96 (1.3)	●	3	87 (2.2)	○	7	58 (3.3)	⦿	7	71 (3.1)
Norway	●	3-7	82 (3.4)	●	4-7	43 (4.1)	○	5-7	17 (2.9)	○	5-7	26 (3.8)
Philippines	●	--	98 (1.3)	●	--	99 (1.0)	●	--	97 (1.5)	●	--	96 (1.7)
Russian Federation	●	--	– –	○	--	– –	○	--	– –	○	--	– –
Scotland	●	--	r 99 (0.8)	●	--	r 88 (3.3)	⦿	--	r 50 (4.2)	⦿	--	r 62 (4.9)
Singapore	●	4-5	96 (1.6)	●	2-3	100 (0.0)	●	3	100 (0.0)	●	2-3	100 (0.0)
Slovenia	○	5	93 (2.1)	●	4	47 (4.3)	○	7	3 (1.5)	○	7	11 (2.8)
Tunisia	○	--	r 64 (4.2)	○	6	r 2 (1.0)	○	6	r 1 (0.9)	○	6	r 1 (0.9)
United States	●	--	99 (0.4)	●	--	88 (1.9)	●	--	75 (2.2)	●	--	68 (2.6)
Yemen	●	4,5	– –	●	2,3	– –	●	2,3	– –	●	3-5	– –
International Avg.			91 (0.5)			82 (0.5)			68 (0.6)			68 (0.6)
Benchmarking Participants												
Indiana State, US	●	--	100 (0.0)	●	--	90 (2.0)	●	--	60 (4.9)	●	--	52 (4.6)
Ontario Province, Can.	●	2-6	98 (0.9)	●	1-3	78 (4.2)	○	5	61 (5.1)	●	2-6	61 (5.2)
Quebec Province, Can.	●	1-6	92 (2.5)	●	4-7	81 (3.4)	○	5-7	50 (4.9)	●	4-7	50 (4.6)

● 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.

Exhibit 5.13: **Intended and Taught TIMSS Number Topics** *(...Continued)*

MATHEMATICS Grade 4

Number	Fractions or decimals represented by words, numbers or models			Adding and subtracting fractions with the same denominator			Adding and subtracting with decimals			Simple and proportional reasoning		
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	Percent of students taught the topic
Armenia	●	4	r 91 (1.8)	●	4	r 99 (0.7)	⦿	6	r 96 (1.9)	●	4	r 46 (4.6)
Australia	●	--	76 (3.2)	○	6	34 (4.2)	○	6	52 (4.5)	○	5	47 (4.5)
Belgium (Flemish)	⦿	6	91 (2.7)	⦿	5	84 (3.3)	⦿	6	95 (2.0)	⦿	5	66 (4.0)
Chinese Taipei	●	4	97 (1.5)	●	4	97 (1.5)	●	4	94 (2.0)	○	5-6	45 (4.4)
Cyprus	●	4-7	86 (3.1)	●	4-7	96 (1.3)	●	4-7	89 (2.5)	●	4-8	83 (3.4)
England	●	3-4	r 89 (3.2)	○	5 on	r 49 (5.0)	●	4	r 77 (4.5)	●	4	r 59 (4.8)
Hong Kong, SAR	●	3	82 (3.3)	●	4	97 (1.4)	●	4	83 (3.6)	●	4	55 (4.7)
Hungary	○	6	34 (4.3)	○	6	23 (3.6)	○	6	2 (1.1)	●	4	29 (4.0)
Iran, Islamic Rep. of	○	6	99 (0.9)	●	4	10 (2.8)	○	5	31 (4.6)	●	4	45 (5.0)
Italy	●	4-6	95 (1.6)	●	4-6	72 (2.9)	●	4-8	97 (1.2)	○	6-8	42 (3.6)
Japan	●	4	51 (3.8)	○	5	14 (2.8)	●	4	76 (3.5)	●	4	25 (3.7)
Latvia	○	--	s 40 (5.4)	○	5	s 62 (5.7)	○	5	s 17 (3.9)	●	--	s 48 (5.7)
Lithuania	⦿	4-6	72 (3.3)	○	6	34 (3.2)	○	5-6	50 (3.4)	⦿	4-6	38 (3.9)
Moldova, Rep. of	●	4	r 95 (1.8)	●	--	r 98 (1.0)	●	4	r 93 (2.4)	○	6	r 63 (4.7)
Morocco	⦿	--	x x	⦿	--	x x	●	--	x x	⦿	--	x x
Netherlands	○	5	31 (4.6)	○	5	29 (4.7)	○	5	9 (2.6)	●	--	54 (4.9)
New Zealand	●	4-5	70 (3.0)	○	9	42 (2.8)	⦿	5	52 (3.3)	⦿	4-9	42 (3.4)
Norway	●	4-7	29 (3.8)	○	5-7	16 (3.0)	●	4-7	51 (4.1)	●	2-7	16 (3.1)
Philippines	●	--	91 (2.6)	●	--	98 (1.2)	●	--	97 (1.5)	○	--	71 (4.7)
Russian Federation	○	--	– –	○	--	– –	○	--	– –	●	--	– –
Scotland	●	--	r 54 (4.7)	○	--	r 24 (4.1)	○	--	r 28 (3.9)	○	--	r 10 (2.9)
Singapore	●	2-4	98 (1.2)	●	4	100 (0.0)	●	4	97 (1.4)	●	3-4	78 (3.5)
Slovenia	●	4	15 (2.8)	○	7	2 (1.1)	○	6	5 (1.4)	●	4	70 (4.1)
Tunisia	○	5	r 1 (0.9)	○	5	r 1 (0.9)	○	5	r 18 (3.6)	○	7	r 14 (3.1)
United States	●	--	76 (2.4)	●	--	66 (2.7)	●	--	70 (2.8)	●	--	59 (2.8)
Yemen	●	--	– –	●	3	– –	●	4,5	– –	○	6	– –
International Avg.			68 (0.7)			54 (0.6)			60 (0.6)			48 (0.9)
Benchmarking Participants												
Indiana State, US	●	--	71 (5.4)	●	--	63 (6.4)	●	--	66 (5.7)	●	--	45 (6.1)
Ontario Province, Can.	●	2-6	61 (4.9)	○	7	38 (5.0)	●	4	58 (4.6)	○	7-8	51 (4.6)
Quebec Province, Can.	●	3-4	36 (4.1)	○	5-7	28 (3.9)	●	4-7	26 (4.1)	○	8	52 (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

