

Chapter 6

Teachers of Mathematics

Since the teacher is central in creating a classroom environment that supports learning mathematics, Chapter 6 presents information about the preparation and background of mathematics teachers in the participating countries. The chapter begins with information about the licensing and/or certification requirements for teaching mathematics at the eighth and fourth grades in the TIMSS countries. The National Research Coordinators were responsible for providing this information as part of completing the Curriculum Questionnaire.

The remaining sections of the chapter include information about the demographic characteristics of the teaching force and about teachers' educational background and preparation, including opportunities for professional development. To collect information from teachers, TIMSS administered a two-part questionnaire in which teachers were asked to provide information about their background and training and their instructional practices. Chapter 6 essentially presents teachers' responses to the first part of the questionnaire, while Chapter 7 presents information from the second part about classroom instruction.

Because the sampling for the teacher questionnaires was based on participating students, teachers' responses do not necessarily represent all eighth-grade or all fourth-grade mathematics teachers in each country. Rather, they represent teachers of the representative

samples of students assessed. It is important to note that when information from the teacher questionnaire is being reported, the student is always the unit of analysis. That is, the data shown are the percentages of students whose teachers reported on various characteristics or instructional strategies. Using the student as the unit of analysis makes it possible to describe the instruction received by representative samples of students and the characteristics of the teachers delivering that instruction. Although this perspective may differ from that obtained by simply collecting information from teachers, it is consistent with the TIMSS goals of providing information about the educational contexts and performance of students.

The teachers who completed the questionnaires were the mathematics teachers of the students who took the TIMSS 2003 test. At the eighth grade, the general sampling procedure was to sample a mathematics class from each participating school, administer the test to those students, and ask their teacher to complete the questionnaire. At the fourth grade, students often only have one teacher for all subjects, so this teacher is their mathematics teacher and the one who completed the questionnaire. In either case, the information about teachers' characteristics and instruction is tied directly to the students tested. Sometimes, however, teachers did not complete the questionnaire assigned to them, so most countries had some percentage of students for whom no teacher questionnaire information is available. The exhibits in this chapter have special notations on this point. For a country where teacher responses are available for at least 70 but less than 85 percent of the students, an "r" is included next to its data. Where teacher responses are available for at least 50 but less than 70 percent of the students, an "s" is included. Where teacher responses are available for less than 50 percent, an "x" replaces the data.

What Are the Requirements for Being a Mathematics Teacher?

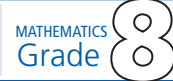
Exhibit 6.1 presents the country-level responses about the requirements for being certified or licensed to teach mathematics at the eighth and

fourth grades. Countries were asked about five requirements, including supervised practical experience (practicum), passing an examination, obtaining a university degree, completion of a probationary period, and completion of an induction program. At the eighth grade, 70 percent of the TIMSS countries (33 out of 47) and three benchmarking entities required a university degree (or equivalent) and just as many participants required fulfillment of some type of practicum for certification as a mathematics teacher. In more than half of the countries (28 out of 47) and all of the benchmarking participants, certification required passing an examination. A probationary period was required in 23 countries and two benchmarking entities. Of the TIMSS countries, 11 required completion of an induction program as did two of the benchmarking entities. For the United States and Canada, it should be noted that requirements for certification vary across states and provinces.

At the fourth grade, most of the TIMSS countries (19 out of 26) and all three of the benchmarking participants required some type of practicum for certification. Eighteen of the countries participating at the fourth grade and all three of the benchmarking participants required two or more of the following for certification – passing an examination, a university degree, or completion of a probationary period. Similar to the eighth grade, the fewest number of fourth grade participants required completion of an induction program.

Exhibit 6.2 contains participants' reports about the organization or authority responsible for granting certification for mathematics teachers. Across participants at the eighth grade, universities or colleges were most likely to be responsible for granting certification (55% of the countries and Quebec province). The next most prevalent procedure was for the ministry of education to grant certification. A handful of participants reported using licensing boards and three (New Zealand, Scotland, and Syria) reported granting certification through a teacher organization. The responses at the fourth grade were similar, with ministries of education and universities/colleges being the organizations most often responsible for granting certification.

Exhibit 6.1: Current Requirements for Being a Mathematics Teacher



Countries	Pre-practicum and Supervised Practicum	Passing an Examination	University Degree or Equivalent	Completion of a Probationary Teaching Period	Completion of an Induction Program
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.	●	●	●	●	●

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

Background data provided by National Research Coordinators.

● Country reported Yes for the particular option

○ Country reported No for the particular option

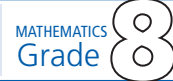
Exhibit 6.1: Current Requirements for Being a Mathematics Teacher

Countries	Pre-practicum and Supervised Practicum	Passing an Examination	University Degree or Equivalent	Completion of a Probationary Teaching Period	Completion of an Induction Program
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

Background data provided by National Research Coordinators.

Exhibit 6.2: Licensing/Certification Authority for Mathematics Teachers



Countries	Minister/ Ministry of Education	National/State Licensing Board	Universities/ Colleges	Teacher Organization
Armenia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Australia	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bahrain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Belgium (Flemish)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Botswana	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Bulgaria	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Chile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chinese Taipei	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Cyprus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Egypt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
England	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Estonia	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Ghana	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Hong Kong, SAR	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hungary	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Indonesia	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Iran, Islamic Rep. of	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Israel	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Italy	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Japan	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jordan	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Korea, Rep. of	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Latvia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lebanon	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Lithuania	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Macedonia, Rep. of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Malaysia	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Moldova, Rep. of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Morocco	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Netherlands	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
New Zealand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Norway	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Palestinian Nat'l Auth.	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Philippines	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Romania	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Russian Federation	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Saudi Arabia	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Scotland	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Serbia	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Singapore	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Slovak Republic	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Slovenia	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
South Africa	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Sweden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Syrian Arab Republic	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
Tunisia	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
United States	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Benchmarking Participants				
Basque Country, Spain	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Indiana State, US	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ontario Province, Can.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quebec Province, Can.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

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

Background data provided by National Research Coordinators.



Exhibit 6.2: Licensing/Certification Authority for Mathematics Teachers

Countries	Minister/ Ministry of Education	National/State Licensing Board	Universities/ Colleges	Teacher Organization
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

Background data provided by National Research Coordinators.

What Are the Background Characteristics of Mathematics Teachers?

Exhibit 6.3 presents a considerable amount of information about the background characteristics of mathematics teachers at the eighth and fourth grades, including their gender, age, certification status, and number of years of teaching experience. Typically, larger percentages of students were taught mathematics by female teachers than male teachers, particularly at the fourth grade. At the eighth grade, on average, internationally, 58 percent of the students were taught mathematics by females and 42 percent by males, and similar percentages were found in a number of countries. However, at least 85 percent of students had female teachers in Armenia, Bulgaria, Estonia, Hungary, Latvia, Lithuania, Moldova, the Russian Federation, and Slovenia. By contrast, only in Egypt and Ghana were as many as 85 percent of the students taught mathematics by male teachers. At the fourth grade, on average, internationally, four-fifths of the mathematics teaching force was female. Across the participants, in each country, with the exception of Morocco and Tunisia at least 50 percent, and often a much higher percentage, of the fourth-grade students were taught by female teachers.

Looking to the last column of Exhibit 6.3, it can be seen that, in general, the mathematics teaching force around the world is quite experienced. At both the eighth and fourth grades, mathematics teachers reported 16 years of teaching experience, on average, internationally.

Given their years of teaching experience, it follows that the majority of the eighth-grade and the fourth-grade students were taught mathematics by teachers in their 30s and 40s. If there was a steady replenishing of the teaching force, one might expect approximately equivalent percentages of students taught by teachers in their 20s, 30s, 40s, and 50s. Very few countries, however, had a comparatively younger teaching force at either the eighth or fourth grades. At the eighth grade, on average, internationally, only 17 percent of students were taught by teachers younger than age 30. The five countries with

the most students (more than 40 percent) taught by younger teachers were Botswana, Ghana, the Palestinian National Authority, Saudi Arabia, and Singapore. The pattern was very similar at the fourth grade. On average, internationally, 19 percent of the students were taught by teachers younger than 30 years old, and with the exception of Singapore (41%), this percentage was usually well under 40 percent.

At the other end of the age distribution, 23 percent of the eighth-grade students and 21 percent of the fourth-grade students internationally were taught by teachers age 50 or older. At the eighth grade, interestingly, the teaching force was relatively older in several countries. More than half of the students in Italy, Moldova, and Serbia had teachers at least 50 years of age.

Finally, from Exhibit 6.3, it can be seen that teachers at both the eighth and fourth grades, reported having full certification rather than provisional or emergency credentials. Given the potential problem of teacher shortages for a variety of reasons, it is interesting to note that, on average, internationally, 88 percent of the eighth-grade students and 85 percent of the fourth-grade students were taught mathematics by certified teachers. Of course, the situation varied dramatically across the TIMSS countries. For example, in South Africa only 45 percent of the eighth-grade students and in Tunisia only 21 percent of the fourth-grade students were taught mathematics by a fully certified teacher.

Exhibit 6.3: Mathematics Teachers' Gender, Age, Certification, and Number of Years of Teaching



Countries	Percentage of Students by Teacher Characteristics							Number of Years of Teaching
	Gender		Age				Have Full Certificate*	
	Female	Male	29 Years or Under	30-39 Years	40-49 Years	50 Years or Older		
Armenia	87 (2.4)	13 (2.4)	3 (0.9)	35 (3.6)	37 (3.5)	25 (3.0)	94 (1.9)	r 19 (0.7)
Australia	49 (4.7)	51 (4.7)	13 (2.6)	26 (4.4)	37 (5.1)	24 (3.7)	89 (2.9)	16 (0.8)
Bahrain	50 (0.5)	50 (0.5)	36 (3.3)	44 (4.0)	17 (3.3)	3 (1.4)	84 (3.1)	11 (0.7)
Belgium (Flemish)	75 (2.6)	25 (2.6)	24 (3.1)	22 (2.9)	36 (3.6)	18 (2.9)	--	18 (0.8)
Botswana	27 (4.0)	73 (4.0)	49 (4.4)	45 (4.3)	4 (1.8)	2 (1.2)	96 (1.7)	r 6 (0.5)
Bulgaria	88 (3.0)	12 (3.0)	5 (1.9)	15 (2.9)	46 (3.9)	34 (3.6)	100 (0.0)	21 (0.7)
Chile	54 (3.7)	46 (3.7)	7 (1.7)	15 (2.9)	38 (3.5)	39 (3.1)	87 (2.3)	22 (0.7)
Chinese Taipei	46 (4.1)	54 (4.1)	19 (2.9)	42 (4.2)	21 (3.4)	18 (3.3)	96 (1.4)	14 (0.9)
Cyprus	63 (3.0)	37 (3.0)	5 (1.2)	37 (3.3)	31 (2.8)	27 (2.7)	--	12 (0.6)
Egypt	14 (2.9)	86 (2.9)	11 (2.3)	56 (4.0)	31 (4.0)	1 (0.4)	99 (0.3)	14 (0.4)
Estonia	89 (2.5)	11 (2.5)	12 (2.6)	16 (3.4)	32 (3.6)	40 (4.3)	91 (2.2)	22 (1.2)
Ghana	11 (3.3)	89 (3.3)	48 (3.9)	31 (4.3)	17 (3.5)	5 (1.9)	r 71 (4.4)	8 (0.6)
Hong Kong, SAR	53 (4.3)	47 (4.3)	29 (3.7)	41 (4.4)	19 (3.1)	10 (2.3)	77 (3.3)	12 (0.7)
Hungary	85 (2.6)	15 (2.6)	5 (1.4)	21 (3.1)	39 (3.6)	35 (3.8)	--	22 (0.8)
Indonesia	53 (4.0)	47 (4.0)	12 (3.0)	49 (3.8)	32 (3.6)	7 (1.9)	100 (0.0)	14 (0.6)
Iran, Islamic Rep. of	39 (4.2)	61 (4.2)	23 (2.8)	41 (3.8)	29 (3.8)	6 (1.8)	69 (3.5)	14 (0.5)
Israel	79 (2.6)	21 (2.6)	14 (2.4)	35 (3.3)	35 (2.8)	16 (2.6)	96 (1.3)	16 (0.6)
Italy	80 (3.0)	20 (3.0)	3 (1.0)	7 (2.1)	31 (3.1)	59 (3.1)	95 (1.6)	23 (0.6)
Japan	32 (3.8)	68 (3.8)	13 (2.6)	35 (3.9)	35 (4.0)	16 (3.1)	99 (0.7)	17 (0.7)
Jordan	49 (2.0)	51 (2.0)	31 (4.0)	47 (4.8)	19 (3.6)	3 (1.5)	76 (3.9)	11 (0.6)
Korea, Rep. of	r 67 (3.6)	33 (3.6)	s 17 (2.7)	39 (3.3)	36 (3.6)	7 (1.9)	s 98 (0.8)	s 13 (0.5)
Latvia	92 (2.5)	8 (2.5)	5 (2.0)	23 (3.8)	39 (4.1)	33 (4.0)	--	22 (0.9)
Lebanon	46 (4.6)	54 (4.6)	22 (3.1)	31 (4.1)	29 (4.0)	18 (3.1)	r 51 (4.6)	15 (0.8)
Lithuania	91 (2.5)	9 (2.5)	7 (2.0)	26 (3.5)	40 (4.0)	26 (3.4)	100 (0.0)	20 (0.8)
Macedonia, Rep. of	68 (3.8)	32 (3.8)	2 (0.6)	25 (3.6)	36 (3.9)	38 (3.4)	x x	21 (0.9)
Malaysia	72 (3.9)	28 (3.9)	26 (3.4)	44 (4.2)	28 (3.5)	2 (1.3)	80 (3.5)	11 (0.6)
Moldova, Rep. of	r 87 (3.0)	13 (3.0)	r 11 (2.5)	13 (2.9)	24 (4.5)	52 (4.8)	r 91 (2.4)	r 26 (0.9)
Morocco	s 15 (4.6)	85 (4.6)	s 8 (3.9)	21 (5.0)	60 (6.8)	11 (3.8)	s 100 (0.0)	x x
Netherlands	32 (4.7)	68 (4.7)	17 (3.3)	14 (3.1)	45 (4.6)	25 (3.8)	--	17 (1.0)
New Zealand	45 (4.7)	55 (4.7)	12 (3.9)	28 (4.6)	34 (4.9)	26 (3.0)	79 (4.8)	14 (1.0)
Norway	36 (3.8)	64 (3.8)	13 (2.6)	22 (3.3)	21 (3.3)	43 (4.2)	96 (1.9)	18 (1.0)
Palestinian Nat'l Auth.	49 (3.1)	51 (3.1)	41 (4.3)	29 (4.1)	27 (3.6)	3 (1.5)	70 (3.8)	10 (0.7)
Philippines	73 (3.9)	27 (3.9)	18 (3.6)	44 (4.7)	24 (3.5)	14 (2.9)	93 (2.3)	11 (0.7)
Romania	51 (4.2)	49 (4.2)	13 (3.0)	17 (3.4)	22 (3.3)	48 (4.1)	96 (1.8)	24 (1.0)
Russian Federation	95 (1.6)	5 (1.6)	9 (1.8)	19 (2.3)	33 (4.3)	40 (3.7)	97 (1.4)	24 (0.9)
Saudi Arabia	42 (3.1)	58 (3.1)	43 (5.8)	38 (5.9)	14 (3.1)	5 (2.0)	96 (1.3)	10 (0.8)
Scotland	50 (4.7)	50 (4.7)	15 (3.8)	22 (4.0)	34 (4.1)	29 (3.9)	--	r 16 (1.0)
Serbia	58 (3.9)	42 (3.9)	7 (2.2)	17 (3.3)	21 (3.5)	55 (4.0)	89 (2.6)	22 (0.9)
Singapore	67 (2.3)	33 (2.3)	43 (2.5)	22 (2.2)	15 (1.8)	20 (2.1)	97 (0.7)	12 (0.7)
Slovak Republic	79 (3.6)	21 (3.6)	11 (2.6)	22 (3.9)	28 (3.9)	39 (4.3)	91 (2.1)	21 (1.1)
Slovenia	87 (3.1)	13 (3.1)	8 (2.4)	24 (3.4)	48 (4.4)	20 (3.6)	91 (2.4)	20 (0.8)
South Africa	40 (3.3)	60 (3.3)	19 (2.7)	55 (3.4)	21 (3.1)	5 (1.6)	r 45 (3.2)	11 (0.6)
Sweden	44 (3.6)	56 (3.6)	13 (2.7)	28 (3.1)	22 (2.8)	37 (3.2)	86 (2.5)	14 (0.8)
Tunisia	32 (4.0)	68 (4.0)	23 (3.2)	42 (3.8)	23 (3.1)	12 (2.5)	91 (2.5)	s 12 (0.9)
United States	65 (2.7)	35 (2.7)	13 (2.0)	26 (2.8)	29 (2.9)	32 (2.9)	93 (1.8)	15 (0.7)
‡ England	r 54 (6.2)	46 (6.2)	r 24 (5.0)	19 (5.0)	36 (6.5)	20 (4.9)	--	r 15 (1.5)
International Avg.	58 (0.5)	42 (0.5)	17 (0.4)	30 (0.6)	30 (0.6)	23 (0.5)	88 (0.4)	16 (0.1)
Benchmarking Participants								
Basque Country, Spain	74 (5.0)	26 (5.0)	5 (2.4)	20 (4.0)	38 (4.9)	36 (4.3)	--	21 (0.9)
Indiana State, US	60 (5.9)	40 (5.9)	22 (5.2)	29 (5.1)	12 (3.6)	38 (6.3)	99 (0.0)	--
Ontario Province, Can.	46 (5.0)	54 (5.0)	24 (4.4)	42 (4.9)	16 (3.0)	18 (3.3)	96 (1.7)	11 (0.9)
Quebec Province, Can.	47 (5.1)	53 (5.1)	21 (4.1)	36 (4.7)	15 (3.5)	28 (3.9)	92 (3.0)	15 (1.0)

Background data provided by teachers.

*Does not include provisional or emergency certificate.