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.

units," and "instruments to measure length, area, mass/weight, angle, and time." Less often included in participants' intended curricula were "calculating areas and perimeters of squares" and "estimating length, area, volume, weight, and time." Regardless of whether they were in the intended curriculum or not, the measurement topics were widely taught, with no fewer than 80 percent of students being taught each one.

Although there are 11 geometry topics in the TIMSS fourth-grade mathematics assessment, their inclusion in participants' curricula varies widely, as does the percentage of students taught each of the topics. Exhibit 5.16 shows that only one geometry topic – "angles greater than, equal to, or less than a right angle" – was included in the intended curriculum of more than half the participants, and that three topics – "congruent triangles," "similar triangles," and "translation, reflection, and rotation" – were included by very few participants indeed. The percentage of students taught the geometry topics also was generally lower than in areas such as number or measurement. Percentages ranged from 74 percent for the aforementioned angles topic to just 33 percent for "translation, reflection, and rotation." For many countries, geometry topics not included in the fourth-grade curriculum were intended for later grades.

As shown in Exhibit 5.17, three of the seven TIMSS data topics were included in the intended fourth-grade mathematics curriculum of more than half the participating entities. Furthermore, these three topics, "organizing a set of data by one characteristic," "reading data directly from tables, pictographs, and bar graphs," and "display data using tables, pictographs, and bar graphs," were each taught to more than 85 percent of students. "Comparing and matching different representations of the same data" was in the curriculum of the fewest participants (11), yet was taught to 65 percent of students, on average.

Exhibit 5.14: Intended and Taught TIMSS Patterns and Relationships Topics

MATHEMATICS Grade 4

Patterns and Relationships	Patterns of numbers or shapes			Equality using equations, areas, volumes, masses/weights			Missing number in an equation			Simple equations		
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	Percent of students taught the topic
Armenia	⦿	8	r 53 (4.3)	●	4	r 80 (3.4)	●	--	r 100 (0.4)	●	--	r 97 (1.0)
Australia	●	--	91 (3.4)	●	--	69 (5.1)	●	--	97 (1.0)	●	--	93 (3.5)
Belgium (Flemish)	●	--	93 (2.3)	⦿	6	51 (4.3)	●	--	98 (1.0)	⦿	5	97 (1.2)
Chinese Taipei	●	4	89 (2.7)	●	4	63 (4.2)	●	3	98 (1.3)	○	7	81 (3.5)
Cyprus	●	3-7	96 (1.3)	⦿	6	77 (3.4)	●	2-6	98 (1.0)	●	4-7	96 (1.6)
England	⦿	4	r 94 (2.5)	⦿	4	r 79 (3.4)	●	K-4	r 98 (1.2)	⦿	5 on	r 56 (5.2)
Hong Kong, SAR	○	6	66 (4.9)	○	5	54 (4.2)	●	4	72 (3.8)	○	5	50 (4.5)
Hungary	●	2	96 (1.7)	●	2	61 (4.4)	●	2	100 (0.0)	○	5	96 (1.5)
Iran, Islamic Rep. of	●	1-2	52 (5.0)	●	3-5	52 (4.5)	●	1-2	88 (2.6)	○	7	78 (3.9)
Italy	●	2-3	85 (2.6)	○	6-8	28 (2.8)	●	2-3	95 (1.6)	○	8-10	74 (3.1)
Japan	●	4	58 (4.1)	●	3-4	47 (4.0)	●	2-4	91 (2.5)	●	3-4	97 (1.5)
Latvia	○	--	s 84 (3.9)	●	--	s 81 (4.7)	●	--	s 98 (1.1)	○	--	s 99 (0.8)
Lithuania	●	4	73 (3.6)	●	4-12	77 (3.3)	●	3-4	100 (0.0)	⦿	4-5	97 (1.0)
Moldova, Rep. of	●	--	r 90 (2.8)	●	--	r 92 (2.6)	●	--	r 99 (0.8)	●	--	r 98 (1.2)
Morocco	⦿	--	x x	⦿	--	x x	⦿	--	x x	○	--	x x
Netherlands	○	7	61 (4.7)	○	7	35 (4.5)	○	7	98 (1.3)	○	7	90 (3.1)
New Zealand	●	K-5	91 (2.1)	●	2-5	66 (3.8)	●	4-5	95 (1.7)	⦿	4-5	95 (1.6)
Norway	●	4-7	67 (3.7)	●	3-7	27 (3.5)	●	3-7	90 (2.7)	○	8-10	61 (4.1)
Philippines	○	--	75 (4.4)	○	--	64 (4.8)	○	--	87 (3.2)	○	--	80 (4.1)
Russian Federation	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Scotland	●	--	r 97 (1.9)	⦿	--	r 67 (4.7)	●	--	r 100 (0.0)	○	--	r 86 (3.2)
Singapore	●	1-5	99 (0.6)	○	7	79 (3.4)	●	2-5	98 (0.9)	○	7	84 (3.0)
Slovenia	○	5	96 (1.8)	○	5	55 (4.3)	●	3	98 (0.9)	●	4	98 (0.9)
Tunisia	○	6	r 68 (4.1)	○	6	r 88 (2.9)	●	--	r 96 (1.8)	○	6	r 97 (1.7)
United States	●	--	96 (1.0)	●	--	68 (2.8)	●	--	99 (0.6)	●	--	97 (1.1)
Yemen	●	2-3	– –	●	4,6-7	– –	●	1-3	– –	○	6-7	– –
International Avg.			81 (0.7)			64 (0.8)			95 (0.4)			87 (0.6)
Benchmarking Participants												
Indiana State, US	●	--	97 (1.8)	⦿	5	63 (5.8)	●	--	99 (1.3)	●	--	95 (3.1)
Ontario Province, Can.	●	1-8	97 (1.8)	●	2-8	65 (4.0)	●	3-6	88 (3.2)	●	4-8	91 (3.2)
Quebec Province, Can.	●	1-7	97 (1.3)	○	8	56 (4.8)	●	1-6	98 (1.0)	○	8	99 (0.2)