‡ 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 6.3: Mathematics Teachers' Gender, Age, Certification, and Number of Years of Teaching

MATHEMATICS
Grade 4

Countries	Percentage of Students by Teacher Characteristics							Number of Years of Teaching
	Gender		Age				Have Full Certificate*	
	Female	Male	29 Years or Under	30-39 Years	40-49 Years	50 Years or Older		
Armenia	88 (2.6)	12 (2.6)	8 (1.9)	25 (3.2)	38 (3.8)	30 (4.0)	r 92 (2.2)	20 (0.9)
Australia	75 (4.2)	25 (4.2)	21 (3.5)	14 (2.4)	46 (4.4)	19 (3.0)	r 91 (2.4)	17 (0.9)
Belgium (Flemish)	78 (2.7)	22 (2.7)	23 (2.9)	37 (3.1)	27 (2.9)	14 (2.1)	100 (0.0)	16 (0.7)
Chinese Taipei	80 (2.9)	20 (2.9)	26 (3.4)	44 (4.0)	23 (3.0)	7 (2.2)	88 (2.6)	11 (0.7)
Cyprus	79 (3.3)	21 (3.3)	39 (4.3)	50 (4.3)	5 (1.7)	7 (2.2)	--	11 (0.7)
England	r 73 (4.2)	27 (4.2)	r 30 (4.7)	24 (4.4)	25 (3.8)	21 (3.5)	--	r 12 (1.0)
Hong Kong, SAR	73 (4.3)	27 (4.3)	34 (4.5)	34 (4.3)	15 (2.8)	17 (3.9)	89 (2.6)	13 (1.1)
Hungary	94 (1.8)	6 (1.8)	8 (2.1)	33 (3.7)	40 (3.7)	19 (3.2)	--	19 (0.8)
Iran, Islamic Rep. of	51 (4.8)	49 (4.8)	14 (3.4)	39 (4.2)	39 (4.4)	8 (2.6)	33 (4.2)	16 (0.7)
Italy	96 (1.2)	4 (1.2)	3 (1.4)	18 (2.4)	39 (3.6)	39 (3.3)	97 (1.3)	21 (0.6)
Japan	63 (3.8)	37 (3.8)	11 (2.8)	27 (3.3)	39 (4.1)	23 (3.6)	99 (1.0)	19 (0.8)
Latvia	99 (0.6)	1 (0.6)	6 (1.8)	38 (3.9)	31 (4.0)	25 (3.5)	--	20 (0.9)
Lithuania	99 (0.6)	1 (0.6)	12 (2.2)	37 (3.1)	32 (3.1)	19 (2.6)	100 (0.0)	19 (0.7)
Moldova, Rep. of	98 (1.2)	2 (1.2)	15 (2.8)	30 (4.0)	35 (4.2)	20 (3.5)	64 (4.6)	21 (0.9)
Morocco	r 36 (4.5)	64 (4.5)	r 24 (3.7)	20 (4.1)	47 (4.6)	9 (2.4)	s 96 (1.8)	s 15 (0.7)
Netherlands	64 (4.6)	36 (4.6)	30 (4.4)	18 (3.7)	24 (4.3)	28 (3.9)	--	16 (1.1)
New Zealand	81 (2.5)	19 (2.5)	24 (2.8)	26 (3.2)	31 (2.9)	19 (2.3)	85 (2.5)	12 (0.6)
Norway	81 (2.4)	19 (2.4)	13 (2.7)	24 (3.3)	31 (4.1)	31 (3.4)	97 (1.3)	16 (0.9)
Philippines	87 (2.9)	13 (2.9)	14 (3.1)	39 (5.1)	24 (4.2)	22 (4.0)	89 (2.9)	13 (0.9)
Russian Federation	99 (0.8)	1 (0.8)	11 (2.6)	36 (3.4)	28 (3.5)	25 (3.7)	98 (0.9)	21 (0.7)
Scotland	r 93 (2.2)	7 (2.2)	r 22 (3.8)	27 (3.6)	22 (3.9)	29 (4.3)	--	r 16 (0.9)
Singapore	82 (3.1)	18 (3.1)	41 (3.8)	38 (3.6)	7 (2.2)	15 (2.6)	97 (1.4)	10 (0.9)
Slovenia	97 (1.6)	3 (1.6)	11 (3.0)	32 (4.3)	36 (4.6)	21 (3.7)	r 89 (3.1)	19 (0.8)
Tunisia	46 (4.3)	54 (4.3)	11 (2.5)	46 (4.6)	24 (3.6)	19 (3.3)	r 21 (3.5)	r 18 (0.8)
United States	85 (2.0)	15 (2.0)	20 (1.8)	28 (2.1)	21 (2.2)	31 (2.7)	91 (1.6)	14 (0.6)
International Avg.	80 (0.6)	20 (0.6)	19 (0.6)	31 (0.7)	29 (0.7)	21 (0.7)	85 (0.6)	16 (0.2)
Benchmarking Participants								
Indiana State, US	88 (3.6)	12 (3.6)	16 (3.8)	22 (4.9)	22 (5.2)	40 (5.3)	100 (0.0)	--
Ontario Province, Can.	76 (3.8)	24 (3.8)	22 (4.1)	23 (3.9)	27 (4.6)	28 (4.5)	92 (3.0)	13 (0.9)
Quebec Province, Can.	93 (2.0)	7 (2.0)	14 (3.3)	31 (4.1)	19 (3.6)	36 (4.4)	84 (3.6)	18 (0.9)

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

Background data provided by teachers.

*Does not include provisional or emergency certificate.

() 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.

What Preparation Do Teachers Have for Teaching Mathematics?

Exhibits 6.4 through 6.8 present teachers' reports about their preparation to teach mathematics, including educational experiences before actually teaching and opportunities for developing their expertise after entering the profession (often referred to as pre-service and in-service training).

Exhibit 6.4 presents teacher's highest level of education. Even though the percentages were somewhat higher at the eighth grade than the fourth grade, approximately two-thirds of the eighth- and fourth-grade students were taught mathematics by teachers having at least a university degree or equivalent. At the eighth grade, 59 percent of the students were taught by teachers with a university degree and another 17 percent by teachers who had coursework beyond the initial university degree. At the fourth grade, 52 percent of the students were taught by teachers with a university degree and another 13 percent by teachers with coursework beyond that degree.

Despite a relatively well-educated teaching force, on average, the situation varied dramatically among countries. At the eighth grade, for example, at least half the students were taught by teachers with work beyond the initial university degree in Armenia, Australia, Bulgaria, the Russian Federation, Tunisia, and the United States. In contrast, 72 percent of the eighth-grade students in Morocco were taught by teachers only having completed secondary school.

According to the results of the Curriculum Questionnaire, almost all of the students participating in TIMSS 2003 were supposed to be learning mathematics according to a national (for most countries) or regional curriculum. To gather some information about coherence between the intended curriculum and teacher preparation, the Curriculum Questionnaire also asked about specific teacher training in how to teach this curriculum – as part of either teachers' pre-service or in-service education. Exhibit 6.5 has the results. The majority of countries and benchmarking participants reported preparation in how to teach

the intended curriculum as part of both pre- and in-service training, and most reported coverage in at least one of these places. Countries reporting no specific training in how to teach the intended curriculum included Chile, Korea, Moldova, Morocco, Norway, and Sweden.

Teachers' reports about their major area or areas of study during their postsecondary education can be found also, in Exhibit 6.5. At the eighth grade, on average, internationally, the majority studied mathematics education (54%) or mathematics (70%) or both (since teachers often reported that their study was focused in more than one area). For example, it was not uncommon for teachers in some countries to report pedagogy as a major area of study and mathematics as another major area. As might be considered, the situation was different at the fourth grade. Here teachers typically studied primary or elementary education (approximately 80 percent, on average). On average, for the primary education majors, about one-fourth (26%) reported specializing in mathematics, 4 percent in science, and half (50%) not having any particular specialization. Countries with more than half the fourth-grade students being taught by mathematics specialists were Latvia, Moldova, and the Russian Federation.

In today's fast-paced world of frequent important discoveries and new technologies in the fields of pedagogy and mathematics, it is very important for teachers to continually update their knowledge. To provide context for considering this important part of teacher training in the TIMSS countries, Exhibits 6.6 through 6.8 contain information about teachers' opportunities for and participation in professional development activities.

Exhibit 6.6 presents schools' reports about the opportunities provided to teachers in five major areas: supporting implementation of the official curriculum, supporting school-level goals, improving content knowledge, improving teaching skills, and using technology. Within each area, schools reported the frequency of teachers' involvement. At both grades, schools reported that their professional development programs emphasized improving content knowledge and teaching skills.

Exhibit 6.4: Highest Educational Level of Mathematics Teachers*



Countries	Percentage of Students by Their Teachers' Educational Level				
	Beyond Initial University Degree**	Finished University or Equivalent	Finished Post Secondary Education but Not University	Finished Upper Secondary Schooling	Did Not Complete Upper Secondary Schooling
Armenia	83 (3.0)	17 (3.0)	0 (0.0)	1 (0.5)	0 (0.0)
Australia	50 (4.0)	43 (4.1)	7 (2.2)	0 (0.0)	0 (0.0)
Bahrain	6 (2.0)	84 (3.5)	9 (2.8)	0 (0.0)	0 (0.0)
Belgium (Flemish)	0 (0.0)	0 (0.0)	100 (0.0)	0 (0.0)	0 (0.0)
Botswana	0 (0.0)	8 (2.4)	89 (2.3)	3 (1.4)	0 (0.0)
Bulgaria	57 (4.4)	33 (4.3)	10 (2.3)	0 (0.0)	0 (0.0)
Chile	2 (1.0)	93 (1.5)	5 (1.3)	1 (0.6)	0 (0.0)
Chinese Taipei	18 (3.1)	81 (3.1)	1 (1.0)	0 (0.0)	0 (0.0)
Cyprus	11 (1.8)	89 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)
Egypt	1 (0.6)	99 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)
Estonia	19 (3.4)	68 (4.0)	8 (2.4)	4 (1.6)	0 (0.0)
Ghana	0 (0.0)	8 (2.5)	82 (3.6)	10 (3.0)	0 (0.0)
Hong Kong, SAR	17 (3.3)	68 (4.5)	15 (3.2)	0 (0.0)	0 (0.0)
Hungary	20 (2.8)	80 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)
Indonesia	0 (0.0)	54 (4.4)	43 (4.4)	3 (1.4)	0 (0.0)
Iran, Islamic Rep. of	1 (0.8)	38 (3.4)	59 (3.4)	1 (0.9)	0 (0.0)
Israel	25 (2.7)	72 (2.9)	2 (0.9)	0 (0.4)	0 (0.0)
Italy	7 (1.9)	93 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)
Japan	5 (1.9)	95 (2.0)	1 (0.6)	0 (0.0)	0 (0.0)
Jordan	7 (2.3)	72 (3.5)	21 (3.0)	0 (0.0)	0 (0.0)
Korea, Rep. of	25 (3.2)	75 (3.2)	0 (0.0)	0 (0.0)	0 (0.0)
Latvia	0 (0.0)	95 (1.7)	1 (0.0)	4 (1.6)	0 (0.0)
Lebanon	--	--	--	--	--
Lithuania	39 (4.0)	57 (4.2)	4 (1.6)	0 (0.0)	0 (0.0)
Macedonia, Rep. of	0 (0.0)	8 (2.3)	92 (2.3)	0 (0.0)	0 (0.0)
Malaysia	0 (0.0)	53 (4.3)	18 (3.4)	28 (3.6)	0 (0.0)
Moldova, Rep. of	2 (1.2)	94 (2.1)	0 (0.0)	4 (1.4)	1 (0.1)
Morocco	2 (2.3)	5 (3.7)	7 (3.0)	72 (6.7)	13 (4.6)
Netherlands	9 (2.4)	--	85 (3.4)	6 (2.3)	0 (0.0)
New Zealand	32 (4.7)	51 (5.2)	18 (3.2)	0 (0.0)	0 (0.0)
Norway	11 (2.5)	64 (4.0)	23 (3.2)	1 (0.7)	2 (1.0)
Palestinian Nat'l Auth.	7 (2.5)	78 (3.8)	15 (3.0)	0 (0.0)	0 (0.0)
Philippines	8 (2.3)	92 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)
Romania	3 (1.4)	73 (3.6)	24 (3.3)	0 (0.0)	0 (0.0)
Russian Federation	75 (3.8)	23 (3.7)	2 (0.8)	0 (0.4)	0 (0.0)
Saudi Arabia	6 (2.5)	84 (3.1)	9 (2.2)	0 (0.0)	0 (0.0)
Scotland	11 (2.8)	89 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)
Serbia	1 (0.0)	27 (3.8)	72 (3.9)	1 (0.9)	0 (0.0)
Singapore	5 (1.1)	80 (2.1)	10 (1.5)	4 (1.2)	0 (0.3)
Slovak Republic	17 (2.8)	82 (2.9)	0 (0.0)	1 (0.0)	0 (0.0)
Slovenia	20 (3.7)	76 (3.8)	1 (0.8)	2 (1.1)	0 (0.0)
South Africa	10 (2.7)	24 (3.0)	61 (3.4)	5 (1.6)	0 (0.0)
Sweden	29 (3.3)	62 (3.7)	4 (1.4)	4 (1.6)	0 (0.0)
Tunisia	61 (3.6)	32 (3.7)	2 (1.2)	5 (1.8)	0 (0.0)
United States	61 (2.7)	39 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)
‡ England	17 (4.2)	83 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)
International Avg.	17 (0.4)	59 (0.5)	20 (0.3)	4 (0.2)	0 (0.1)
Benchmarking Participants					
Basque Country, Spain	35 (5.2)	65 (5.2)	0 (0.0)	0 (0.0)	0 (0.0)
Indiana State, US	--	--	--	--	--
Ontario Province, Can.	17 (4.2)	81 (4.2)	2 (1.3)	0 (0.0)	0 (0.0)
Quebec Province, Can.	9 (2.6)	91 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)

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

Background data provided by teachers.

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

**For example, doctorate, master's, postgraduate diploma, and honors bachelor's degree.

‡ 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 6.4: Highest Educational Level of Mathematics Teachers*

 MATHEMATICS
 Grade 4

Countries	Percentage of Students by Their Teachers' Educational Level				
	Beyond Initial University Degree**	Finished University or Equivalent	Finished Post Secondary Education but Not University	Finished Upper Secondary Schooling	Did Not Complete Upper Secondary Schooling
Armenia	79 (2.9)	12 (2.4)	6 (1.9)	2 (1.1)	0 (0.0)
Australia	27 (4.1)	49 (4.4)	24 (3.4)	0 (0.0)	0 (0.0)
Belgium (Flemish)	0 (0.0)	0 (0.0)	100 (0.0)	0 (0.0)	0 (0.0)
Chinese Taipei	5 (1.8)	77 (3.8)	12 (2.8)	6 (2.2)	0 (0.0)
Cyprus	19 (3.1)	81 (3.1)	1 (0.4)	0 (0.0)	0 (0.0)
England	4 (1.9)	96 (1.9)	0 (0.0)	0 (0.0)	0 (0.0)
Hong Kong, SAR	4 (1.8)	51 (4.9)	44 (5.0)	0 (0.0)	1 (0.0)
Hungary	3 (1.3)	97 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)
Iran, Islamic Rep. of	2 (1.9)	21 (4.2)	34 (4.7)	34 (3.9)	8 (2.2)
Italy	1 (0.5)	13 (2.2)	3 (1.0)	84 (2.3)	0 (0.0)
Japan	3 (1.4)	83 (3.1)	14 (2.9)	0 (0.0)	0 (0.0)
Latvia	0 (0.0)	84 (3.2)	3 (1.4)	13 (3.0)	0 (0.0)
Lithuania	16 (2.4)	75 (3.2)	8 (2.1)	0 (0.0)	1 (0.5)
Moldova, Rep. of	0 (0.0)	65 (4.2)	21 (4.0)	12 (2.9)	2 (1.0)
Morocco	1 (0.8)	23 (4.6)	4 (2.9)	54 (5.7)	18 (3.5)
Netherlands	1 (0.5)	--	98 (1.0)	1 (0.9)	0 (0.0)
New Zealand	10 (2.0)	54 (3.2)	36 (3.3)	0 (0.0)	0 (0.0)
Norway	1 (0.6)	57 (3.9)	38 (3.9)	2 (1.1)	2 (0.8)
Philippines	7 (2.3)	93 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)
Russian Federation	44 (3.8)	26 (3.4)	29 (3.5)	0 (0.0)	0 (0.0)
Scotland	12 (3.1)	88 (3.1)	0 (0.0)	0 (0.0)	0 (0.0)
Singapore	3 (1.7)	40 (4.0)	41 (3.9)	16 (3.1)	0 (0.0)
Slovenia	34 (4.4)	56 (4.8)	3 (1.4)	7 (2.3)	0 (0.0)
Tunisia	2 (1.2)	7 (2.4)	43 (4.2)	48 (4.0)	1 (0.9)
United States	52 (2.6)	47 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)
International Avg.	13 (0.4)	52 (0.7)	22 (0.5)	11 (0.4)	1 (0.2)
Benchmarking Participants					
Indiana State, US	--	--	--	--	--
Ontario Province, Can.	9 (2.8)	84 (3.6)	7 (2.3)	0 (0.0)	0 (0.0)
Quebec Province, Can.	9 (2.6)	88 (2.9)	4 (1.1)	0 (0.0)	0 (0.0)

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

Background data provided by teachers.