● 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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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 Patterns and Relationships Topics**

MATHEMATICS Grade 4

Patterns and Relationships	Pairs of numbers following a given rule			Finding a rule for a relationship given some pairs of numbers		
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	●	--	r 92 (2.1)	●	--	r 91 (2.2)
Australia	●	--	62 (4.9)	○	5	62 (4.8)
Belgium (Flemish)	○	6	80 (2.9)	○	6	78 (3.2)
Chinese Taipei	○	5	72 (3.7)	○	5	76 (3.5)
Cyprus	●	4-7	86 (2.4)	●	4-7	72 (3.8)
England	●	4	r 78 (4.1)	●	4	r 75 (4.6)
Hong Kong, SAR	○	7-9	40 (4.8)	○	7-9	45 (4.9)
Hungary	●	2	97 (1.4)	●	2	99 (0.7)
Iran, Islamic Rep. of	○	8	69 (4.1)	○	8	50 (4.8)
Italy	●	3-4	76 (3.4)	●	3-4	81 (2.9)
Japan	●	4	43 (3.5)	●	4	41 (3.8)
Latvia	●	--	s 84 (4.0)	○	--	s 88 (3.7)
Lithuania	◉	4	81 (3.1)	○	11-12	70 (3.7)
Moldova, Rep. of	●	--	r 94 (2.1)	●	--	r 88 (3.0)
Morocco	◉	--	x x	◉	--	x x
Netherlands	○	7	65 (4.4)	○	6	56 (4.6)
New Zealand	●	4	78 (2.5)	●	4	79 (2.9)
Norway	○	9-10	40 (4.0)	○	9-10	34 (3.8)
Philippines	○	--	68 (4.4)	○	--	66 (4.8)
Russian Federation	●	--	– –	○	--	– –
Scotland	○	--	r 80 (3.6)	○	--	r 75 (4.7)
Singapore	○	7	91 (2.2)	○	7	73 (3.7)
Slovenia	●	4	92 (2.4)	●	4	75 (4.2)
Tunisia	○	7	r 83 (3.2)	○	7	r 77 (3.9)
United States	●	--	86 (1.8)	◉	--	85 (2.0)
Yemen	○	6-7	– –	○	--	– –
International Avg.			76 (0.7)			71 (0.8)
Benchmarking Participants						
Indiana State, US	●	--	82 (4.5)	●	--	68 (6.0)
Ontario Province, Can.	●	3-6	76 (3.7)	●	4-9	84 (3.8)
Quebec Province, Can.	●	3-4	76 (3.6)	●	3-4	69 (4.5)

● 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 5.15: **Intended and Taught TIMSS Measurement Topics**

MATHEMATICS Grade 4

Measurement	Non-standard units to measure lengths, area, volume, and time			Standard units to measure length, area, mass/weight, angle, and time			Conversion factors between standard units			Instruments to measure length, area, mass/weight, angle, and time		
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	Percent of students taught the topic
Armenia	●	--	r 82 (3.6)	●	4	r 97 (1.6)	●	--	r 94 (2.0)	●	--	r 90 (2.7)
Australia	●	--	96 (1.5)	●	--	98 (1.1)	●	--	82 (3.9)	●	--	96 (1.2)
Belgium (Flemish)	●	--	90 (2.4)	●	--	100 (0.3)	●	--	99 (0.5)	●	--	98 (0.7)
Chinese Taipei	●	1-4	94 (1.9)	●	2-4	99 (0.6)	○	5	98 (1.0)	●	2-3	96 (1.7)
Cyprus	●	2-6	88 (3.0)	⦿	6	99 (0.6)	⦿	6	99 (0.4)	●	2-6	93 (2.2)
England	●	K-4	r 93 (2.4)	●	1-4	r 99 (0.6)	●	3-4	r 88 (2.7)	●	K-3	r 97 (1.1)
Hong Kong, SAR	●	K-4	80 (4.1)	●	K-4	87 (2.9)	●	4	85 (3.4)	●	K-4	90 (2.7)
Hungary	●	1	72 (4.4)	●	2-5	98 (1.3)	●	2	100 (0.0)	●	2	100 (0.0)
Iran, Islamic Rep. of	●	2-5	77 (4.1)	●	2-5	84 (3.3)	●	4-5,7	77 (4.1)	●	2-5	95 (1.6)
Italy	●	2-5	74 (3.1)	●	4-7	86 (2.7)	●	4-7	84 (2.4)	●	4-7	73 (3.3)
Japan	●	1-4	58 (4.2)	●	2-4	92 (1.9)	●	2-4	96 (1.7)	●	2-3	98 (1.3)
Latvia	●	--	s 69 (5.2)	●	--	s 96 (1.8)	●	--	s 99 (0.7)	●	--	s 96 (1.9)
Lithuania	○	--	72 (3.4)	●	1-6	97 (1.5)	●	4	98 (1.2)	●	1-4	95 (1.7)
Moldova, Rep. of	○	--	r 96 (1.4)	●	--	r 99 (0.7)	●	--	r 98 (1.2)	●	--	r 98 (1.3)
Morocco	⦿	--	x x	⦿	--	x x	●	--	x x	⦿	--	x x
Netherlands	●	--	75 (3.8)	●	--	93 (2.3)	●	--	87 (3.0)	●	--	87 (2.7)
New Zealand	●	K-1	91 (1.9)	●	2-5	96 (1.1)	⦿	5	81 (2.5)	●	2-7	90 (2.1)
Norway	●	3-7	75 (3.0)	●	3-7	94 (1.8)	○	5-7	77 (3.7)	●	3-7	92 (2.3)
Philippines	●	--	76 (4.0)	●	--	80 (3.8)	●	--	82 (3.4)	●	--	76 (4.1)
Russian Federation	●	--	– –	●	--	– –	●	--	– –	●	--	– –
Scotland	●	--	r 93 (2.9)	●	--	r 89 (3.3)	●	--	r 86 (3.7)	●	--	s 90 (3.3)
Singapore	●	1-4	90 (2.3)	●	2-4	97 (1.2)	●	3	98 (0.6)	●	2-4	95 (1.9)
Slovenia	●	4	62 (4.0)	●	4	91 (2.7)	●	4	69 (3.7)	●	4	67 (4.3)
Tunisia	○	--	64 (4.1)	●	--	r 78 (3.6)	●	--	97 (1.4)	●	--	r 86 (2.9)
United States	●	--	83 (2.2)	●	--	82 (2.3)	●	--	67 (2.4)	●	--	89 (1.7)
Yemen	●	1-3	– –	●	2-3	– –	●	--	– –	●	4-6	– –
International Avg.			80 (0.7)			93 (0.4)			89 (0.5)			91 (0.5)
Benchmarking Participants												
Indiana State, US	●	--	82 (3.8)	●	--	86 (4.2)	●	--	68 (4.9)	●	--	88 (3.5)
Ontario Province, Can.	●	1-2	92 (2.5)	●	2-6	92 (2.0)	●	2-6	73 (4.5)	●	2-6	89 (2.7)
Quebec Province, Can.	●	1-4	83 (3.3)	●	2-6	84 (3.6)	○	5-7	56 (4.5)	●	2-6	60 (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 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 5.15: **Intended and Taught TIMSS Measurement Topics**

MATHEMATICS Grade 4

Measurement	Calculating areas and perimeters of squares			Estimating length, area, volume, weight, and time		
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	●	--	r 100 (0.3)	●	--	r 96 (1.6)
Australia	●	--	79 (3.5)	●	--	86 (4.0)
Belgium (Flemish)	⦿	5	78 (3.6)	⦿	5	91 (2.5)
Chinese Taipei	○	5	93 (2.2)	○	5	93 (2.1)
Cyprus	●	--	98 (1.2)	⦿	6	91 (2.4)
England	●	3-4	r 97 (1.5)	●	1-3	r 95 (2.4)
Hong Kong, SAR	●	4	82 (3.5)	○	7-9	81 (3.4)
Hungary	●	4	81 (3.3)	●	1	84 (3.4)
Iran, Islamic Rep. of	●	3-4	96 (1.5)	○	6	x x
Italy	●	4-6	60 (3.2)	●	4-10	47 (3.4)
Japan	●	4	88 (2.4)	○	6	47 (4.4)
Latvia	●	--	s 99 (0.7)	●	--	s 98 (1.6)
Lithuania	●	3-4	100 (0.0)	●	1-4	94 (1.7)
Moldova, Rep. of	●	--	r 100 (0.0)	●	--	r 99 (0.7)
Morocco	⦿	--	x x	⦿	--	x x
Netherlands	○	5	65 (4.9)	●	--	61 (5.0)
New Zealand	⦿	5	71 (3.0)	●	K-5	82 (2.5)
Norway	○	5-7	67 (4.4)	●	3-7	59 (4.9)
Philippines	○	--	80 (4.1)	○	--	72 (4.1)
Russian Federation	●	--	– –	●	--	– –
Scotland	○	--	r 69 (4.6)	⦿	--	r 87 (3.0)
Singapore	●	3-4	97 (1.5)	●	1-4	93 (2.2)
Slovenia	●	4-5	0 (0.0)	●	4	63 (4.0)
Tunisia	●	--	x x	○	6	r 88 (2.9)
United States	●	--	87 (1.7)	●	--	76 (2.5)
Yemen	●	--	– –	●	4-6	– –
International Avg.			81 (0.6)			81 (0.7)
Benchmarking Participants						
Indiana State, US	●	--	79 (4.6)	●	--	67 (5.3)
Ontario Province, Can.	●	4-5	90 (2.8)	●	3-8	83 (3.7)
Quebec Province, Can.	○	5-7	77 (3.8)	●	1-6	62 (4.1)