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

**For example, doctorate, master's, postgraduate diploma, and honors bachelor's degree.

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

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 6.5: Preparation to Teach Mathematics



Countries	Teachers Receive Specific Preparation in How to Teach the Intended Mathematics Curriculum		Teachers' Major Area of Study in Their Postsecondary Education ¹											
			Education-Mathematics	Mathematics	Education-Science	Science	Education-General	Other						
	As Part of Pre-Service Education	As Part of In-Service Education	Percent of Students	Percent of Students	Percent of Students	Percent of Students	Percent of Students	Percent of Students						
Armenia	●	●	42 (4.1)	82 (2.6)	--	24 (3.1)	r	13 (3.0)	r	25 (4.2)				
Australia	●	●	58 (4.3)	61 (3.7)	25 (3.5)	37 (4.5)		38 (4.4)		42 (4.1)				
Bahrain	●	●	88 (2.6)	49 (3.3)	10 (2.5)	14 (2.5)		14 (2.3)		7 (1.9)				
Belgium (Flemish)	●	●	--	96 (1.1)	--	--		11 (2.2)		24 (3.0)				
Botswana	●	●	51 (5.1)	77 (4.0)	7 (2.3)	25 (4.0)		28 (4.4)		28 (4.4)				
Bulgaria	●	●	82 (3.8)	97 (1.6)	42 (4.0)	43 (3.8)		66 (3.9)		39 (4.4)				
Chile	○	○	29 (2.7)	51 (3.5)	4 (1.5)	8 (2.1)		64 (3.2)	r	23 (3.5)				
Chinese Taipei	●	●	63 (4.3)	80 (3.3)	26 (3.4)	25 (3.8)		58 (3.8)		24 (3.6)				
Cyprus	○	●	23 (2.1)	98 (1.0)	0 (0.0)	8 (1.5)		5 (1.5)		10 (1.7)				
Egypt	●	●	80 (3.5)	85 (3.1)	1 (1.0)	11 (2.2)		16 (2.4)		7 (1.9)				
Estonia	●	●	67 (3.8)	78 (3.6)	12 (2.6)	13 (2.9)		37 (3.9)		22 (3.4)				
Ghana	●	●	r	53 (5.0)	r	58 (5.0)	r	31 (4.7)	r	34 (4.7)	r	67 (4.6)	r	46 (4.7)
Hong Kong, SAR	●	●	57 (4.4)	63 (3.7)	25 (3.8)	36 (4.4)		53 (4.3)		54 (4.4)				
Hungary	●	●	92 (2.3)	40 (4.5)	47 (4.1)	27 (3.7)		6 (1.9)		35 (3.6)				
Indonesia	●	●	80 (3.6)	59 (4.2)	14 (3.1)	19 (3.1)		27 (4.1)		19 (3.5)				
Iran, Islamic Rep. of	●	●	33 (3.9)	78 (3.6)	1 (0.5)	5 (1.8)		7 (2.0)		16 (3.1)				
Israel	●	●	66 (3.1)	74 (3.4)	9 (1.7)	21 (2.9)		33 (3.6)		33 (3.6)				
Italy	○	●	--	21 (3.5)	--	70 (3.8)		0 (0.0)		11 (2.3)				
Japan	●	●	58 (4.6)	81 (3.2)	3 (1.6)	12 (2.8)		33 (4.1)		27 (3.9)				
Jordan	○	●	28 (4.2)	72 (4.2)	0 (0.3)	5 (1.8)		1 (0.0)		7 (2.2)				
Korea, Rep. of	○	○	s	66 (3.2)	s	37 (3.8)	s	1 (0.9)	s	1 (0.5)	s	7 (2.1)	s	5 (1.5)
Latvia	●	●	83 (2.8)	97 (1.3)	16 (3.0)	32 (4.0)		79 (3.1)		56 (4.6)				
Lebanon	●	●	x x	x x	x x	x x		x x		x x				
Lithuania	○	○	41 (3.9)	92 (2.2)	5 (1.5)	6 (1.9)		27 (3.7)	r	15 (3.0)				
Macedonia, Rep. of	●	●	40 (4.1)	60 (4.3)	9 (2.6)	8 (2.2)		2 (1.0)		1 (1.1)				
Malaysia	●	●	48 (4.6)	46 (4.4)	15 (2.9)	20 (3.3)		13 (2.2)		46 (3.7)				
Moldova, Rep. of	○	○	r	44 (5.0)	r	87 (2.9)	r	13 (3.1)	r	14 (3.2)	r	27 (4.1)	r	23 (3.9)
Morocco	○	○	x x	x x	x x	x x		x x		x x				
Netherlands	●	●	67 (4.8)	49 (4.3)	21 (3.9)	--		25 (3.9)		27 (4.7)				
New Zealand	●	●	24 (4.4)	51 (4.6)	13 (2.8)	28 (3.9)		38 (4.5)		53 (4.6)				
Norway	○	○	r	3 (1.3)	r	37 (4.4)	r	8 (2.7)	r	50 (4.6)	r	32 (3.7)	r	64 (4.8)
Palestinian Nat'l Auth.	○	●	43 (3.6)	51 (4.0)	2 (1.3)	7 (2.2)		5 (2.1)		5 (2.0)				
Philippines	○	●	54 (4.3)	62 (4.5)	3 (1.6)	5 (2.0)		11 (2.4)		14 (3.3)				
Romania	●	●	24 (3.6)	97 (1.7)	6 (2.1)	14 (3.0)		17 (3.0)		10 (2.3)				
Russian Federation	●	●	--	96 (1.6)	18 (2.7)	24 (2.8)		--		--				
Saudi Arabia	●	●	66 (6.1)	93 (2.3)	2 (1.2)	9 (2.4)		19 (3.5)		7 (2.6)				
Scotland	●	●	61 (4.3)	76 (4.1)	r	15 (3.6)	r	32 (4.3)	r	34 (4.2)	r	37 (5.3)		
Serbia	●	○	60 (4.2)	96 (1.7)	14 (2.9)	19 (3.0)		52 (4.2)		30 (3.6)				
Singapore	●	●	57 (2.8)	86 (1.8)	21 (2.4)	46 (2.5)		38 (2.2)		44 (3.0)				
Slovak Republic	●	○	61 (4.4)	60 (4.5)	44 (4.2)	33 (3.6)		16 (3.8)		29 (3.6)				
Slovenia	●	●	73 (4.0)	80 (3.5)	24 (3.7)	18 (3.5)		14 (2.7)		19 (3.4)				
South Africa	○	●	40 (3.8)	r	68 (3.6)	r	21 (3.5)	42 (3.9)	32 (3.6)	r	39 (4.0)			
Sweden	○	○	58 (3.7)	65 (3.6)	55 (3.8)	55 (3.2)		38 (3.5)		37 (3.9)				
Tunisia	●	●	39 (4.4)	83 (2.8)	1 (1.0)	7 (2.2)		4 (1.6)		10 (2.5)				
United States	●	--	55 (2.7)	48 (3.3)	9 (1.8)	15 (1.9)		--		35 (3.2)				
‡ England	●	●	r	58 (6.1)	r	76 (5.7)	s	9 (3.5)	r	24 (4.8)	r	36 (5.6)	s	38 (5.6)
International Avg.			54 (0.6)	70 (0.5)	15 (0.4)	22 (0.5)		27 (0.5)		27 (0.5)				
Benchmarking Participants														
Basque Country, Spain	○	●	37 (5.4)	25 (4.7)	42 (5.3)	23 (4.5)		22 (4.5)		22 (4.4)				
Indiana State, US	●	○	--	--	--	--		--		--				
Ontario Province, Can.	●	○	15 (3.5)	12 (3.0)	14 (3.6)	29 (4.5)		62 (5.0)		77 (4.0)				
Quebec Province, Can.	●	●	56 (4.7)	36 (4.6)	16 (4.0)	14 (3.3)		33 (4.9)	r	39 (4.9)				

Background data provided by National Research Coordinators and by teachers

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

¹ Teachers who responded that they majored in more than one area are reflected in all categories that apply.

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.

‡ 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.

Country reported No. for the particular option

Country reported Yes. for the particular option

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

Exhibit 6.5: Preparation to Teach Mathematics

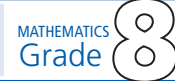
Countries	Teachers Receive Specific Preparation in How to Teach the Intended Mathematics Curriculum		Teachers' Major Area of Study in Their Postsecondary Education				
			Primary/Elementary Education with a Major or Specialization in Mathematics	Primary/Elementary Education with a Major or Specialization in Science but Not in Mathematics	Mathematics or Science Major or Specialization without a Major in Primary/Elementary Education	Primary/Elementary Education without a Major or Specialization in Mathematics or Science	Other
	As Part of Pre-Service Education	As Part of In-Service Education	Percent of Students	Percent of Students	Percent of Students	Percent of Students	Percent of Students
Armenia	●	●	9 (2.3)	0 (0.0)	86 (2.7)	2 (0.9)	3 (1.1)
Australia	●	●	17 (3.5)	6 (1.7)	1 (0.5)	72 (4.1)	4 (1.4)
Belgium (Flemish)	●	●	34 (3.5)	3 (1.2)	2 (1.1)	59 (3.2)	1 (0.6)
Chinese Taipei	●	●	29 (3.7)	3 (1.3)	11 (2.8)	36 (4.2)	22 (3.4)
Cyprus	●	○	18 (2.8)	11 (2.3)	1 (0.5)	68 (3.6)	2 (1.0)
England	●	●	8 (3.1)	7 (2.6)	5 (1.8)	64 (4.3)	16 (2.7)
Hong Kong, SAR	●	●	37 (4.4)	1 (0.9)	11 (3.2)	34 (4.7)	17 (3.5)
Hungary	●	●	x x	x x	x x	x x	x x
Iran, Islamic Rep. of	●	●	s 50 (5.5)	2 (1.2)	5 (2.5)	32 (5.2)	11 (2.8)
Italy	○	●	s 0 (0.0)	0 (0.0)	6 (1.8)	5 (2.1)	88 (2.8)
Japan	●	●	15 (3.0)	7 (2.1)	1 (0.7)	56 (3.9)	22 (3.4)
Latvia	●	●	63 (3.7)	2 (1.2)	3 (1.4)	24 (3.4)	7 (2.6)
Lithuania	●	●	14 (2.5)	2 (1.1)	3 (1.0)	78 (3.2)	4 (1.3)
Moldova, Rep. of	○	○	51 (4.6)	2 (1.3)	5 (1.7)	32 (4.4)	10 (2.5)
Morocco	●	●	x x	x x	x x	x x	x x
Netherlands	●	●	12 (3.1)	9 (2.7)	--	76 (3.7)	2 (1.7)
New Zealand	●	●	21 (2.6)	10 (2.3)	1 (0.5)	63 (3.2)	6 (1.4)
Norway	○	○	--	--	--	--	--
Philippines	●	●	24 (4.0)	7 (2.2)	4 (2.2)	54 (4.3)	11 (2.9)
Russian Federation	●	●	57 (3.5)	2 (1.3)	1 (0.8)	35 (3.7)	5 (1.6)
Scotland	●	●	r 8 (2.4)	5 (1.9)	1 (0.1)	79 (3.6)	7 (2.3)
Singapore	●	●	48 (4.2)	4 (1.6)	8 (2.1)	24 (2.7)	16 (3.1)
Slovenia	●	●	34 (4.2)	2 (1.6)	0 (0.0)	63 (4.4)	0 (0.0)
Tunisia	●	●	15 (3.0)	0 (0.4)	6 (1.8)	67 (4.1)	12 (2.7)
United States	●	--	8 (1.5)	6 (1.4)	3 (0.8)	72 (2.8)	12 (1.9)
International Avg.			26 (0.7)	4 (0.3)	7 (0.4)	50 (0.8)	13 (0.5)
Benchmarking Participants							
Indiana State, US	●	○	--	--	--	--	--
Ontario Province, Can.	●	○	6 (2.2)	4 (1.5)	5 (2.1)	63 (5.1)	21 (4.0)
Quebec Province, Can.	●	●	15 (2.9)	2 (0.9)	4 (1.7)	68 (4.2)	12 (2.7)

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

Background data provided by National Research Coordinators and by teachers
() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.
A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 6.6: Professional Development Opportunities for Teachers in Mathematics and Science



Countries	Percentage of Students by Their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science					
	Supporting the Implementation of the National or Regional Curriculum			Designing or Supporting the School's Own Improvement Goals		
	3 Times or More a Year	1-2 Times a Year	Never	3 Times or More a Year	1-2 Times a Year	Never
Armenia	r 4 (1.8)	34 (4.2)	63 (4.5)	r 21 (4.6)	35 (4.8)	44 (4.7)
Australia	48 (5.0)	38 (5.1)	14 (2.9)	60 (4.5)	35 (4.3)	4 (1.9)
Bahrain	60 (0.2)	23 (0.2)	16 (0.1)	66 (0.2)	19 (0.1)	16 (0.1)
Belgium (Flemish)	11 (2.7)	67 (4.2)	22 (3.7)	12 (3.2)	62 (4.5)	26 (3.9)
Botswana	30 (4.3)	38 (4.7)	32 (3.8)	43 (4.7)	42 (4.7)	15 (3.0)
Bulgaria	2 (1.1)	30 (4.2)	68 (4.3)	11 (2.8)	36 (4.2)	53 (4.5)
Chile	27 (4.0)	55 (4.7)	19 (3.4)	50 (3.8)	39 (3.8)	11 (2.3)
Chinese Taipei	11 (2.8)	46 (4.3)	43 (4.2)	43 (4.3)	46 (4.1)	11 (2.7)
Cyprus	10 (0.2)	90 (0.2)	0 (0.0)	50 (0.3)	47 (0.3)	3 (0.0)
Egypt	88 (2.7)	8 (2.4)	3 (1.5)	88 (2.4)	9 (2.0)	3 (1.2)
Estonia	20 (3.6)	62 (4.0)	18 (3.3)	25 (3.6)	46 (4.5)	29 (4.3)
Ghana	17 (3.7)	33 (4.4)	50 (5.1)	45 (4.3)	29 (4.4)	26 (3.5)
Hong Kong, SAR	47 (4.6)	46 (4.4)	7 (2.5)	44 (5.1)	51 (5.1)	5 (2.0)
Hungary	15 (3.1)	32 (3.7)	53 (3.8)	69 (3.5)	28 (3.6)	3 (1.5)
Indonesia	16 (3.2)	34 (4.4)	50 (4.7)	26 (4.0)	49 (4.3)	25 (4.0)
Iran, Islamic Rep. of	20 (3.4)	48 (4.1)	32 (3.7)	31 (4.1)	43 (3.9)	25 (3.3)
Israel	91 (2.0)	6 (1.8)	3 (1.2)	81 (3.7)	17 (3.4)	2 (1.3)
Italy	28 (3.4)	34 (3.5)	38 (3.5)	35 (3.7)	38 (3.7)	27 (3.4)
Japan	15 (3.1)	28 (3.8)	57 (4.3)	31 (3.8)	40 (3.8)	29 (3.8)
Jordan	39 (4.2)	41 (4.1)	20 (3.3)	41 (4.6)	40 (3.6)	19 (3.6)
Korea, Rep. of	9 (2.3)	73 (3.8)	18 (3.6)	9 (2.1)	55 (3.9)	36 (3.7)
Latvia	11 (3.0)	42 (4.7)	46 (5.0)	28 (3.4)	59 (4.0)	13 (2.9)
Lebanon	24 (3.9)	37 (4.6)	39 (4.0)	38 (4.2)	34 (4.2)	28 (3.7)
Lithuania	5 (2.1)	35 (4.1)	60 (4.3)	53 (4.6)	45 (4.6)	2 (1.2)
Macedonia, Rep. of	26 (4.1)	54 (4.0)	20 (3.3)	41 (4.3)	44 (3.6)	15 (3.2)
Malaysia	49 (4.3)	43 (4.3)	8 (2.0)	55 (4.2)	40 (4.1)	5 (2.0)
Moldova, Rep. of	r 40 (4.9)	46 (4.9)	14 (3.5)	r 50 (5.1)	42 (4.8)	8 (2.7)
Morocco	s 12 (3.7)	24 (5.1)	64 (5.1)	s 2 (1.8)	32 (5.3)	66 (5.6)
Netherlands	2 (1.2)	43 (4.5)	56 (4.6)	23 (4.1)	52 (5.0)	25 (4.2)
New Zealand	41 (5.3)	53 (5.3)	5 (2.4)	47 (5.8)	48 (6.2)	5 (2.1)
Norway	10 (2.5)	43 (5.2)	47 (5.1)	10 (2.8)	36 (4.5)	54 (4.6)
Palestinian Nat'l Auth.	56 (4.4)	33 (3.7)	11 (2.9)	58 (4.3)	32 (4.3)	10 (2.5)
Philippines	58 (3.9)	38 (4.1)	4 (1.7)	70 (3.7)	26 (3.4)	4 (1.9)
Romania	61 (4.1)	25 (3.6)	14 (3.1)	78 (3.4)	17 (3.0)	5 (2.0)
Russian Federation	16 (2.9)	63 (3.5)	22 (4.9)	17 (2.7)	60 (4.6)	24 (4.3)
Saudi Arabia	20 (4.2)	27 (4.0)	54 (5.4)	37 (5.2)	28 (4.2)	35 (5.4)
Scotland	s 33 (5.8)	60 (5.7)	7 (3.0)	s 55 (5.6)	42 (5.4)	3 (2.0)
Serbia	13 (2.8)	33 (3.7)	54 (4.0)	46 (4.4)	38 (4.2)	17 (3.2)
Singapore	56 (0.0)	42 (0.0)	2 (0.0)	67 (0.0)	31 (0.0)	2 (0.0)
Slovak Republic	13 (3.1)	38 (4.8)	49 (4.4)	7 (2.0)	27 (3.9)	65 (4.0)
Slovenia	58 (4.3)	38 (4.1)	4 (1.7)	39 (4.5)	58 (4.4)	3 (1.3)
South Africa	55 (3.6)	27 (3.4)	18 (2.4)	49 (3.2)	33 (3.2)	18 (3.0)
Sweden	11 (2.6)	41 (4.4)	49 (4.6)	17 (3.1)	52 (4.0)	30 (4.1)
Tunisia	27 (3.6)	26 (3.5)	47 (4.1)	31 (4.1)	33 (4.4)	37 (4.2)
United States	63 (3.6)	34 (3.5)	4 (1.4)	72 (3.0)	25 (3.0)	3 (1.4)
‡ England	s 68 (6.0)	27 (5.9)	4 (2.1)	s 46 (7.6)	48 (7.4)	6 (3.0)
International Avg.	31 (0.5)	40 (0.6)	29 (0.5)	42 (0.6)	39 (0.6)	20 (0.5)
Benchmarking Participants						
Basque Country, Spain	20 (4.4)	23 (4.4)	57 (5.4)	49 (5.1)	26 (5.0)	25 (4.6)
Indiana State, US	64 (5.5)	31 (5.7)	5 (3.1)	67 (6.7)	32 (6.7)	1 (0.0)
Ontario Province, Can.	31 (4.6)	58 (4.8)	11 (2.8)	40 (4.8)	53 (4.9)	8 (2.6)
Quebec Province, Can.	15 (3.5)	51 (4.8)	34 (4.3)	24 (4.5)	45 (5.1)	30 (4.6)

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

Background data provided by schools.