● All or almost all students ⦿ Only the more able students ○ Not included in the curriculum through fourth grade

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 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 5.16: Intended and Taught TIMSS Geometry Topics

MATHEMATICS Grade 4

Geometry	Angles greater than, equal to, or less than a right angle			Parallel and perpendicular lines			Familiar two- and three-dimensional shapes and their properties			Congruent triangles		
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	Percent of students taught the topic
Armenia	●	--	r 92 (2.4)	●	--	r 70 (4.0)	●	--	r 58 (4.1)	⦿	--	r 37 (4.6)
Australia	○	5	76 (2.9)	○	5	63 (4.2)	●	--	98 (1.0)	○	5	46 (4.5)
Belgium (Flemish)	●	--	95 (1.8)	●	--	99 (0.7)	⦿	5	69 (3.5)	○	5	63 (4.1)
Chinese Taipei	●	4	71 (3.8)	●	4	70 (4.0)	●	3	88 (2.8)	○	6	65 (4.0)
Cyprus	⦿	6	90 (2.5)	⦿	6	80 (3.2)	⦿	6	93 (1.9)	○	7	65 (4.1)
England	●	2-4	r 94 (2.3)	●	4 on	r 86 (3.2)	●	K-4	r 98 (1.5)	○	6 on	r 93 (2.2)
Hong Kong, SAR	○	7-9	62 (4.2)	○	7-9	68 (4.2)	●	4	83 (3.2)	○	7-9	59 (4.6)
Hungary	●	4	75 (3.6)	○	5	96 (1.8)	●	3	72 (3.8)	○	6-7	55 (5.0)
Iran, Islamic Rep. of	●	4-5	98 (1.2)	●	4	100 (0.0)	●	3-4	42 (4.5)	○	6	83 (3.3)
Italy	●	4,6,9	96 (1.3)	●	4,6,9	99 (0.7)	●	4-10	69 (3.1)	●	4,6,9	79 (2.9)
Japan	●	4	99 (1.0)	○	5	17 (3.2)	●	3	27 (3.6)	○	8	20 (3.5)
Latvia	●	--	s 84 (4.5)	○	--	s 36 (5.1)	○	--	s 64 (4.8)	○	--	s 46 (5.5)
Lithuania	●	4	82 (3.0)	○	5-6	65 (3.6)	○	6	74 (3.5)	○	7	86 (2.6)
Moldova, Rep. of	●	--	r 99 (0.6)	●	--	r 99 (0.8)	●	--	r 82 (3.3)	○	--	r 73 (4.1)
Morocco	●	--	x x	●	--	x x	⦿	--	x x	⦿	--	x x
Netherlands	○	7	2 (1.5)	○	7	5 (2.0)	○	7	7 (2.4)	○	7	12 (3.3)
New Zealand	●	4-5	47 (3.3)	●	4-5	66 (3.8)	●	4-5	90 (2.1)	●	K-7	46 (3.4)
Norway	○	7	19 (3.4)	●	4-7	20 (3.0)	○	9-10	43 (4.1)	○	8-10	21 (3.6)
Philippines	●	--	92 (2.6)	○	--	93 (2.3)	○	--	74 (4.3)	○	--	90 (3.0)
Russian Federation	●	--	– –	○	5	– –	●	--	– –	○	7	– –
Scotland	●	--	r 60 (4.5)	○	--	r 13 (3.3)	●	--	r 96 (1.7)	○	--	r 46 (4.6)
Singapore	●	3-4	95 (1.8)	●	4	94 (2.0)	●	4-8	70 (3.8)	○	8	29 (3.7)
Slovenia	○	6	1 (1.0)	●	4	12 (1.7)	●	4	39 (4.4)	○	7	92 (2.5)
Tunisia	○	7	r 89 (2.8)	○	7	r 98 (1.3)	○	8	r 55 (4.4)	○	7	r 24 (3.6)
United States	●	--	78 (2.1)	●	--	88 (1.9)	●	--	86 (1.9)	⦿	--	82 (2.1)
Yemen	●	3	– –	●	--	– –	○	11-12	– –	○	6-7	– –
International Avg.			74 (0.6)			67 (0.6)			69 (0.7)			57 (0.8)
Benchmarking Participants												
Indiana State, US	●	--	66 (4.9)	●	--	77 (4.0)	●	--	71 (4.5)	○	5	71 (4.8)
Ontario Province, Can.	●	4-5	75 (4.3)	●	3	83 (3.9)	●	1-8	93 (2.6)	●	4-7	81 (3.5)
Quebec Province, Can.	●	4-6	71 (3.9)	●	3-4	81 (3.5)	●	1-6	87 (2.8)	●	1-2	60 (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

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 5.16: **Intended and Taught TIMSS Geometry Topics** *(Continued...)*

MATHEMATICS Grade 4

Geometry	Similar triangles			Points in a plane			Relationships between two-dimensional and three-dimensional shapes			Informal coordinate systems		
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	Percent of students taught the topic
Armenia	⦿	--	r 21 (3.7)	●	--	r 49 (4.4)	⦿	--	r 25 (3.9)	○	--	r 25 (4.0)
Australia	○	5	60 (4.1)	○	5	22 (3.8)	●	--	84 (2.9)	●	--	69 (3.9)
Belgium (Flemish)	○	5	65 (3.8)	○	6	61 (4.4)	○	6	32 (4.0)	○	6	52 (3.4)
Chinese Taipei	○	6	51 (3.9)	○	7	61 (4.3)	○	5	59 (4.4)	○	6	48 (4.2)
Cyprus	○	7	56 (4.5)	○	7	70 (3.8)	⦿	6	67 (3.6)	⦿	9	78 (3.1)
England	○	8 on	r 87 (2.9)	●	4 on	r 91 (3.0)	●	3-4	r 71 (4.2)	●	2-4	r 90 (2.9)
Hong Kong, SAR	○	7-9	56 (4.6)	○	7-9	45 (4.6)	○	7-9	39 (5.0)	○	7-9	18 (3.0)
Hungary	○	9	59 (4.3)	●	3	56 (3.9)	○	6	43 (4.2)	●	3	7 (2.5)
Iran, Islamic Rep. of	○	8,10	x x	○	7	59 (4.8)	○	5,7	14 (3.3)	○	7	17 (3.4)
Italy	●	4,6,9	72 (2.8)	●	4-6	81 (2.8)	○	5-10	47 (3.6)	○	5-8	49 (3.9)
Japan	○	9	12 (2.7)	○	5	30 (3.8)	○	6	4 (1.6)	●	4	17 (3.1)
Latvia	○	--	s 53 (4.8)	○	--	s 69 (5.4)	○	--	s 28 (3.9)	○	--	s 12 (3.5)
Lithuania	○	9-10	83 (2.9)	○	6	65 (3.7)	●	3-4	49 (3.6)	○	6	27 (3.1)
Moldova, Rep. of	○	--	r 73 (4.0)	●	--	r 68 (4.7)	●	--	r 58 (4.4)	○	--	r 44 (5.1)
Morocco	⦿	--	x x	●	--	x x	●	--	x x	●	--	– –
Netherlands	○	7	8 (2.5)	○	7	2 (1.1)	○	5	14 (3.3)	●	--	32 (4.5)
New Zealand	●	K-7	56 (3.3)	○	5-10	35 (3.6)	●	4-5	72 (2.6)	⦿	5	56 (3.1)
Norway	○	8-10	24 (4.1)	●	3-10	20 (3.6)	○	8-10	18 (3.7)	●	3-7	45 (4.5)
Philippines	○	--	88 (3.0)	○	--	79 (3.9)	○	--	60 (4.6)	○	--	36 (4.6)
Russian Federation	○	8-9	– –	○	5-7	– –	○	--	– –	○	--	– –
Scotland	○	--	r 45 (4.8)	○	--	r 78 (3.7)	○	--	r 79 (4.4)	●	--	r 90 (3.3)
Singapore	○	8	34 (4.0)	○	9	20 (3.0)	○	6	28 (3.4)	○	--	16 (3.0)
Slovenia	○	7	75 (3.9)	●	4	47 (4.0)	●	3	29 (4.6)	●	4	12 (2.7)
Tunisia	○	7	r 25 (3.9)	○	7	76 (3.9)	○	11	32 (4.1)	○	11	r 5 (1.9)
United States	●	--	79 (2.3)	⦿	--	54 (2.7)	●	--	60 (2.4)	⦿	--	65 (2.6)
Yemen	○	9	– –	○	7	– –	○	7	– –	○	7	– –
International Avg.			54 (0.8)			54 (0.8)			44 (0.8)			40 (0.7)
Benchmarking Participants												
Indiana State, US	○	6	67 (5.1)	●	--	34 (6.0)	○	6	40 (4.9)	●	--	43 (4.7)
Ontario Province, Can.	●	4-10	76 (3.9)	●	3-6	38 (4.7)	●	4-8	78 (4.3)	●	2-4	72 (3.5)
Quebec Province, Can.	○	8-10	61 (4.7)	●	1-4	46 (4.4)	●	4-9	55 (4.3)	●	1-4	32 (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

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Exhibit 5.16: **Intended and Taught TIMSS Geometry Topics** *(...Continued)*