‡ 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.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 6.6: Professional Development Opportunities for Teachers in Mathematics and Science (Continued...)

MATHEMATICS
Grade

Countries	Percentage of Students by Their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science					
	Improving the Content Knowledge			Improving Teaching Skills		
	3 Times or More a Year	1-2 Times a Year	Never	3 Times or More a Year	1-2 Times a Year	Never
Armenia	32 (4.4)	35 (4.8)	34 (4.3)	33 (4.3)	37 (4.6)	30 (4.4)
Australia	40 (4.6)	48 (4.6)	12 (3.6)	50 (4.5)	47 (4.2)	3 (1.4)
Bahrain	67 (0.2)	26 (0.1)	7 (0.1)	87 (0.2)	7 (0.0)	6 (0.2)
Belgium (Flemish)	16 (3.5)	66 (4.1)	18 (3.1)	14 (3.1)	60 (4.3)	26 (4.1)
Botswana	32 (4.2)	36 (4.9)	33 (4.3)	40 (4.6)	36 (4.3)	25 (3.4)
Bulgaria	41 (4.5)	39 (4.0)	20 (3.6)	42 (4.7)	42 (4.1)	17 (3.0)
Chile	38 (4.0)	49 (4.3)	12 (2.5)	46 (4.3)	45 (4.6)	9 (2.2)
Chinese Taipei	61 (4.2)	36 (4.1)	3 (1.4)	55 (4.1)	43 (3.9)	2 (1.1)
Cyprus	32 (0.3)	59 (0.3)	10 (0.2)	41 (0.3)	58 (0.3)	1 (0.0)
Egypt	94 (2.0)	5 (1.8)	2 (0.9)	95 (1.7)	3 (1.4)	1 (1.0)
Estonia	56 (3.9)	43 (3.8)	1 (0.8)	35 (4.5)	61 (4.4)	4 (1.8)
Ghana	49 (4.6)	29 (4.1)	21 (3.8)	48 (4.5)	35 (4.6)	17 (3.0)
Hong Kong, SAR	55 (4.9)	43 (5.0)	2 (1.1)	51 (4.8)	46 (4.7)	3 (1.3)
Hungary	55 (3.8)	38 (4.0)	8 (2.3)	66 (3.6)	27 (3.9)	7 (2.0)
Indonesia	42 (4.2)	47 (4.3)	11 (2.8)	43 (4.1)	47 (4.1)	10 (2.9)
Iran, Islamic Rep. of	34 (3.6)	49 (3.7)	17 (3.0)	25 (3.5)	57 (4.1)	18 (3.2)
Israel	87 (2.9)	12 (2.8)	1 (1.0)	83 (3.4)	13 (2.9)	4 (1.7)
Italy	26 (3.4)	33 (3.8)	41 (3.9)	39 (3.9)	33 (3.8)	28 (3.4)
Japan	44 (3.8)	49 (4.1)	7 (2.2)	42 (3.7)	49 (4.1)	9 (2.1)
Jordan	51 (4.3)	40 (4.1)	9 (2.7)	49 (3.9)	41 (4.1)	10 (2.5)
Korea, Rep. of	18 (3.3)	75 (3.7)	6 (2.0)	21 (3.0)	68 (3.9)	11 (2.8)
Latvia	40 (4.4)	58 (4.4)	2 (1.3)	44 (4.6)	54 (4.4)	3 (1.6)
Lebanon	39 (4.3)	33 (4.3)	28 (3.4)	47 (4.4)	30 (4.2)	24 (3.7)
Lithuania	59 (5.0)	41 (5.1)	1 (0.6)	61 (4.6)	39 (4.6)	0 (0.0)
Macedonia, Rep. of	32 (3.7)	56 (3.9)	12 (3.0)	28 (3.8)	55 (4.1)	17 (3.3)
Malaysia	68 (3.6)	32 (3.7)	1 (0.8)	62 (4.3)	36 (4.3)	2 (1.2)
Moldova, Rep. of	61 (4.9)	37 (4.9)	2 (1.1)	78 (4.5)	20 (4.2)	3 (1.5)
Morocco	12 (3.2)	33 (5.3)	55 (5.6)	23 (4.4)	43 (5.0)	35 (4.5)
Netherlands	9 (2.7)	70 (4.3)	21 (4.2)	18 (3.7)	54 (5.5)	28 (4.8)
New Zealand	36 (5.6)	60 (5.7)	4 (1.3)	35 (4.8)	56 (4.8)	8 (3.0)
Norway	15 (3.4)	68 (4.1)	17 (3.1)	9 (2.5)	58 (4.5)	33 (4.3)
Palestinian Nat'l Auth.	62 (4.5)	34 (4.2)	5 (1.9)	67 (4.1)	26 (3.5)	6 (2.4)
Philippines	73 (3.7)	24 (3.6)	3 (1.6)	85 (3.1)	14 (3.0)	1 (0.9)
Romania	83 (3.2)	14 (2.9)	4 (1.7)	86 (3.2)	13 (2.9)	2 (1.3)
Russian Federation	44 (3.4)	50 (3.4)	7 (1.8)	43 (3.5)	51 (3.6)	6 (1.9)
Saudi Arabia	41 (5.4)	30 (4.3)	30 (5.3)	39 (5.5)	38 (5.0)	22 (5.1)
Scotland	41 (4.9)	50 (4.9)	9 (3.3)	35 (4.7)	59 (5.3)	6 (2.9)
Serbia	45 (3.8)	49 (3.7)	6 (2.0)	37 (3.6)	51 (3.9)	13 (3.2)
Singapore	59 (0.0)	40 (0.0)	0 (0.0)	68 (0.0)	32 (0.0)	0 (0.0)
Slovak Republic	46 (4.4)	42 (4.3)	12 (2.9)	44 (4.0)	49 (3.9)	7 (2.0)
Slovenia	40 (4.8)	53 (5.0)	7 (2.5)	36 (4.2)	53 (4.3)	11 (2.5)
South Africa	60 (3.2)	29 (3.3)	12 (2.3)	63 (3.0)	24 (3.1)	13 (2.2)
Sweden	16 (2.9)	62 (4.0)	22 (3.6)	15 (3.2)	47 (4.4)	38 (3.6)
Tunisia	59 (4.0)	25 (3.4)	16 (2.7)	62 (4.5)	23 (3.7)	15 (3.1)
United States	56 (3.3)	37 (3.4)	7 (1.8)	59 (3.4)	36 (3.5)	6 (1.6)
‡ England	55 (7.2)	36 (6.8)	9 (4.0)	68 (6.5)	30 (6.3)	2 (0.1)
International Avg.	46 (0.6)	42 (0.6)	12 (0.4)	48 (0.6)	40 (0.6)	12 (0.4)
Benchmarking Participants						
Basque Country, Spain	33 (4.9)	37 (4.7)	30 (5.0)	41 (5.1)	42 (5.1)	17 (4.1)
Indiana State, US	50 (6.0)	41 (5.9)	9 (4.2)	47 (6.6)	46 (6.4)	7 (3.5)
Ontario Province, Can.	23 (4.2)	62 (4.6)	15 (3.7)	29 (4.0)	58 (4.6)	13 (3.5)
Quebec Province, Can.	14 (3.6)	45 (5.0)	41 (5.0)	21 (4.6)	58 (4.4)	21 (3.6)

Background data provided by schools.

‡ 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.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 6.6: Professional Development Opportunities for Teachers in Mathematics and Science (...Continued)

Countries	Percentage of Students by Their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science		
	Using Information and Communication Technology for Educational Purposes		
	3 Times or More a Year	1-2 Times a Year	Never
Armenia	r 23 (4.0)	31 (4.9)	46 (4.9)
Australia	46 (3.9)	50 (3.5)	4 (1.7)
Bahrain	44 (0.2)	35 (0.2)	22 (0.2)
Belgium (Flemish)	29 (4.0)	64 (4.3)	7 (2.3)
Botswana	23 (3.8)	21 (4.2)	56 (5.1)
Bulgaria	18 (3.9)	30 (4.2)	52 (4.5)
Chile	47 (3.9)	40 (3.6)	13 (2.7)
Chinese Taipei	46 (4.2)	50 (4.3)	4 (1.7)
Cyprus	30 (0.3)	45 (0.3)	24 (0.2)
Egypt	85 (2.8)	9 (2.3)	6 (2.1)
Estonia	25 (3.5)	62 (4.0)	12 (2.5)
Ghana	15 (3.9)	15 (3.2)	70 (4.1)
Hong Kong, SAR	69 (4.3)	29 (4.1)	2 (1.3)
Hungary	38 (4.0)	42 (4.3)	20 (3.2)
Indonesia	14 (3.0)	33 (3.7)	52 (4.1)
Iran, Islamic Rep. of	21 (3.2)	35 (3.6)	44 (4.0)
Israel	51 (4.5)	29 (4.3)	20 (3.5)
Italy	52 (4.2)	37 (3.7)	12 (2.8)
Japan	25 (3.3)	38 (3.9)	37 (3.8)
Jordan	29 (4.6)	31 (3.7)	39 (4.5)
Korea, Rep. of	30 (3.5)	65 (3.7)	5 (1.9)
Latvia	31 (4.2)	58 (4.7)	11 (2.7)
Lebanon	34 (4.0)	29 (4.2)	38 (3.5)
Lithuania	34 (4.1)	64 (4.3)	2 (1.3)
Macedonia, Rep. of	20 (3.8)	45 (4.3)	36 (4.3)
Malaysia	28 (3.8)	41 (4.1)	31 (3.7)
Moldova, Rep. of	r 53 (4.6)	32 (4.2)	15 (3.8)
Morocco	s 8 (2.2)	23 (5.0)	69 (5.5)
Netherlands	14 (3.6)	50 (4.9)	36 (4.6)
New Zealand	38 (5.8)	54 (5.8)	8 (2.8)
Norway	41 (4.3)	49 (4.4)	10 (2.7)
Palestinian Nat'l Auth.	35 (3.9)	32 (3.9)	33 (4.0)
Philippines	55 (4.4)	32 (4.5)	13 (3.2)
Romania	50 (4.2)	23 (3.7)	27 (4.1)
Russian Federation	18 (2.6)	41 (4.5)	42 (4.0)
Saudi Arabia	29 (5.5)	23 (3.6)	48 (5.6)
Scotland	s 60 (5.9)	38 (5.8)	2 (1.2)
Serbia	32 (4.0)	45 (4.1)	22 (3.2)
Singapore	77 (0.0)	23 (0.0)	0 (0.0)
Slovak Republic	40 (4.5)	41 (4.8)	19 (3.1)
Slovenia	26 (4.1)	57 (4.8)	17 (3.1)
South Africa	38 (3.0)	25 (3.4)	37 (3.4)
Sweden	13 (3.0)	46 (4.4)	42 (4.3)
Tunisia	29 (3.9)	32 (3.7)	40 (3.7)
United States	52 (3.4)	37 (3.5)	11 (2.2)
‡ England	s 59 (6.7)	37 (6.4)	4 (2.5)
International Avg.	36 (0.6)	38 (0.6)	25 (0.5)
Benchmarking Participants			
Basque Country, Spain	50 (4.6)	37 (4.5)	13 (3.4)
Indiana State, US	33 (6.6)	57 (7.1)	10 (4.1)
Ontario Province, Can.	31 (4.5)	56 (4.5)	13 (3.4)
Quebec Province, Can.	14 (3.3)	47 (5.0)	39 (4.8)

Background data provided by schools.

‡ 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.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 6.6: Professional Development Opportunities for Teachers in Mathematics and Science (Continued...)

Countries	Percentage of Students by Their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science					
	Supporting the Implementation of the National or Regional Curriculum			Designing or Supporting the School's Own Improvement Goals		
	3 Times or More a Year	1-2 Times a Year	Never	3 Times or More a Year	1-2 Times a Year	Never
Armenia	r 4 (1.9)	22 (4.2)	75 (4.0)	s 19 (3.9)	36 (4.8)	46 (5.1)
Australia	43 (4.3)	34 (4.2)	23 (3.9)	46 (4.3)	38 (4.4)	16 (2.7)
Belgium (Flemish)	28 (3.6)	47 (4.3)	25 (3.9)	33 (3.8)	43 (4.0)	25 (3.9)
Chinese Taipei	3 (1.4)	30 (3.7)	67 (3.8)	25 (3.8)	61 (4.1)	14 (2.7)
Cyprus	21 (3.4)	68 (3.8)	12 (2.9)	20 (4.2)	61 (4.8)	19 (4.0)
England	r 61 (5.5)	33 (5.5)	5 (2.6)	r 50 (5.4)	45 (5.6)	5 (2.5)
Hong Kong, SAR	46 (5.2)	48 (4.8)	5 (2.0)	43 (4.7)	50 (5.2)	7 (2.9)
Hungary	13 (2.6)	24 (4.2)	64 (4.0)	69 (4.0)	29 (3.9)	2 (1.2)
Iran, Islamic Rep. of	14 (3.7)	38 (4.2)	48 (4.7)	29 (4.7)	33 (4.5)	38 (4.8)
Italy	24 (3.3)	25 (3.4)	51 (3.7)	35 (3.7)	29 (3.5)	36 (3.4)
Japan	7 (2.2)	27 (3.6)	66 (3.7)	24 (3.3)	46 (3.4)	30 (3.7)
Latvia	r 9 (2.8)	36 (4.7)	55 (4.9)	r 20 (3.6)	59 (4.1)	21 (3.4)
Lithuania	r 3 (1.5)	16 (3.1)	81 (3.1)	31 (4.7)	61 (4.4)	7 (2.8)
Moldova, Rep. of	r 27 (4.7)	50 (5.4)	23 (4.3)	r 41 (4.8)	42 (4.2)	17 (3.5)
Morocco	r 6 (1.8)	16 (3.0)	78 (3.3)	r 9 (3.2)	19 (3.3)	72 (4.0)
Netherlands	7 (2.6)	18 (3.3)	75 (4.0)	52 (4.8)	34 (4.6)	14 (3.6)
New Zealand	45 (3.2)	35 (3.6)	20 (3.0)	47 (3.8)	45 (4.0)	8 (1.9)
Norway	16 (3.6)	44 (4.6)	40 (4.3)	20 (4.3)	30 (4.3)	50 (4.6)
Philippines	53 (4.3)	37 (4.2)	10 (2.4)	72 (3.9)	25 (3.9)	3 (1.2)
Russian Federation	19 (3.2)	56 (3.7)	25 (3.8)	13 (2.2)	56 (3.3)	30 (3.6)
Scotland	38 (5.2)	58 (5.2)	4 (1.9)	38 (4.7)	55 (5.2)	6 (2.2)
Singapore	57 (4.3)	39 (4.1)	3 (1.5)	72 (3.6)	27 (3.6)	1 (0.6)
Slovenia	57 (4.3)	38 (4.3)	5 (1.8)	38 (4.7)	55 (4.5)	7 (2.4)
Tunisia	r 29 (4.2)	31 (4.3)	39 (4.4)	r 37 (4.2)	45 (4.7)	18 (3.4)
United States	50 (3.6)	40 (3.5)	9 (2.0)	61 (3.3)	31 (3.1)	8 (1.9)
International Avg.	27 (0.7)	36 (0.8)	36 (0.7)	38 (0.8)	42 (0.9)	20 (0.6)
Benchmarking Participants						
Indiana State, US	52 (7.1)	42 (7.0)	6 (3.2)	48 (7.7)	41 (6.6)	11 (4.6)
Ontario Province, Can.	29 (4.6)	56 (5.0)	15 (3.5)	42 (5.0)	44 (4.9)	14 (3.3)
Quebec Province, Can.	25 (4.4)	55 (5.0)	20 (3.9)	24 (4.3)	47 (5.0)	29 (4.5)

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

Background data provided by schools.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 6.6: Professional Development Opportunities for Teachers in Mathematics and Science (...Continued)
MATHEMATICS
Grade 4

Countries	Percentage of Students by Their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science					
	Improving the Content Knowledge			Improving Teaching Skills		
	3 Times or More a Year	1-2 Times a Year	Never	3 Times or More a Year	1-2 Times a Year	Never
Armenia	r 28 (4.3)	35 (4.9)	37 (4.6)	r 29 (4.1)	33 (4.6)	38 (4.8)
Australia	40 (4.7)	37 (4.6)	23 (2.8)	44 (4.8)	42 (5.1)	14 (3.0)
Belgium (Flemish)	25 (4.0)	57 (4.3)	18 (3.4)	22 (3.3)	49 (4.4)	29 (3.6)
Chinese Taipei	47 (4.0)	47 (4.1)	6 (2.1)	53 (4.3)	43 (4.4)	4 (1.7)
Cyprus	16 (3.9)	57 (5.1)	28 (4.5)	27 (4.2)	62 (5.3)	11 (3.5)
England	r 49 (5.6)	45 (5.7)	5 (2.4)	r 59 (5.8)	36 (5.7)	6 (2.5)
Hong Kong, SAR	53 (5.4)	45 (5.4)	3 (1.5)	56 (5.2)	42 (5.4)	2 (1.3)
Hungary	56 (3.7)	36 (3.7)	8 (2.1)	68 (3.8)	26 (3.7)	6 (1.8)
Iran, Islamic Rep. of	22 (3.9)	48 (4.2)	29 (3.8)	26 (4.4)	50 (4.7)	23 (3.5)
Italy	26 (3.4)	31 (4.1)	43 (4.1)	35 (3.6)	33 (3.7)	32 (3.6)
Japan	44 (4.2)	47 (4.1)	9 (2.2)	49 (4.2)	46 (4.1)	5 (1.8)
Latvia	r 28 (4.2)	58 (4.4)	15 (3.2)	35 (4.6)	55 (4.5)	9 (2.6)
Lithuania	40 (4.4)	56 (4.5)	4 (1.6)	46 (4.2)	50 (4.1)	5 (1.9)
Moldova, Rep. of	r 62 (4.8)	34 (4.9)	4 (1.9)	r 72 (5.0)	22 (4.5)	7 (2.6)
Morocco	r 15 (3.8)	27 (3.9)	58 (4.5)	r 16 (3.8)	31 (5.1)	53 (5.2)
Netherlands	30 (5.2)	37 (4.8)	33 (5.0)	38 (4.7)	37 (4.4)	26 (4.5)
New Zealand	48 (3.6)	40 (3.7)	13 (2.5)	54 (3.5)	33 (3.5)	12 (2.7)
Norway	19 (3.5)	53 (4.3)	27 (4.6)	12 (3.1)	41 (4.4)	46 (4.9)
Philippines	74 (4.0)	23 (3.9)	2 (1.2)	80 (3.5)	20 (3.4)	0 (0.2)
Russian Federation	32 (3.9)	47 (4.3)	20 (3.2)	42 (3.5)	46 (4.0)	12 (2.7)
Scotland	30 (5.2)	54 (5.8)	16 (3.6)	32 (5.2)	49 (5.8)	19 (3.9)
Singapore	67 (3.7)	33 (3.7)	0 (0.0)	78 (3.0)	21 (3.0)	0 (0.3)
Slovenia	32 (4.3)	56 (4.7)	13 (2.9)	35 (4.6)	59 (4.4)	6 (1.7)
Tunisia	49 (4.7)	38 (4.7)	13 (2.7)	56 (4.2)	35 (4.2)	9 (2.6)
United States	49 (3.3)	43 (3.2)	8 (1.7)	58 (3.9)	36 (3.6)	6 (1.6)
International Avg.	39 (0.9)	43 (0.9)	17 (0.6)	45 (0.8)	40 (0.9)	15 (0.6)
Benchmarking Participants						
Indiana State, US	43 (6.9)	41 (7.3)	16 (5.6)	51 (6.8)	43 (5.9)	7 (3.4)
Ontario Province, Can.	30 (4.6)	49 (4.9)	21 (3.3)	28 (4.3)	56 (4.7)	15 (3.4)
Quebec Province, Can.	20 (4.3)	61 (5.1)	19 (3.5)	21 (4.2)	50 (4.4)	30 (4.2)

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

Background data provided by schools.