MATHEMATICS Grade 4

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

Geometry	Symmetry about a line			Two-dimensional symmetrical figures			Translation, reflection, and rotation		
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
Armenia	○	--	r 22 (4.0)	●	--	r 18 (3.5)	●	--	r 7 (2.0)
Australia	●	--	87 (2.9)	●	--	86 (2.9)	○	6	68 (4.4)
Belgium (Flemish)	●	--	68 (3.5)	⦿	5	55 (4.2)	○	6	27 (3.4)
Chinese Taipei	○	5	25 (3.9)	○	5	33 (4.4)	○	6	13 (2.9)
Cyprus	⦿	7	94 (1.5)	⦿	7	65 (3.8)	⦿	7	33 (3.8)
England	●	K-4	r 95 (2.4)	●	1-4	r 91 (3.1)	⦿	2-4	r 65 (4.6)
Hong Kong, SAR	○	6	69 (4.4)	○	7-9	67 (4.2)	○	7-9	13 (2.9)
Hungary	○	6	75 (3.7)	○	6	86 (3.1)	○	7	45 (4.2)
Iran, Islamic Rep. of	●	4,5,7	78 (3.7)	●	4,5,7	56 (5.0)	○	7,11	32 (5.0)
Italy	●	4-6,9	80 (2.9)	●	4-6,9	69 (3.5)	○	5-10	55 (3.7)
Japan	○	7	1 (1.0)	○	7	1 (0.7)	○	-9	1 (0.7)
Latvia	○	--	s 39 (5.5)	○	--	s 43 (5.0)	○	--	s 20 (3.9)
Lithuania	○	8	68 (4.0)	○	8	67 (4.1)	○	--	23 (3.2)
Moldova, Rep. of	●	--	r 84 (3.0)	●	--	r 64 (4.3)	○	--	r 42 (4.7)
Morocco	●	--	x x	●	--	x x	○	--	x x
Netherlands	●	--	14 (3.3)	●	--	19 (3.2)	○	7	34 (4.3)
New Zealand	●	K-5	84 (2.4)	●	K-5	85 (2.3)	●	K-5	80 (2.3)
Norway	●	2-7	59 (4.2)	●	2-7	39 (4.2)	●	4-7	44 (4.2)
Philippines	○	--	61 (5.0)	○	--	53 (4.6)	○	--	44 (4.9)
Russian Federation	○	5	– –	○	5	– –	○	8-9	– –
Scotland	⦿	--	r 94 (2.6)	●	--	r 83 (4.0)	○	--	r 28 (4.2)
Singapore	●	4	90 (2.4)	●	4	73 (3.6)	○	8	11 (2.3)
Slovenia	●	2	22 (3.6)	●	2	34 (3.7)	○	7	12 (3.0)
Tunisia	○	10	r 34 (4.0)	○	10	r 34 (4.1)	○	10	r 6 (2.1)
United States	⦿	--	81 (2.3)	●	--	74 (2.6)	●	--	64 (2.9)
Yemen	○	7,10	– –	○	--	– –	○	7	– –
International Avg.			62 (0.7)			56 (0.8)			33 (0.8)
Benchmarking Participants									
Indiana State, US	○	5	65 (5.7)	○	5	58 (6.1)	○	6	41 (6.0)
Ontario Province, Can.	●	2-5	81 (3.9)	●	2-5	84 (3.7)	●	2-7	58 (5.0)
Quebec Province, Can.	●	3-4	59 (4.8)	●	3-4	66 (4.0)	●	3-7	34 (4.3)

● All or almost all students ⦿ Only the more able students ○ Not included in the curriculum through fourth grade

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Exhibit 5.17: **Intended and Taught TIMSS Data Topics** *(Continued...)*

MATHEMATICS Grade 4

Data	Recognizing what various numbers, symbols, and points mean in data display			Organizing a set of data by one characteristic			Reading data directly from tables, pictographs, and bar graphs			Display data using tables, pictographs, and bar graphs		
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	Percent of students taught the topic
Armenia	●	--	r 80 (3.1)	●	--	r 75 (3.6)	●	--	r 61 (4.2)	●	--	r 55 (4.0)
Australia	●	--	71 (4.7)	●	--	90 (3.8)	●	--	90 (2.8)	●	--	95 (1.5)
Belgium (Flemish)	○	6	86 (2.6)	○	6	84 (2.8)	○	6	94 (1.8)	⦿	6	84 (2.7)
Chinese Taipei	●	4	81 (3.5)	●	4	89 (2.6)	●	3	95 (1.8)	●	4	95 (1.8)
Cyprus	⦿	6	96 (1.4)	⦿	6	86 (3.0)	⦿	6	97 (1.4)	●	2-6	89 (2.4)
England	●	1-4	r 86 (3.0)	●	K-4	r 93 (2.5)	●	K-4	r 99 (1.2)	●	K-2	r 100 (0.0)
Hong Kong, SAR	○	7-9	74 (4.1)	●	4	79 (3.2)	●	4,7-9	96 (1.8)	○	7-9	95 (1.6)
Hungary	●	2	74 (3.5)	●	1	91 (2.5)	●	2-4	74 (4.0)	●	2	62 (4.5)
Iran, Islamic Rep. of	○	5,6, 8,10	79 (2.6)	●	4,6, 8,10	82 (3.7)	●	3-4,6, 8,10	57 (4.4)	●	4,6, 8	63 (4.3)
Italy	●	3	89 (2.4)	●	2-3	94 (1.6)	●	4-6,9	88 (2.5)	●	4-6,9	85 (2.6)
Japan	●	3-4	76 (3.7)	●	3-4	92 (2.1)	●	3	76 (3.4)	●	3	91 (2.3)
Latvia	○	--	s 88 (3.6)	●	--	s 98 (1.1)	●	--	s 95 (2.2)	●	--	s 95 (1.7)
Lithuania	●	2-4	82 (3.4)	●	2-4	94 (1.8)	●	3-4	93 (2.0)	●	3-4	87 (3.1)
Moldova, Rep. of	●	--	r 88 (3.0)	●	--	r 90 (2.8)	●	--	r 95 (1.8)	●	--	r 94 (2.0)
Morocco	○	--	x x	⦿	--	x x	⦿	--	x x	○	--	x x
Netherlands	●	--	73 (4.0)	●	--	75 (4.3)	●	4-5	95 (2.1)	●	--	82 (3.8)
New Zealand	●	K-5	87 (2.2)	●	K-5	91 (1.9)	●	K-7	95 (1.3)	●	K-5	95 (1.4)
Norway	○	5-7	57 (4.1)	○	5-7	73 (3.2)	○	7-10	70 (3.9)	○	7-10	65 (4.1)
Philippines	○	--	80 (3.5)	●	--	76 (4.3)	●	--	74 (4.1)	●	--	73 (3.9)
Russian Federation	○	--	– –	●	--	– –	●	--	– –	○	--	– –
Scotland	●	--	r 79 (3.9)	●	--	r 95 (1.8)	●	--	r 94 (1.7)	●	--	r 97 (1.4)
Singapore	●	1-7	92 (2.3)	●	1-6	89 (2.6)	●	1-6	96 (1.6)	●	1-4	94 (2.1)
Slovenia	●	3	77 (3.4)	●	2	95 (2.0)	●	2	90 (2.9)	●	2	90 (2.9)
Tunisia	○	10	r 85 (3.2)	○	10	r 90 (2.8)	○	10	r 51 (4.5)	○	10	x x
United States	●	--	87 (1.9)	⦿	--	92 (1.7)	●	--	98 (0.8)	●	--	96 (1.1)
Yemen	○	6	– –	●	4,6	– –	○	6	– –	○	6	– –
International Avg.			81 (0.7)			88 (0.6)			86 (0.6)			86 (0.6)
Benchmarking Participants												
Indiana State, US	●	--	79 (4.8)	●	--	91 (2.9)	●	--	99 (0.9)	●	--	94 (2.0)
Ontario Province, Can.	●	1-8	92 (2.9)	●	1	95 (2.5)	●	1-8	98 (1.5)	●	2-8	97 (1.6)
Quebec Province, Can.	●	1-6	83 (3.6)	●	1-6	86 (2.9)	●	1-6	74 (4.0)	●	1-6	71 (3.5)