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

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

Exhibit 6.6: Professional Development Opportunities for Teachers in Mathematics and Science

Countries	Percentage of Students by Their School's Report of Teachers' Involvement in Professional Development Opportunities in Mathematics and Science		
	Using Information and Communication Technology for Educational Purposes		
	3 Times or More a Year	1-2 Times a Year	Never
Armenia	r 19 (3.5)	29 (4.8)	52 (5.0)
Australia	48 (4.4)	39 (4.5)	13 (2.8)
Belgium (Flemish)	35 (4.4)	47 (4.6)	18 (3.3)
Chinese Taipei	46 (4.1)	51 (4.1)	4 (1.6)
Cyprus	26 (4.6)	52 (4.5)	21 (3.9)
England	r 60 (5.6)	36 (5.2)	4 (2.1)
Hong Kong, SAR	75 (3.8)	23 (3.8)	1 (0.9)
Hungary	37 (4.6)	44 (4.5)	18 (3.1)
Iran, Islamic Rep. of	20 (3.4)	33 (5.1)	47 (5.1)
Italy	47 (3.9)	30 (3.7)	24 (3.5)
Japan	23 (3.5)	37 (4.0)	39 (4.1)
Latvia	22 (4.0)	47 (4.8)	31 (4.2)
Lithuania	19 (3.6)	65 (4.5)	16 (3.0)
Moldova, Rep. of	r 60 (5.1)	19 (4.0)	21 (3.9)
Morocco	r 7 (2.4)	13 (3.7)	79 (4.0)
Netherlands	46 (5.2)	33 (4.6)	20 (4.2)
New Zealand	58 (3.3)	35 (3.0)	8 (2.1)
Norway	41 (4.2)	39 (4.6)	20 (4.1)
Philippines	50 (5.0)	31 (4.5)	19 (3.6)
Russian Federation	5 (1.4)	22 (2.4)	74 (2.6)
Scotland	54 (5.2)	39 (5.0)	7 (2.9)
Singapore	82 (3.0)	18 (2.9)	0 (0.3)
Slovenia	20 (3.5)	65 (4.2)	15 (3.5)
Tunisia	r 3 (1.5)	5 (2.1)	92 (2.6)
United States	46 (3.6)	42 (3.3)	11 (2.1)
International Avg.	38 (0.8)	36 (0.8)	26 (0.7)
Benchmarking Participants			
Indiana State, US	41 (6.0)	46 (6.1)	12 (4.8)
Ontario Province, Can.	30 (4.6)	51 (4.8)	19 (4.2)
Quebec Province, Can.	16 (3.6)	48 (4.5)	36 (4.1)

Background data provided by schools.

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

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

Exhibit 6.7: Teachers' Participation in Professional Development in Mathematics



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

Countries	Percentage of Students by Their Teachers' Participation in Professional Development in Mathematics in the Past Two Years					
	Mathematics Content	Mathematics Pedagogy/ Instruction	Mathematics Curriculum	Integrating Information Technology into Mathematics	Improving Students' Critical Thinking or Problem Solving Skills	Mathematics Assessment
Armenia	12 (2.4)	r 29 (3.3)	r 28 (3.0)	r 15 (3.1)	r 30 (4.1)	r 40 (4.6)
Australia	68 (3.7)	56 (4.0)	71 (3.7)	70 (4.0)	47 (4.8)	57 (4.4)
Bahrain	24 (2.6)	37 (3.4)	19 (2.3)	31 (3.7)	41 (4.0)	42 (3.7)
Belgium (Flemish)	53 (3.6)	40 (3.6)	42 (3.8)	76 (3.2)	24 (3.2)	20 (3.4)
Botswana	39 (4.0)	24 (4.6)	18 (3.8)	17 (3.6)	50 (5.2)	40 (4.7)
Bulgaria	r 19 (3.5)	r 9 (2.7)	r 20 (3.7)	r 13 (3.7)	r 9 (2.7)	r 10 (2.7)
Chile	78 (3.2)	75 (3.4)	50 (4.1)	50 (3.8)	54 (3.9)	54 (3.7)
Chinese Taipei	86 (3.1)	89 (2.3)	85 (2.8)	81 (3.2)	47 (4.1)	69 (4.0)
Cyprus	71 (2.1)	65 (2.9)	74 (2.6)	64 (2.7)	45 (3.5)	50 (3.1)
Egypt	28 (3.8)	49 (4.1)	28 (3.5)	48 (4.2)	80 (3.3)	60 (4.3)
Estonia	63 (4.1)	74 (3.6)	74 (3.7)	70 (3.7)	49 (3.9)	50 (4.1)
Ghana	50 (4.3)	40 (4.4)	41 (4.4)	20 (3.8)	52 (4.4)	57 (4.0)
Hong Kong, SAR	61 (3.9)	64 (4.1)	62 (4.2)	79 (3.7)	46 (4.0)	42 (4.5)
Hungary	49 (4.2)	44 (3.6)	48 (3.6)	17 (3.0)	26 (3.3)	29 (3.8)
Indonesia	57 (4.3)	64 (4.1)	59 (4.2)	21 (3.1)	49 (4.3)	48 (4.3)
Iran, Islamic Rep. of	53 (3.6)	58 (3.3)	40 (3.8)	22 (3.6)	38 (4.4)	41 (4.2)
Israel	63 (3.7)	68 (3.4)	63 (4.0)	50 (3.9)	52 (3.8)	48 (4.0)
Italy	22 (3.1)	28 (3.3)	15 (2.7)	52 (3.8)	13 (2.3)	20 (3.1)
Japan	63 (3.9)	71 (3.7)	41 (4.0)	27 (4.2)	30 (4.1)	57 (4.3)
Jordan	48 (4.2)	69 (4.0)	45 (4.5)	35 (4.1)	58 (4.3)	47 (5.1)
Korea, Rep. of	s 32 (3.4)	s 36 (3.3)	s 29 (3.4)	s 43 (3.5)	s 12 (2.1)	s 21 (2.7)
Latvia	80 (3.5)	72 (3.9)	83 (3.0)	48 (4.4)	65 (4.1)	72 (4.1)
Lebanon	60 (4.6)	61 (4.6)	59 (4.2)	39 (4.0)	62 (4.4)	73 (3.8)
Lithuania	86 (2.7)	76 (3.1)	67 (3.8)	63 (3.7)	43 (4.1)	55 (4.0)
Macedonia, Rep. of	64 (4.3)	67 (4.0)	63 (3.7)	16 (3.0)	41 (3.9)	42 (4.3)
Malaysia	69 (3.9)	64 (4.3)	65 (3.9)	48 (4.4)	72 (3.8)	29 (3.7)
Moldova, Rep. of	r 41 (5.0)	r 45 (5.0)	r 49 (5.0)	r 50 (4.8)	r 75 (4.2)	r 75 (4.2)
Morocco	x x	x x	x x	s 16 (4.9)	s 48 (6.5)	x x
Netherlands	38 (4.5)	43 (4.6)	15 (3.2)	42 (4.9)	29 (4.0)	11 (3.0)
New Zealand	82 (2.9)	61 (3.9)	78 (3.4)	53 (5.4)	52 (4.0)	79 (4.0)
Norway	28 (4.1)	33 (4.2)	16 (3.3)	30 (4.2)	15 (3.2)	27 (3.8)
Palestinian Nat'l Auth.	84 (3.1)	79 (3.6)	78 (3.6)	33 (4.6)	59 (4.7)	63 (4.2)
Philippines	82 (3.3)	68 (4.1)	77 (3.5)	44 (4.5)	67 (4.1)	61 (4.7)
Romania	71 (4.0)	68 (3.8)	65 (4.3)	33 (3.7)	54 (4.0)	77 (4.0)
Russian Federation	70 (4.0)	64 (4.1)	70 (3.8)	52 (2.8)	53 (4.4)	55 (3.5)
Saudi Arabia	43 (5.5)	61 (5.7)	38 (4.6)	19 (4.5)	49 (6.3)	43 (4.7)
Scotland	68 (4.5)	77 (3.3)	57 (4.6)	83 (3.6)	42 (5.1)	40 (4.5)
Serbia	66 (4.0)	45 (4.3)	60 (4.2)	31 (3.4)	41 (3.8)	43 (4.1)
Singapore	76 (2.3)	78 (2.3)	59 (2.4)	88 (1.6)	70 (2.4)	58 (2.6)
Slovak Republic	50 (4.4)	41 (4.5)	50 (3.8)	34 (3.9)	35 (4.5)	36 (4.4)
Slovenia	86 (2.8)	88 (3.0)	79 (3.0)	46 (4.0)	53 (4.0)	69 (3.6)
South Africa	r 61 (4.6)	r 43 (4.0)	r 59 (3.7)	r 34 (3.9)	r 58 (4.2)	r 77 (3.4)
Sweden	44 (3.8)	50 (3.6)	35 (3.3)	12 (2.7)	35 (3.6)	31 (3.4)
Tunisia	26 (3.5)	42 (3.9)	22 (3.3)	16 (3.0)	46 (4.2)	46 (4.3)
United States	83 (2.5)	75 (2.7)	83 (2.5)	74 (3.0)	76 (2.4)	74 (2.7)
‡ England	r 66 (5.8)	r 83 (4.1)	r 78 (4.6)	r 63 (5.4)	r 52 (6.1)	r 55 (5.4)
International Avg.	57 (0.6)	57 (0.6)	52 (0.6)	43 (0.6)	47 (0.6)	49 (0.6)
Benchmarking Participants						
Basque Country, Spain	35 (5.1)	44 (5.0)	34 (4.6)	53 (4.8)	40 (4.7)	35 (4.7)
Indiana State, US	r 72 (6.2)	r 69 (6.0)	r 76 (5.2)	r 60 (6.3)	r 64 (6.6)	r 58 (5.4)
Ontario Province, Can.	81 (4.0)	74 (4.4)	81 (3.5)	48 (5.1)	63 (4.5)	67 (4.3)
Quebec Province, Can.	36 (4.7)	51 (4.6)	43 (4.9)	40 (4.4)	42 (5.4)	28 (4.1)

Background data provided by teachers.

‡ 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.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 6.7: Teachers' Participation in Professional Development in Mathematics

 MATHEMATICS
Grade 4

Countries	Percentage of Students by Their Teachers' Participation in Professional Development in Mathematics in the Past Two Years					
	Mathematics Content	Mathematics Pedagogy/ Instruction	Mathematics Curriculum	Integrating Information Technology into Mathematics	Improving Students' Critical Thinking or Problem Solving Skills	Mathematics Assessment
Armenia	r 12 (2.7)	r 26 (3.7)	r 23 (3.4)	r 9 (2.2)	r 38 (4.3)	r 37 (3.7)
Australia	63 (3.6)	57 (3.5)	58 (4.0)	36 (4.3)	57 (3.5)	53 (4.2)
Belgium (Flemish)	31 (3.5)	21 (2.8)	4 (1.3)	12 (2.2)	28 (3.4)	18 (3.6)
Chinese Taipei	57 (4.0)	73 (3.7)	61 (3.7)	45 (3.5)	37 (4.2)	49 (4.0)
Cyprus	73 (3.3)	52 (3.5)	34 (4.2)	44 (3.8)	49 (3.8)	23 (3.9)
England	r 76 (3.6)	r 88 (2.7)	r 78 (4.1)	r 60 (4.3)	r 72 (4.0)	r 51 (4.7)
Hong Kong, SAR	55 (4.2)	65 (4.3)	55 (4.3)	68 (4.8)	49 (4.0)	39 (4.4)
Hungary	35 (4.0)	37 (4.1)	26 (4.0)	9 (2.6)	23 (3.8)	20 (3.5)
Iran, Islamic Rep. of	39 (4.8)	41 (4.9)	30 (4.9)	12 (3.0)	33 (4.1)	33 (4.3)
Italy	29 (3.4)	30 (3.4)	20 (3.1)	37 (3.4)	12 (2.1)	10 (2.2)
Japan	40 (3.9)	43 (4.0)	19 (3.2)	16 (3.2)	22 (3.8)	30 (4.1)
Latvia	49 (4.2)	53 (4.2)	53 (4.5)	26 (3.8)	68 (3.8)	69 (3.7)
Lithuania	40 (3.6)	48 (4.0)	38 (3.8)	42 (3.5)	57 (3.9)	47 (3.6)
Moldova, Rep. of	36 (4.3)	42 (4.2)	39 (4.3)	40 (4.3)	63 (4.5)	66 (4.2)
Morocco	x x	x x	x x	x x	x x	x x
Netherlands	19 (4.0)	30 (4.3)	10 (2.5)	33 (4.7)	27 (4.2)	22 (3.2)
New Zealand	64 (3.5)	57 (3.3)	58 (3.4)	28 (3.1)	59 (3.6)	59 (3.5)
Norway	18 (2.8)	21 (3.1)	8 (2.1)	10 (2.0)	12 (2.4)	6 (1.6)
Philippines	62 (4.6)	53 (4.9)	70 (4.4)	51 (5.1)	67 (4.6)	56 (4.6)
Russian Federation	56 (4.1)	60 (4.0)	67 (3.4)	34 (3.7)	57 (4.0)	54 (3.9)
Scotland	r 42 (5.3)	r 47 (5.4)	s 39 (4.6)	r 42 (5.8)	r 45 (5.2)	r 28 (4.7)
Singapore	60 (3.7)	68 (3.9)	43 (4.3)	56 (4.1)	73 (3.6)	47 (3.9)
Slovenia	54 (4.2)	41 (4.3)	49 (4.1)	25 (3.7)	37 (4.4)	53 (4.0)
Tunisia	r 21 (4.0)	27 (4.0)	r 25 (3.7)	r 9 (2.7)	51 (4.4)	52 (4.5)
United States	65 (2.9)	54 (2.9)	66 (2.8)	41 (2.9)	58 (2.9)	54 (2.6)
International Avg.	46 (0.8)	47 (0.8)	41 (0.8)	33 (0.8)	46 (0.8)	41 (0.8)
Benchmarking Participants						
Indiana State, US	44 (5.5)	40 (5.6)	58 (5.3)	34 (3.6)	49 (5.6)	36 (5.8)
Ontario Province, Can.	62 (4.7)	53 (5.1)	59 (5.0)	33 (4.2)	54 (4.6)	55 (4.7)
Quebec Province, Can.	53 (4.5)	57 (4.3)	67 (4.4)	26 (4.2)	39 (4.2)	39 (4.4)

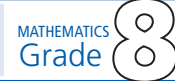
SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 6.8: Types of Interactions Among Mathematics Teachers



Countries	Percentage of Students by Their Teachers' Interactions with Other Teachers					
	Discussion About How to Teach a Particular Concept			Working on Preparing Instructional Materials		
	At Least Weekly	2 or 3 Times per Month	Never or Almost Never	At Least Weekly	2 or 3 Times per Month	Never or Almost Never
Armenia	49 (4.3)	43 (4.1)	8 (2.3)	34 (3.7)	40 (3.5)	26 (3.4)
Australia	52 (4.1)	38 (3.7)	10 (2.5)	51 (4.7)	39 (4.2)	10 (2.5)
Bahrain	64 (3.7)	31 (3.5)	6 (1.4)	51 (3.3)	33 (3.4)	16 (2.6)
Belgium (Flemish)	45 (4.1)	37 (3.9)	17 (3.0)	15 (2.7)	44 (3.7)	41 (3.9)
Botswana	73 (3.9)	25 (3.8)	3 (1.5)	65 (3.9)	27 (3.5)	8 (2.3)
Bulgaria	46 (4.3)	40 (4.2)	14 (3.6)	53 (4.7)	29 (3.6)	19 (3.6)
Chile	42 (3.5)	35 (3.3)	24 (3.3)	45 (3.8)	27 (3.2)	27 (3.7)
Chinese Taipei	51 (4.0)	42 (4.0)	7 (1.8)	16 (3.4)	36 (3.7)	48 (4.6)
Cyprus	75 (2.3)	24 (2.3)	1 (0.4)	63 (2.9)	29 (2.7)	8 (1.2)
Egypt	84 (3.4)	14 (3.1)	2 (1.3)	59 (3.9)	37 (3.8)	4 (1.8)
Estonia	59 (4.5)	34 (4.3)	7 (2.1)	52 (4.0)	36 (4.0)	12 (2.3)
Ghana	37 (4.4)	38 (4.7)	25 (4.3)	52 (4.8)	26 (3.9)	22 (3.7)
Hong Kong, SAR	38 (4.5)	51 (4.6)	11 (3.0)	20 (3.5)	49 (4.1)	31 (4.1)
Hungary	48 (4.5)	46 (4.5)	5 (1.9)	40 (4.1)	41 (3.8)	18 (3.2)
Indonesia	58 (4.4)	38 (4.3)	4 (1.6)	78 (3.4)	17 (3.4)	4 (1.7)
Iran, Islamic Rep. of	39 (4.3)	55 (4.3)	6 (1.9)	26 (3.9)	56 (4.1)	18 (3.2)
Israel	51 (3.5)	42 (3.6)	8 (2.0)	44 (4.0)	46 (3.9)	10 (1.9)
Italy	33 (3.4)	46 (3.8)	21 (2.9)	23 (3.1)	44 (3.3)	33 (3.4)
Japan	34 (3.9)	42 (4.4)	24 (3.9)	19 (3.3)	37 (3.8)	44 (4.4)
Jordan	52 (4.3)	38 (4.1)	10 (2.5)	33 (4.1)	47 (5.1)	20 (3.9)
Korea, Rep. of	18 (2.4)	49 (3.3)	34 (3.4)	35 (3.2)	47 (3.2)	18 (2.5)
Latvia	47 (4.4)	45 (4.3)	8 (2.9)	32 (4.4)	55 (4.8)	13 (3.1)
Lebanon	40 (4.0)	46 (4.6)	14 (3.3)	38 (4.6)	32 (4.1)	30 (4.2)
Lithuania	41 (4.0)	46 (3.8)	13 (2.8)	36 (3.9)	50 (4.1)	14 (2.9)
Macedonia, Rep. of	56 (3.9)	35 (3.9)	8 (2.2)	47 (4.3)	42 (4.4)	11 (2.7)
Malaysia	58 (4.2)	39 (4.4)	2 (1.2)	25 (3.5)	59 (4.0)	17 (3.0)
Moldova, Rep. of	49 (5.1)	38 (4.9)	13 (3.1)	58 (5.0)	25 (4.0)	17 (3.5)
Morocco	25 (5.3)	35 (6.6)	40 (7.2)	x x	x x	x x
Netherlands	25 (3.9)	55 (4.6)	21 (3.4)	9 (2.8)	50 (4.7)	42 (4.6)
New Zealand	57 (5.1)	32 (4.6)	11 (2.9)	38 (4.7)	41 (4.9)	21 (3.5)
Norway	54 (4.3)	37 (4.0)	9 (2.1)	36 (4.5)	48 (4.5)	15 (3.0)
Palestinian Nat'l Auth.	70 (3.8)	26 (4.0)	4 (1.7)	50 (4.6)	42 (4.7)	8 (2.2)
Philippines	63 (4.2)	34 (4.1)	3 (1.5)	64 (4.3)	27 (4.2)	9 (2.3)
Romania	64 (4.1)	32 (3.9)	4 (1.6)	63 (4.2)	30 (4.3)	7 (2.2)
Russian Federation	59 (3.9)	37 (3.7)	4 (1.5)	45 (3.8)	45 (4.0)	9 (2.2)
Saudi Arabia	57 (5.9)	30 (4.2)	13 (4.8)	42 (5.4)	43 (4.4)	16 (4.7)
Scotland	40 (4.4)	44 (4.7)	17 (3.5)	28 (4.2)	56 (4.3)	16 (3.4)
Serbia	60 (4.0)	32 (3.9)	8 (2.3)	44 (3.9)	43 (3.6)	12 (2.9)
Singapore	42 (2.6)	46 (2.8)	12 (2.0)	43 (2.4)	36 (2.4)	21 (2.0)
Slovak Republic	54 (4.7)	45 (4.6)	1 (0.7)	43 (4.1)	45 (4.5)	12 (2.9)
Slovenia	47 (4.0)	38 (3.8)	15 (3.0)	29 (4.0)	37 (3.9)	34 (4.1)
South Africa	56 (3.6)	36 (3.5)	8 (2.3)	61 (3.5)	28 (3.4)	11 (2.5)
Sweden	60 (3.5)	34 (3.4)	6 (1.6)	50 (3.6)	33 (3.4)	18 (3.0)
Tunisia	55 (4.2)	29 (3.6)	16 (2.8)	29 (4.1)	39 (4.5)	32 (4.0)
United States	39 (2.9)	42 (2.8)	18 (2.2)	43 (3.0)	30 (3.1)	27 (2.8)
‡ England	32 (5.4)	56 (6.0)	11 (3.3)	40 (6.1)	43 (6.0)	17 (4.0)
International Avg.	50 (0.6)	39 (0.6)	11 (0.4)	42 (0.6)	39 (0.6)	19 (0.5)
Benchmarking Participants						
Basque Country, Spain	56 (5.1)	26 (4.2)	18 (3.6)	51 (5.0)	32 (4.7)	17 (3.8)
Indiana State, US	34 (5.0)	45 (6.3)	21 (5.4)	36 (5.3)	37 (5.6)	27 (5.2)
Ontario Province, Can.	44 (5.3)	38 (4.6)	18 (3.7)	37 (5.0)	40 (4.8)	23 (3.9)
Quebec Province, Can.	50 (5.2)	28 (4.1)	23 (4.0)	43 (4.9)	36 (5.3)	22 (4.1)

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

Background data provided by teachers.

‡ 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.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



Exhibit 6.8: Types of Interactions Among Mathematics Teachers

Countries	Percentage of Students by Their Teachers' Interactions with Other Teachers					
	Visit to Another Teacher's Classroom to Observe Teaching			Informal Observations of Their Classroom by Another Teacher		
	At Least Weekly	2 or 3 Times per Month	Never or Almost Never	At Least Weekly	2 or 3 Times per Month	Never or Almost Never
Armenia	22 (3.0)	67 (3.4)	12 (2.2)	11 (2.8)	63 (4.1)	26 (3.3)
Australia	2 (1.0)	13 (2.7)	85 (2.8)	5 (2.0)	16 (3.0)	80 (3.5)
Bahrain	2 (1.1)	46 (2.7)	52 (2.9)	6 (2.1)	34 (3.1)	60 (3.2)
Belgium (Flemish)	0 (0.0)	1 (0.8)	99 (0.8)	5 (1.9)	2 (0.9)	93 (2.2)
Botswana	7 (2.3)	51 (5.0)	42 (4.9)	9 (2.6)	49 (4.7)	42 (4.7)
Bulgaria	3 (1.4)	18 (3.4)	79 (3.7)	1 (0.8)	16 (3.1)	83 (3.3)
Chile	6 (2.1)	7 (2.0)	87 (2.2)	13 (2.5)	15 (3.0)	72 (3.4)
Chinese Taipei	3 (1.4)	27 (3.7)	70 (3.8)	1 (0.0)	8 (2.5)	91 (2.6)
Cyprus	6 (1.8)	17 (1.9)	77 (2.3)	25 (2.8)	21 (2.8)	54 (2.8)
Egypt	37 (3.7)	40 (4.1)	22 (3.4)	9 (2.4)	32 (3.9)	59 (4.4)
Estonia	8 (1.9)	29 (3.6)	64 (3.8)	7 (1.8)	28 (3.1)	65 (3.4)
Ghana	30 (3.9)	41 (4.4)	30 (4.3)	34 (4.2)	43 (4.3)	23 (3.7)
Hong Kong, SAR	1 (1.0)	22 (4.1)	76 (4.2)	1 (1.0)	14 (3.3)	84 (3.4)
Hungary	3 (1.5)	42 (4.1)	55 (4.3)	1 (1.0)	23 (3.3)	76 (3.3)
Indonesia	35 (4.2)	17 (3.4)	48 (4.1)	23 (3.4)	18 (3.4)	59 (4.6)
Iran, Islamic Rep. of	2 (1.2)	14 (2.9)	84 (3.0)	2 (1.1)	22 (3.1)	75 (3.4)
Israel	1 (0.6)	12 (2.8)	87 (2.9)	3 (1.4)	15 (2.8)	82 (3.0)
Italy	2 (1.0)	3 (1.6)	95 (1.9)	11 (2.5)	15 (2.9)	75 (3.1)
Japan	9 (2.4)	18 (3.0)	74 (3.7)	8 (2.3)	14 (3.0)	78 (3.7)
Jordan	10 (3.0)	52 (4.7)	38 (3.8)	8 (2.7)	33 (4.2)	59 (4.5)
Korea, Rep. of	2 (1.1)	11 (2.5)	87 (2.7)	2 (1.2)	9 (2.0)	89 (2.3)
Latvia	6 (2.0)	41 (3.7)	54 (3.4)	6 (2.2)	26 (4.2)	68 (4.5)
Lebanon	8 (2.5)	25 (3.8)	67 (3.7)	12 (2.5)	39 (4.6)	50 (4.7)
Lithuania	3 (1.3)	34 (3.9)	63 (3.9)	3 (1.5)	33 (3.7)	64 (3.9)
Macedonia, Rep. of	8 (2.5)	40 (3.9)	52 (4.2)	5 (2.0)	44 (4.0)	51 (4.1)
Malaysia	8 (2.4)	32 (4.0)	60 (4.0)	7 (2.1)	43 (4.1)	50 (4.4)
Moldova, Rep. of	20 (3.6)	56 (4.8)	24 (4.5)	16 (3.8)	47 (5.0)	38 (4.7)
Morocco	0 (0.0)	11 (4.6)	89 (4.6)	x x	x x	x x
Netherlands	2 (1.1)	11 (3.2)	87 (3.3)	3 (1.4)	11 (3.2)	87 (3.4)
New Zealand	2 (1.0)	22 (2.8)	75 (3.1)	7 (2.2)	41 (5.2)	52 (4.7)
Norway	10 (2.6)	13 (2.4)	77 (3.4)	20 (3.3)	17 (2.9)	63 (4.0)
Palestinian Nat'l Auth.	2 (1.4)	51 (4.1)	47 (4.2)	3 (1.3)	35 (4.0)	62 (4.1)
Philippines	6 (2.2)	27 (4.2)	67 (4.5)	13 (3.0)	54 (4.4)	34 (4.2)
Romania	10 (2.5)	60 (4.1)	30 (3.6)	30 (3.9)	45 (4.3)	25 (3.6)
Russian Federation	12 (2.7)	69 (3.6)	19 (2.6)	6 (1.7)	59 (3.4)	35 (3.3)
Saudi Arabia	2 (1.3)	51 (4.8)	47 (4.6)	4 (1.9)	17 (3.3)	80 (3.6)
Scotland	9 (3.0)	14 (3.1)	77 (4.1)	9 (2.7)	24 (4.4)	67 (4.8)
Serbia	15 (3.0)	20 (3.4)	66 (3.9)	15 (3.1)	24 (3.4)	61 (3.7)
Singapore	3 (0.8)	14 (1.8)	83 (2.0)	3 (1.0)	27 (2.6)	70 (2.6)
Slovak Republic	1 (0.8)	23 (2.9)	76 (2.9)	1 (0.6)	27 (3.6)	72 (3.7)
Slovenia	0 (0.0)	6 (2.1)	94 (2.1)	2 (1.4)	7 (2.3)	91 (2.7)
South Africa	7 (1.9)	36 (3.5)	57 (3.5)	13 (2.4)	40 (3.3)	47 (3.4)
Sweden	4 (1.2)	7 (1.5)	89 (1.8)	5 (1.2)	12 (2.7)	83 (2.7)
Tunisia	1 (1.0)	8 (2.3)	91 (2.5)	1 (1.1)	7 (1.9)	92 (2.2)
United States	4 (1.2)	11 (2.0)	85 (2.3)	4 (1.2)	17 (2.5)	79 (2.5)
‡ England	5 (2.4)	25 (5.0)	71 (5.7)	3 (1.5)	35 (5.7)	63 (5.9)
International Avg.	7 (0.3)	27 (0.5)	65 (0.5)	8 (0.3)	27 (0.5)	65 (0.6)
Benchmarking Participants						
Basque Country, Spain	3 (1.9)	8 (3.0)	89 (3.5)	6 (2.5)	6 (2.4)	88 (3.5)
Indiana State, US	2 (2.1)	4 (1.9)	94 (2.8)	2 (2.1)	11 (3.9)	87 (4.4)
Ontario Province, Can.	4 (1.9)	20 (4.1)	76 (4.5)	5 (2.4)	18 (3.7)	77 (4.3)
Quebec Province, Can.	2 (1.3)	1 (0.3)	97 (1.3)	0 (0.0)	4 (2.1)	96 (2.1)

Background data provided by teachers.

‡ 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.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 6.8: Types of Interactions Among Mathematics Teachers

Countries	Percentage of Students by Their Teachers' Interactions with Other Teachers					
	Discussion About How to Teach a Particular Concept			Working on Preparing Instructional Materials		
	At Least Weekly	2 or 3 Times per Month	Never or Almost Never	At Least Weekly	2 or 3 Times per Month	Never or Almost Never
Armenia	47 (3.6)	48 (3.7)	5 (1.3)	r 30 (4.1)	55 (4.3)	15 (2.1)
Australia	51 (4.2)	37 (4.8)	12 (2.7)	54 (4.6)	31 (4.9)	15 (2.9)
Belgium (Flemish)	52 (3.5)	40 (3.5)	9 (2.0)	41 (3.8)	37 (3.6)	23 (2.6)
Chinese Taipei	54 (4.1)	44 (4.2)	2 (1.2)	24 (3.4)	52 (4.5)	25 (3.7)
Cyprus	59 (3.9)	36 (3.7)	5 (1.7)	59 (3.6)	32 (3.2)	9 (2.0)
England	r 61 (5.2)	28 (5.0)	10 (2.7)	r 62 (4.9)	20 (4.2)	17 (3.5)
Hong Kong, SAR	41 (4.5)	49 (4.5)	9 (2.3)	17 (3.4)	60 (4.8)	24 (4.1)
Hungary	55 (4.3)	41 (4.2)	4 (1.2)	57 (4.2)	35 (3.9)	7 (2.3)
Iran, Islamic Rep. of	62 (4.3)	35 (4.2)	3 (1.7)	64 (4.6)	31 (4.5)	5 (2.0)
Italy	47 (3.0)	42 (3.0)	11 (2.0)	55 (3.6)	32 (3.3)	13 (2.5)
Japan	52 (4.3)	37 (4.3)	11 (2.6)	41 (4.0)	45 (4.3)	14 (2.5)
Latvia	43 (4.1)	45 (4.5)	13 (2.8)	36 (3.9)	56 (4.0)	9 (2.4)
Lithuania	60 (3.5)	33 (3.4)	7 (1.9)	68 (3.2)	27 (3.0)	5 (1.8)
Moldova, Rep. of	57 (4.3)	37 (4.2)	6 (2.0)	74 (3.3)	18 (3.1)	8 (2.2)
Morocco	s 31 (4.6)	29 (4.5)	40 (5.1)	s 12 (3.1)	18 (4.2)	70 (5.0)
Netherlands	42 (4.7)	42 (4.7)	16 (3.2)	25 (4.4)	44 (4.7)	32 (4.4)
New Zealand	65 (3.5)	30 (3.1)	5 (1.5)	57 (3.6)	31 (3.4)	12 (2.2)
Norway	64 (2.9)	28 (3.9)	8 (2.6)	50 (3.6)	30 (3.9)	20 (3.3)
Philippines	58 (5.0)	38 (5.1)	3 (1.4)	71 (4.6)	26 (4.6)	3 (1.3)
Russian Federation	55 (3.3)	43 (3.2)	2 (1.0)	46 (3.4)	48 (3.9)	6 (1.9)
Scotland	r 43 (4.9)	41 (4.7)	16 (3.2)	r 39 (4.7)	37 (4.5)	24 (3.5)
Singapore	42 (4.6)	49 (4.7)	9 (2.2)	35 (4.2)	52 (4.2)	13 (2.8)
Slovenia	64 (4.0)	30 (3.7)	6 (2.2)	38 (4.5)	45 (4.6)	17 (3.4)
Tunisia	55 (4.4)	23 (3.3)	23 (3.7)	r 29 (3.9)	29 (3.7)	42 (4.4)
United States	62 (2.6)	29 (2.3)	9 (1.7)	59 (2.7)	29 (2.7)	11 (1.7)
International Avg.	53 (0.8)	37 (0.8)	10 (0.5)	46 (0.8)	37 (0.8)	17 (0.6)
Benchmarking Participants						
Indiana State, US	59 (5.2)	33 (4.9)	8 (2.9)	48 (4.8)	38 (4.6)	15 (3.0)
Ontario Province, Can.	46 (4.8)	46 (4.7)	9 (2.7)	47 (5.2)	33 (4.7)	20 (3.7)
Quebec Province, Can.	52 (5.0)	34 (4.4)	14 (3.2)	46 (4.5)	33 (4.3)	22 (3.6)

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

Background data provided by teachers.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 6.8: Types of Interactions Among Mathematics Teachers

MATHEMATICS
Grade 4

Countries	Percentage of Students by Their Teachers' Interactions with Other Teachers					
	Visit to Another Teacher's Classroom to Observe Teaching			Informal Observations of Their Classroom by Another Teacher		
	At Least Weekly	2 or 3 Times per Month	Never or Almost Never	At Least Weekly	2 or 3 Times per Month	Never or Almost Never
Armenia	r 19 (3.6)	69 (3.7)	11 (2.2)	r 8 (2.1)	65 (3.8)	27 (3.4)
Australia	9 (2.3)	23 (4.0)	68 (4.3)	18 (3.6)	22 (3.5)	60 (4.3)
Belgium (Flemish)	1 (0.5)	5 (1.4)	94 (1.5)	5 (1.6)	12 (2.5)	83 (2.9)
Chinese Taipei	6 (1.9)	57 (4.4)	37 (4.0)	7 (1.8)	26 (3.8)	67 (4.0)
Cyprus	7 (2.1)	33 (3.4)	60 (3.5)	30 (3.8)	42 (3.9)	27 (3.2)
England	r 2 (1.5)	31 (4.2)	66 (4.4)	r 3 (1.6)	39 (4.9)	58 (4.8)
Hong Kong, SAR	3 (1.6)	35 (4.8)	62 (5.0)	3 (1.6)	15 (3.3)	81 (3.6)
Hungary	3 (1.4)	52 (4.4)	45 (4.3)	2 (1.2)	31 (3.6)	66 (3.5)
Iran, Islamic Rep. of	12 (3.3)	35 (4.7)	54 (5.0)	9 (2.9)	43 (5.0)	48 (5.2)
Italy	8 (1.8)	12 (2.5)	80 (2.9)	9 (1.8)	15 (2.4)	76 (3.0)
Japan	4 (1.4)	45 (3.9)	51 (3.7)	10 (2.5)	21 (3.4)	69 (3.8)
Latvia	4 (1.5)	90 (2.3)	6 (1.9)	9 (1.9)	75 (3.1)	16 (2.6)
Lithuania	1 (0.6)	64 (3.7)	35 (3.7)	1 (0.7)	53 (4.1)	46 (4.1)
Moldova, Rep. of	18 (3.3)	67 (3.9)	15 (2.9)	11 (2.7)	50 (3.9)	39 (4.2)
Morocco	s 5 (2.8)	12 (3.9)	83 (4.7)	s 5 (3.0)	12 (4.3)	83 (4.8)
Netherlands	1 (0.9)	8 (2.8)	92 (3.0)	1 (0.9)	11 (3.2)	88 (3.3)
New Zealand	4 (1.5)	31 (3.1)	65 (3.1)	11 (2.1)	38 (2.7)	51 (2.9)
Norway	13 (3.1)	10 (2.0)	77 (3.5)	27 (3.6)	11 (2.6)	62 (4.4)
Philippines	18 (3.3)	38 (4.4)	44 (4.1)	22 (4.3)	48 (5.0)	30 (4.2)
Russian Federation	12 (2.6)	83 (2.8)	5 (1.3)	9 (2.3)	63 (3.6)	28 (3.1)
Scotland	r 1 (0.7)	11 (2.7)	88 (2.7)	r 11 (2.9)	29 (5.1)	61 (5.4)
Singapore	0 (0.0)	8 (1.8)	92 (1.8)	1 (0.0)	15 (2.8)	84 (2.7)
Slovenia	0 (0.2)	11 (2.9)	88 (2.9)	1 (0.6)	9 (2.4)	89 (2.4)
Tunisia	8 (2.2)	15 (2.9)	77 (3.4)	r 5 (1.5)	9 (2.6)	85 (2.8)
United States	4 (1.1)	16 (1.7)	80 (2.1)	4 (1.1)	17 (1.9)	78 (2.2)
International Avg.	7 (0.4)	34 (0.7)	59 (0.7)	9 (0.5)	31 (0.7)	60 (0.7)
Benchmarking Participants						
Indiana State, US	3 (1.6)	8 (2.4)	90 (2.5)	6 (1.9)	7 (2.1)	87 (3.0)
Ontario Province, Can.	6 (2.4)	12 (2.9)	82 (3.8)	8 (2.6)	14 (3.4)	78 (4.2)
Quebec Province, Can.	3 (1.5)	9 (2.9)	88 (3.2)	5 (2.1)	13 (3.1)	82 (3.3)

Background data provided by teachers.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

More than 80 percent of the students were taught mathematics by teachers having a least some professional development training in these areas.