● 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 5.17: **Intended and Taught TIMSS Data Topics** *(...Continued)*

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

Data	Comparing and matching different representations of the same data			Characteristics of related data sets			Drawing conclusions from data displays		
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
Armenia	●	--	r 60 (4.1)	●	--	r 68 (4.2)	●	--	r 75 (3.4)
Australia	●	--	63 (4.4)	●	--	74 (4.1)	●	--	84 (3.3)
Belgium (Flemish)	○	6	55 (3.9)	⦿	6	68 (3.3)	○	6	83 (2.6)
Chinese Taipei	○	6	82 (3.5)	●	4	91 (2.5)	○	5	86 (2.9)
Cyprus	⦿	6	65 (4.0)	●	3-10	76 (3.6)	⦿	9	91 (2.1)
England	⦿	5	r 76 (4.3)	●	4	r 81 (3.6)	●	4	r 92 (2.7)
Hong Kong, SAR	○	7-11	70 (4.0)	○	7-9	81 (3.6)	●	4-12	86 (3.1)
Hungary	●	3	61 (4.5)	●	3	77 (3.9)	●	3	79 (3.5)
Iran, Islamic Rep. of	○	10	59 (4.7)	●	4,6, 8,10	75 (3.7)	○	6,8,10	67 (4.3)
Italy	●	4-10	69 (3.1)	●	3-10	71 (3.1)	●	3-10	86 (2.3)
Japan	●	3	43 (4.3)	●	3-4	48 (4.6)	●	3-4	58 (4.0)
Latvia	●	--	s 72 (5.1)	●	--	s 79 (5.0)	●	--	s 85 (3.2)
Lithuania	○	--	81 (3.2)	●	2-4	84 (3.0)	●	3-4	88 (2.4)
Moldova, Rep. of	●	--	r 86 (3.3)	○	--	r 79 (3.9)	○	--	r 93 (2.3)
Morocco	○	--	x x	⦿	--	x x	⦿	--	x x
Netherlands	○	5	34 (4.4)	○	6	51 (4.9)	●	--	60 (4.9)
New Zealand	⦿	6-9	73 (2.7)	⦿	4-9	79 (2.7)	●	K-5	90 (1.8)
Norway	●	4-10	24 (3.5)	○	6-8	45 (4.4)	○	6-10	48 (4.0)
Philippines	○	--	66 (4.5)	○	--	72 (4.3)	●	--	63 (4.9)
Russian Federation	○	--	– –	○	--	– –	○	--	– –
Scotland	○	--	s 69 (4.8)	○	--	r 74 (4.6)	●	--	r 90 (2.5)
Singapore	○	--	84 (3.1)	○	--	90 (2.6)	●	3-6	86 (2.7)
Slovenia	●	4	73 (4.1)	●	3	81 (3.4)	○	5	82 (3.7)
Tunisia	○	10	r 48 (4.2)	○	10	79 (3.5)	○	10	r 73 (4.1)
United States	●	--	80 (2.3)	●	--	83 (2.3)	⦿	--	92 (1.6)
Yemen	○	7	– –	●	3	– –	○	6-7	– –
International Avg.			65 (0.8)			74 (0.8)			80 (0.7)
Benchmarking Participants									
Indiana State, US	●	--	68 (4.9)	●	--	87 (3.7)	●	--	94 (2.7)
Ontario Province, Can.	○	5-6	81 (4.0)	●	3-8	83 (3.5)	○	5-8	90 (3.0)
Quebec Province, Can.	○	--	50 (4.5)	●	1-6	60 (4.6)	●	1-6	57 (4.7)

● All or almost all students ⦿ Only the more able students ○ Not included in the curriculum through fourth grade

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

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

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