Exhibit 6.7 presents teachers' reports about their professional development participation in six different aspects of mathematics teaching. The results were relatively consistent across the six topics – content, pedagogy, curriculum, technology, problem solving, and assessment. At the eighth grade, from 43 to 57 percent of the students, on average, internationally, were taught by teachers having participated in professional development in the area during the past two years. The highest percentages, 57 percent in both cases, were for the areas of content and pedagogy. At the fourth grade, on average, the percentages were somewhat lower, ranging from 33 to 47 percent. The highest percentages were for content (46%), pedagogy (47%), and problem solving (46%). The lowest percentage was for integrating information technology into mathematics (33%).

Because opportunities for professional development do not necessarily have to be structured by the school, teachers also were asked about how often they interacted with their colleagues. More specifically, they were asked about discussing teaching strategies for particular concepts, preparing instructional materials, and classroom observations. As shown in Exhibit 6.8, on average, the results for the TIMSS participants were consistent across grades. Teachers of most students (80% or more) reported weekly or monthly interaction about instructional issues. In contrast, observing other teachers or being observed themselves was relatively infrequent (65% never).

How Ready Do Teachers Think They Are to Teach Mathematics?

TIMSS 2003 asked teachers how ready they felt to teach the mathematics topics included in the TIMSS 2003 mathematics framework. Across the five major content areas (number, algebra, measurement,

geometry, and data), the eighth-grade teachers were asked about 18 topics (sub-areas). Exhibit 6.9 contains teachers' reports, indicating that the teachers of almost all the eighth-grade students felt ready to teach nearly all the topics. On average, internationally, the results ranged from 84 to 98 percent, with the results above 90 percent for all but three of the data topics (sources of error, data collection methods, and simple probability). At the fourth grade, the results were very similar. Teachers were asked about 16 topics, with the results ranging from 83 to 100 percent, on average, internationally. The results dipped below 90 percent for only two geometry topics, relationships between two- and three-dimensional shapes (88%) and translation, reflection, and rotation (83%).

At the eighth grade, essentially all students in all countries were taught the number topics by teachers who felt ready to teach the topics. Teachers' reports for the algebra topics were similar, falling substantially below 90 percent of the students only in Tunisia (71 to 74%). In the measurement area, percentages ranged between 55 to 89 percent for at least one topic in a number of countries, including Belgium (Flemish), Botswana, Ghana, Iran, Japan, Moldova, the Philippines, Saudi Arabia, South Africa, and Tunisia. For geometry, readiness reports were uniformly above 90 percent with only few exceptions for particular topics in Chile, Hungary, Moldova, Saudi Arabia, Serbia, and Tunisia. Across the topics, the least amount of readiness was reported for the data topics. For almost all of the countries, for one or more of the data topics, fewer than 90 percent of the students were taught by teachers who felt ready to teach the topic.

At the fourth grade, in general, almost all the students (at least 90%) in all the participating entities (except Tunisia) were taught by teachers who felt ready to teach the topics in number, algebra, measurement, and data. Teachers in several countries felt less ready to teach one more of the geometry topics, including Belgium (Flemish), Hungary, Iran, Japan, the Netherlands, Norway, the Philippines, Singapore, Slovenia, and Tunisia.

Exhibit 6.9: Readiness to Teach Mathematics



Countries	Percentage of Students Whose Teachers Report Feeling They Are Ready to Teach Mathematics Topics					
	Number		Algebra			
	Representing Decimals and Fractions Using Words, Numbers, and Number Lines	Integers, Including Words, Numbers, and Number Lines; Ordering Integers; and Operations (+, -, ×, ÷) with Integers	Numeric, Algebraic, and Geometric Patterns or Sequences	Simple Linear Equations and Inequalities, and Simultaneous (Two Variable) Equations	Equivalent Representations of Functions as Ordered Pairs, Tables, Graphs, Words, or Equations	Attributes of a Graph, Such as Intercepts on Axes, and Intervals
Armenia	99 (0.8)	99 (0.7)	r 99 (0.7)	r 100 (0.3)	100 (0.3)	98 (1.1)
Australia	100 (0.0)	100 (0.0)	100 (0.0)	99 (0.7)	99 (0.7)	98 (1.3)
Bahrain	99 (0.5)	99 (0.5)	94 (2.1)	98 (1.3)	97 (1.3)	94 (2.1)
Belgium (Flemish)	100 (0.4)	99 (0.8)	92 (1.8)	93 (2.3)	95 (1.6)	93 (2.0)
Botswana	r 97 (1.5)	r 98 (1.5)	r 98 (1.2)	r 98 (1.3)	r 95 (2.0)	r 90 (2.8)
Bulgaria	100 (0.0)	100 (0.0)	99 (0.7)	100 (0.0)	100 (0.0)	100 (0.0)
Chile	100 (0.0)	99 (0.8)	95 (1.4)	94 (1.5)	96 (1.5)	90 (2.1)
Chinese Taipei	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	99 (0.6)
Cyprus	98 (0.0)	98 (0.0)	r 98 (0.6)	100 (0.0)	98 (0.0)	97 (0.7)
Egypt	99 (0.8)	100 (0.0)	96 (1.9)	100 (0.0)	100 (0.0)	100 (0.0)
Estonia	100 (0.4)	100 (0.4)	100 (0.0)	100 (0.4)	100 (0.4)	100 (0.4)
Ghana	98 (1.1)	99 (0.9)	97 (1.6)	100 (0.0)	100 (0.5)	94 (2.2)
Hong Kong, SAR	100 (0.0)	100 (0.0)	99 (0.8)	100 (0.0)	99 (0.8)	98 (1.3)
Hungary	100 (0.4)	100 (0.4)	99 (0.5)	100 (0.4)	100 (0.4)	100 (0.4)
Indonesia	s 99 (1.1)	s 100 (0.0)	s 98 (1.5)	s 100 (0.0)	s 100 (0.0)	s 93 (2.9)
Iran, Islamic Rep. of	99 (0.8)	98 (1.0)	90 (2.5)	98 (1.2)	94 (2.2)	87 (2.7)
Israel	99 (0.7)	99 (0.7)	99 (0.9)	99 (0.8)	98 (0.9)	98 (0.9)
Italy	100 (0.0)	100 (0.0)	92 (1.9)	99 (0.7)	98 (0.9)	95 (1.4)
Japan	95 (1.6)	99 (0.7)	93 (2.3)	99 (0.7)	95 (2.0)	97 (1.6)
Jordan	99 (0.7)	98 (1.2)	99 (0.6)	99 (0.8)	97 (1.4)	96 (1.8)
Korea, Rep. of	s 99 (0.5)	s 98 (1.0)	s 93 (2.0)	s 99 (0.4)	s 99 (0.7)	s 98 (1.0)
Latvia	s 100 (0.0)	s 100 (0.0)	s 100 (0.0)	s 100 (0.0)	s 97 (1.5)	s 99 (1.0)
Lebanon	98 (1.4)	100 (0.0)	93 (2.6)	96 (1.8)	95 (2.0)	95 (1.6)
Lithuania	100 (0.0)	100 (0.0)	98 (1.4)	100 (0.0)	100 (0.0)	100 (0.0)
Macedonia, Rep. of	99 (0.7)	99 (1.0)	100 (0.5)	99 (0.7)	99 (1.0)	98 (1.3)
Malaysia	100 (0.0)	100 (0.0)	100 (0.0)	99 (0.7)	97 (1.3)	90 (2.6)
Moldova, Rep. of	r 91 (2.8)	r 91 (2.6)	r 94 (2.1)	r 91 (2.5)	r 89 (3.1)	r 92 (2.6)
Morocco	x x	x x	x x	x x	x x	x x
Netherlands	99 (0.6)	100 (0.0)	96 (1.6)	99 (0.8)	99 (0.6)	100 (0.0)
New Zealand	100 (0.2)	98 (2.2)	100 (0.2)	98 (1.2)	99 (0.6)	100 (0.2)
Norway	100 (0.0)	100 (0.0)	97 (1.8)	97 (1.7)	98 (1.4)	98 (1.5)
Palestinian Nat'l Auth.	100 (0.0)	100 (0.0)	99 (0.8)	100 (0.0)	100 (0.0)	99 (0.9)
Philippines	100 (0.0)	100 (0.0)	97 (1.5)	100 (0.0)	100 (0.0)	99 (1.0)
Romania	100 (0.0)	100 (0.0)	97 (1.4)	100 (0.0)	100 (0.0)	100 (0.0)
Russian Federation	--	--	--	--	--	--
Saudi Arabia	r 96 (1.8)	r 100 (0.0)	r 86 (5.9)	r 95 (2.4)	r 94 (5.3)	r 80 (6.1)
Scotland	100 (0.0)	100 (0.0)	100 (0.0)	95 (2.2)	98 (1.1)	96 (1.8)
Serbia	91 (2.8)	90 (2.9)	93 (2.4)	90 (2.5)	90 (2.5)	90 (2.5)
Singapore	r 99 (0.4)	r 100 (0.4)	r 95 (1.3)	r 99 (0.6)	r 98 (0.8)	r 97 (1.0)
Slovak Republic	100 (0.0)	100 (0.3)	100 (0.0)	100 (0.0)	99 (0.9)	98 (1.2)
Slovenia	100 (0.0)	100 (0.0)	99 (0.8)	100 (0.0)	100 (0.0)	100 (0.0)
South Africa	r 99 (0.9)	r 100 (0.0)	r 99 (0.7)	r 98 (1.0)	r 95 (1.8)	r 91 (2.3)
Sweden	100 (0.2)	100 (0.2)	98 (1.1)	99 (0.8)	98 (0.9)	96 (1.2)
Tunisia	r 99 (1.1)	r 98 (1.3)	r 87 (2.9)	r 71 (4.5)	r 74 (3.9)	r 71 (4.1)
United States	100 (0.0)	100 (0.0)	99 (0.6)	100 (0.2)	99 (0.4)	98 (0.9)
‡ England	--	--	--	--	--	--
International Avg.	99 (0.1)	99 (0.1)	97 (0.3)	98 (0.2)	97 (0.2)	95 (0.3)
Benchmarking Participants						
Basque Country, Spain	99 (0.8)	99 (0.8)	98 (1.6)	99 (0.8)	99 (0.6)	96 (1.2)
Indiana State, US	r 100 (0.0)	r 100 (0.0)	r 100 (0.0)	r 100 (0.0)	r 100 (0.0)	r 100 (0.0)
Ontario Province, Can.	100 (0.0)	98 (1.3)	98 (1.5)	97 (1.7)	99 (0.8)	96 (2.0)
Quebec Province, Can.	100 (0.0)	100 (0.0)	99 (0.9)	90 (3.2)	99 (0.9)	93 (2.6)

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

Background data provided by teachers.

‡ 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 6.9: Readiness to Teach Mathematics (Continued...)



Countries	Percentage of Students Whose Teachers Report Feeling They Are Ready to Teach Mathematics Topics								
	Measurement				Geometry				
	Estimations of Length, Circumference, Area, Volume, Weight, Time, Angle, and Speed	Computations with Measurements in Problem Situations	Measurements of Irregular or Compound Areas	Precision of Measurements	Pythagorean Theorem (Not Proof) to Find Length of a Side	Congruent Figures (Triangles, Quadrilaterals) and their Corresponding Measures	Cartesian Plane (Ordered Pairs, Equations, Intercepts, Intersections, and Gradient)	Translation, Reflection, Rotation, and Enlargement	
Armenia	r 99 (0.7)	r 100 (0.0)	r 98 (1.3)	r 99 (0.1)	100 (0.3)	r 99 (0.5)	r 99 (0.8)	r 98 (1.0)	
Australia	100 (0.0)	99 (1.2)	97 (0.7)	97 (1.5)	100 (0.0)	100 (0.0)	99 (0.8)	98 (1.1)	
Bahrain	96 (2.0)	95 (1.3)	94 (2.3)	93 (1.9)	99 (0.5)	98 (0.5)	x x	96 (1.7)	
Belgium (Flemish)	94 (1.6)	98 (1.0)	83 (2.8)	91 (2.4)	98 (0.8)	98 (1.0)	90 (2.2)	98 (0.9)	
Botswana	r 99 (1.0)	r 98 (1.3)	r 89 (3.1)	r 84 (3.7)	r 97 (1.9)	r 97 (1.7)	r 95 (2.2)	r 96 (2.1)	
Bulgaria	99 (0.6)	99 (0.6)	98 (0.9)	97 (1.4)	98 (1.1)	100 (0.0)	100 (0.0)	100 (0.0)	
Chile	99 (0.9)	98 (1.1)	91 (2.6)	93 (2.1)	98 (1.1)	100 (0.0)	96 (1.6)	76 (3.0)	
Chinese Taipei	98 (1.1)	99 (0.9)	99 (0.6)	100 (0.0)	100 (0.0)	100 (0.0)	98 (0.9)	96 (1.6)	
Cyprus	100 (0.0)	98 (0.0)	95 (1.4)	96 (1.1)	100 (0.0)	100 (0.0)	100 (0.0)	90 (1.7)	
Egypt	97 (1.5)	94 (2.4)	93 (2.1)	94 (2.2)	100 (0.0)	100 (0.0)	x x	r 99 (0.9)	
Estonia	100 (0.4)	100 (0.4)	100 (0.4)	99 (0.8)	99 (0.6)	100 (0.4)	100 (0.4)	99 (0.7)	
Ghana	97 (1.3)	89 (3.4)	79 (4.3)	r 94 (2.3)	96 (2.1)	97 (1.6)	r 94 (2.6)	94 (2.4)	
Hong Kong, SAR	100 (0.1)	100 (0.0)	99 (0.9)	99 (1.1)	100 (0.0)	100 (0.0)	100 (0.0)	96 (1.8)	
Hungary	99 (0.5)	100 (0.4)	99 (0.8)	100 (0.4)	100 (0.4)	100 (0.4)	86 (3.1)	100 (0.4)	
Indonesia	s 99 (0.9)	s 99 (1.0)	s 96 (1.9)	s 96 (1.9)	s 95 (1.8)	s 97 (1.9)	s 100 (0.0)	s 87 (3.7)	
Iran, Islamic Rep. of	97 (1.4)	93 (2.2)	87 (3.1)	82 (3.4)	99 (0.8)	99 (0.7)	98 (0.4)	98 (1.3)	
Israel	98 (1.6)	99 (0.8)	95 (2.1)	93 (2.3)	99 (0.8)	99 (0.8)	98 (1.0)	94 (1.7)	
Italy	99 (0.6)	100 (0.0)	96 (1.5)	92 (2.1)	99 (0.6)	100 (0.5)	98 (0.9)	91 (2.0)	
Japan	94 (2.0)	82 (3.1)	81 (3.4)	74 (3.7)	87 (2.7)	100 (0.0)	97 (1.5)	95 (1.7)	
Jordan	99 (0.6)	97 (1.6)	94 (2.1)	97 (1.5)	99 (0.7)	98 (1.3)	96 (1.6)	90 (2.7)	
Korea, Rep. of	s 95 (1.2)	s 96 (1.4)	s 91 (2.5)	s 96 (1.5)	s 96 (1.7)	s 98 (1.1)	s 99 (0.8)	s 96 (1.2)	
Latvia	s 96 (2.0)	s 99 (0.7)	s 95 (2.2)	s 93 (2.8)	s 100 (0.0)	s 100 (0.0)	s 91 (3.6)	s 92 (2.7)	
Lebanon	98 (1.3)	94 (2.7)	r 92 (2.3)	r 98 (1.4)	98 (1.3)	99 (1.2)	98 (1.3)	96 (1.8)	
Lithuania	100 (0.4)	100 (0.0)	99 (1.0)	99 (0.9)	100 (0.0)	100 (0.0)	100 (0.0)	98 (1.2)	
Macedonia, Rep. of	98 (1.1)	98 (1.1)	95 (1.9)	96 (1.7)	99 (0.7)	99 (0.7)	100 (0.0)	98 (1.3)	
Malaysia	100 (0.0)	95 (1.7)	91 (2.4)	93 (2.1)	100 (0.0)	99 (0.6)	98 (1.2)	98 (1.2)	
Moldova, Rep. of	r 91 (2.8)	r 92 (2.5)	r 89 (2.9)	r 85 (3.2)	r 87 (3.2)	r 89 (3.0)	r 91 (2.6)	r 91 (2.7)	
Morocco	x x	x x	x x	x x	x x	x x	x x	x x	
Netherlands	99 (0.7)	99 (0.7)	98 (1.1)	99 (0.6)	100 (0.0)	100 (0.0)	95 (2.0)	99 (1.0)	
New Zealand	100 (0.2)	97 (2.3)	96 (2.4)	99 (0.6)	97 (1.3)	99 (0.6)	99 (0.6)	97 (2.3)	
Norway	99 (1.4)	100 (0.0)	98 (1.5)	97 (1.7)	98 (1.6)	98 (1.4)	100 (0.0)	99 (1.4)	
Palestinian Nat'l Auth.	99 (0.7)	98 (1.2)	96 (1.9)	99 (0.7)	100 (0.0)	100 (0.0)	99 (0.9)	92 (2.6)	
Philippines	93 (1.9)	92 (2.3)	79 (3.4)	90 (2.8)	93 (2.3)	93 (2.4)	96 (1.6)	76 (3.7)	
Romania	99 (0.9)	99 (1.0)	97 (1.4)	99 (0.8)	100 (0.0)	100 (0.0)	100 (0.0)	95 (1.9)	
Russian Federation	— —	— —	— —	— —	— —	— —	— —	— —	
Saudi Arabia	r 85 (5.8)	r 69 (6.4)	r 73 (6.0)	r 79 (6.3)	r 76 (6.6)	r 99 (1.0)	r 88 (5.6)	r 92 (2.7)	
Scotland	100 (0.0)	100 (0.0)	100 (0.0)	99 (1.0)	99 (1.0)	99 (1.1)	94 (2.4)	96 (2.1)	
Serbia	90 (2.9)	91 (2.7)	91 (2.7)	92 (2.4)	89 (2.7)	90 (2.5)	90 (2.9)	91 (2.8)	
Singapore	r 100 (0.4)	r 99 (0.6)	r 93 (1.6)	r 97 (1.2)	r 100 (0.4)	r 97 (1.0)	r 98 (0.9)	r 97 (1.1)	
Slovak Republic	100 (0.3)	99 (1.2)	99 (0.4)	97 (1.3)	100 (0.0)	100 (0.3)	98 (1.1)	98 (1.0)	
Slovenia	99 (0.8)	99 (0.8)	95 (2.0)	97 (1.5)	100 (0.0)	100 (0.0)	99 (0.7)	99 (0.9)	
South Africa	r 93 (1.8)	r 88 (2.7)	r 79 (3.1)	r 88 (2.8)	r 95 (1.7)	r 98 (0.9)	r 92 (1.9)	r 81 (3.1)	
Sweden	100 (0.2)	100 (0.2)	99 (0.5)	98 (0.9)	98 (0.9)	98 (0.9)	98 (0.8)	93 (1.7)	
Tunisia	r 84 (3.5)	r 68 (4.3)	r 66 (4.4)	r 55 (5.0)	r 47 (5.1)	r 91 (2.4)	r 61 (4.8)	r 40 (4.5)	
United States	99 (0.6)	100 (0.0)	97 (0.9)	97 (1.1)	98 (0.8)	99 (0.7)	98 (1.0)	97 (1.1)	
‡ England	— —	— —	— —	— —	— —	— —	— —	— —	
International Avg.	97 (0.2)	96 (0.3)	92 (0.4)	93 (0.3)	96 (0.3)	98 (0.2)	96 (0.3)	93 (0.3)	
Benchmarking Participants									
Basque Country, Spain	99 (0.8)	99 (0.8)	96 (2.0)	93 (2.5)	99 (0.8)	99 (0.8)	97 (1.9)	90 (3.2)	
Indiana State, US	r 98 (0.2)	r 100 (0.0)	r 97 (2.3)	r 95 (2.3)	r 99 (0.0)	r 100 (0.0)	r 99 (0.6)	r 99 (0.6)	
Ontario Province, Can.	100 (0.0)	100 (0.1)	93 (2.7)	95 (2.0)	100 (0.1)	100 (0.1)	91 (2.9)	98 (1.2)	
Quebec Province, Can.	99 (0.9)	99 (0.5)	99 (0.9)	91 (2.9)	94 (2.8)	98 (1.2)	96 (2.1)	100 (0.4)	

Background data provided by teachers.

‡ 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 6.9: Readiness to Teach Mathematics (...Continued)

Countries	Percentage of Students Whose Teachers Report Feeling They Are Ready to Teach Mathematics Topics							
	Data							
	Sources of Error in Collecting and Organizing Data	Data Collection Methods (e.g., Survey, Experiment, Questionnaire)	Characteristics of Data (Mean, Median, Range, and Shape of Distribution)	Simple Probability				
Armenia	s	92 (2.8)	r	96 (1.8)	r	90 (2.8)	r	86 (3.2)
Australia		95 (1.4)		99 (0.8)		99 (0.6)		98 (0.9)
Bahrain		76 (2.8)		83 (2.9)		90 (2.5)		83 (2.8)
Belgium (Flemish)		73 (3.7)		68 (3.5)		90 (2.2)		69 (3.5)
Botswana	r	84 (3.5)	r	90 (3.0)	r	100 (0.5)	r	87 (3.3)
Bulgaria		73 (4.1)		80 (3.5)		73 (3.8)		80 (3.9)
Chile		80 (3.2)		96 (1.6)		97 (1.3)		85 (2.9)
Chinese Taipei		97 (1.3)		100 (0.0)		100 (0.0)		100 (0.4)
Cyprus		88 (1.9)		92 (1.1)		96 (1.1)		94 (1.1)
Egypt		62 (4.2)		65 (4.1)		95 (2.2)		94 (1.7)
Estonia		97 (1.5)	r	100 (0.5)		98 (1.1)		100 (0.5)
Ghana		90 (3.2)		93 (2.8)		98 (1.3)		93 (3.1)
Hong Kong, SAR		96 (1.8)		98 (1.2)		98 (1.4)		96 (1.8)
Hungary		77 (3.3)		76 (3.2)		85 (2.5)		91 (2.5)
Indonesia	s	86 (3.7)	s	93 (2.6)	s	100 (0.0)	s	96 (1.7)
Iran, Islamic Rep. of		80 (3.7)		83 (3.2)		87 (2.9)		80 (3.5)
Israel		91 (2.3)		96 (1.7)		99 (0.9)		98 (0.8)
Italy		72 (3.3)		97 (1.2)		96 (1.3)		95 (1.5)
Japan		74 (3.6)		76 (3.3)		82 (2.9)		91 (2.4)
Jordan		75 (3.9)		73 (3.9)		88 (3.0)		88 (3.1)
Korea, Rep. of	s	89 (1.9)	s	88 (2.3)	s	96 (1.7)	s	97 (1.4)
Latvia	s	71 (5.4)	s	83 (4.6)	s	78 (5.2)	s	89 (3.9)
Lebanon	r	83 (3.9)	r	88 (3.3)		87 (3.0)		79 (3.8)
Lithuania		95 (1.6)		98 (1.3)		97 (1.3)		96 (1.6)
Macedonia, Rep. of		95 (1.8)		96 (1.7)		97 (1.4)		94 (1.9)
Malaysia		83 (3.1)		92 (2.2)		94 (2.1)		79 (3.3)
Moldova, Rep. of	r	88 (3.0)	r	89 (3.1)	r	87 (3.0)	r	88 (3.2)
Morocco		x x		x x		x x		x x
Netherlands		81 (3.9)		90 (2.6)		100 (0.0)		97 (1.5)
New Zealand		99 (0.6)		100 (0.2)		100 (0.2)		97 (2.4)
Norway		96 (1.9)		96 (1.6)		98 (1.2)		95 (1.9)
Palestinian Nat'l Auth.		82 (3.6)		84 (3.4)		98 (1.2)		99 (0.9)
Philippines		79 (3.9)		80 (4.0)		90 (2.9)		78 (3.9)
Romania		90 (2.6)		95 (1.8)		87 (2.8)		99 (0.9)
Russian Federation		--		--		--		--
Saudi Arabia	r	54 (4.9)	r	49 (6.4)	r	68 (6.8)	r	64 (6.5)
Scotland		90 (3.0)		94 (2.3)		99 (0.6)		99 (1.0)
Serbia	r	85 (3.1)	r	86 (2.9)	r	87 (2.9)		83 (3.5)
Singapore	r	86 (1.8)	r	95 (1.2)	r	98 (0.8)	r	89 (1.5)
Slovak Republic		93 (2.0)		91 (2.6)		97 (1.3)		97 (1.4)
Slovenia		84 (3.2)		91 (2.6)		79 (3.7)		73 (4.0)
South Africa	r	83 (3.0)	r	88 (2.8)	r	92 (2.3)	r	83 (3.0)
Sweden		91 (1.9)		96 (1.2)		97 (1.1)		96 (1.4)
Tunisia	r	65 (4.2)	r	57 (5.3)	r	53 (5.0)	r	59 (3.9)
United States		96 (1.0)		99 (0.6)		100 (0.0)		100 (0.3)
‡ England		--		--		--		--
International Avg.		84 (0.5)		88 (0.4)		92 (0.4)		89 (0.4)
Benchmarking Participants								
Basque Country, Spain		86 (3.7)		91 (3.0)		91 (3.0)		88 (3.6)
Indiana State, US	r	100 (0.0)	r	99 (0.7)	r	100 (0.0)	r	99 (0.0)
Ontario Province, Can.		98 (1.3)		100 (0.0)		100 (0.1)		97 (1.8)
Quebec Province, Can.		85 (4.0)		95 (2.3)		88 (3.8)		97 (1.5)

Background data provided by teachers.

‡ 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 6.9: Readiness to Teach Mathematics (Continued...)



Countries	Percentage of Students Whose Teachers Report Feeling They Are Ready to Teach Mathematics Topics						
	Number				Patterns and Relationships		
	Operations (+, −, X, ÷) with Whole Numbers	Fractions as Part of Whole and Representation on Number Line	Fractions and Decimals Represented by Words, Numbers, or Models	Adding and Subtracting with Decimals	Patterns of Numbers and Shapes	Simple Equations	Finding a Rule for a Relationship Given Some Pair of Numbers
Armenia	r 100 (0.0)	r 100 (0.0)	r 100 (0.4)	r 100 (0.0)	r 97 (1.4)	r 100 (0.0)	r 99 (0.8)
Australia	100 (0.0)	99 (0.4)	99 (0.5)	98 (1.1)	100 (0.1)	99 (1.1)	99 (0.4)
Belgium (Flemish)	100 (0.0)	100 (0.0)	100 (0.2)	100 (0.0)	98 (1.0)	98 (0.9)	97 (1.2)
Chinese Taipei	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	99 (1.0)	99 (1.3)
Cyprus	100 (0.0)	100 (0.0)	100 (0.5)	100 (0.3)	100 (0.5)	100 (0.0)	99 (0.5)
England	--	--	--	--	--	--	--
Hong Kong, SAR	100 (0.0)	100 (0.0)	98 (1.2)	100 (0.5)	98 (1.1)	98 (1.1)	97 (1.4)
Hungary	99 (1.1)	99 (1.1)	95 (2.0)	87 (3.1)	99 (1.1)	98 (1.3)	98 (1.3)
Iran, Islamic Rep. of	98 (1.1)	98 (1.4)	96 (1.8)	96 (1.7)	92 (2.8)	96 (1.8)	87 (2.8)
Italy	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	96 (1.4)	90 (2.2)	95 (1.5)
Japan	99 (1.0)	94 (1.9)	88 (2.5)	98 (1.3)	89 (2.3)	99 (1.0)	84 (2.9)
Latvia	r 99 (1.0)	r 99 (1.0)	r 89 (3.5)	s 88 (3.5)	r 95 (2.0)	r 99 (1.0)	r 96 (1.6)
Lithuania	100 (0.0)	99 (0.8)	95 (1.3)	94 (2.0)	93 (1.7)	100 (0.0)	97 (0.9)
Moldova, Rep. of	99 (0.9)	99 (0.6)	98 (1.3)	98 (1.2)	97 (1.6)	99 (0.9)	97 (1.5)
Morocco	x x	x x	x x	x x	x x	x x	x x
Netherlands	100 (0.0)	100 (0.0)	97 (1.7)	98 (1.4)	97 (1.8)	97 (1.6)	93 (2.6)
New Zealand	100 (0.0)	99 (0.8)	98 (0.7)	95 (1.5)	100 (0.1)	100 (0.0)	98 (0.7)
Norway	100 (0.0)	100 (0.4)	97 (1.6)	100 (0.4)	98 (1.0)	96 (1.9)	89 (2.6)
Philippines	100 (0.0)	99 (0.9)	99 (0.9)	99 (0.8)	95 (2.0)	95 (2.0)	96 (1.9)
Russian Federation	--	--	--	--	--	--	--
Scotland	r 100 (0.0)	r 100 (0.0)	r 100 (0.0)	r 95 (2.4)	r 100 (0.2)	r 98 (1.3)	r 100 (0.2)
Singapore	100 (0.2)	100 (0.2)	100 (0.0)	100 (0.0)	99 (0.8)	98 (1.1)	97 (1.4)
Slovenia	100 (0.0)	99 (0.8)	96 (1.7)	90 (2.3)	99 (0.8)	100 (0.0)	91 (2.6)
Tunisia	99 (1.0)	s 44 (4.6)	s 42 (4.7)	r 51 (4.3)	r 92 (2.4)	r 96 (1.7)	r 92 (2.3)
United States	100 (0.0)	99 (0.4)	99 (0.5)	99 (0.5)	100 (0.4)	99 (0.4)	99 (0.6)
International Avg.	100 (0.1)	97 (0.3)	95 (0.4)	95 (0.4)	97 (0.3)	98 (0.3)	95 (0.4)
Benchmarking Participants							
Indiana State, US	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)	100 (0.0)
Ontario Province, Can.	100 (0.0)	99 (0.8)	99 (0.7)	100 (0.1)	100 (0.2)	100 (0.0)	99 (0.2)
Quebec Province, Can.	100 (0.0)	97 (1.7)	97 (1.7)	95 (1.8)	100 (0.0)	100 (0.0)	99 (0.7)

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

Background data provided by teachers.

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

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 6.9: Readiness to Teach Mathematics (...Continued)



Countries	Percentage of Students Whose Teachers Report Feeling They Are Ready to Teach Mathematics Topics					
	Measurement		Geometry			
	Recognizing and Selecting Appropriate Units to Measure Length, Weight, Time, and Temperature	Estimating and Measuring Length, Area, Volume, Weight, and Time	Familiar 2D and 3D Shapes and Their Properties	Congruent Triangles	Relationship Between 2D and 3D Shapes	Translation, Reflection, and Rotation
Armenia	r 100 (0.0)	r 100 (0.4)	r 99 (0.9)	r 100 (0.0)	r 97 (1.5)	r 96 (1.7)
Australia	100 (0.0)	100 (0.3)	100 (0.1)	100 (0.1)	100 (0.1)	95 (1.7)
Belgium (Flemish)	100 (0.0)	99 (0.8)	93 (1.9)	89 (3.0)	82 (2.5)	81 (3.4)
Chinese Taipei	100 (0.0)	100 (0.0)	99 (0.6)	99 (0.6)	99 (0.8)	94 (2.0)
Cyprus	100 (0.0)	100 (0.0)	100 (0.5)	99 (0.7)	99 (0.5)	--
‡ England	--	--	--	--	--	--
Hong Kong, SAR	100 (0.3)	96 (2.1)	98 (1.4)	97 (1.6)	98 (1.2)	87 (3.3)
Hungary	99 (1.1)	99 (1.1)	92 (2.4)	93 (2.3)	86 (3.0)	90 (2.7)
Iran, Islamic Rep. of	97 (1.5)	97 (1.4)	86 (3.7)	97 (1.5)	78 (3.8)	81 (3.3)
Italy	100 (0.0)	100 (0.0)	96 (1.5)	98 (0.9)	92 (1.9)	96 (1.4)
Japan	97 (1.4)	91 (2.3)	76 (3.6)	86 (2.3)	62 (3.6)	70 (3.4)
Latvia	r 99 (0.9)	r 99 (0.9)	r 96 (1.7)	r 91 (3.5)	s 81 (4.3)	s 68 (4.9)
Lithuania	100 (0.0)	99 (0.6)	96 (1.6)	100 (0.0)	89 (2.3)	73 (2.7)
Moldova, Rep. of	99 (0.7)	99 (0.7)	90 (2.2)	88 (3.0)	89 (2.7)	77 (3.5)
Morocco	x x	x x	x x	x x	x x	x x
Netherlands	97 (1.8)	95 (2.2)	83 (3.8)	85 (3.5)	79 (3.7)	77 (3.8)
New Zealand	99 (0.3)	99 (0.8)	99 (0.4)	97 (0.9)	98 (0.6)	99 (0.8)
Norway	100 (0.4)	99 (0.6)	96 (1.5)	95 (1.4)	90 (2.3)	87 (2.8)
Philippines	95 (1.9)	92 (2.5)	91 (2.9)	96 (2.2)	88 (3.3)	79 (4.1)
Russian Federation	--	--	--	--	--	--
Scotland	r 100 (0.0)	r 100 (0.0)	r 100 (0.0)	r 99 (0.8)	r 99 (0.7)	r 94 (2.3)
Singapore	100 (0.2)	100 (0.2)	98 (0.8)	95 (1.7)	94 (1.9)	87 (2.9)
Slovenia	100 (0.0)	99 (0.8)	97 (1.7)	99 (0.7)	91 (2.6)	84 (3.5)
Tunisia	98 (1.1)	r 98 (1.1)	r 76 (4.2)	r 51 (4.7)	r 56 (4.5)	r 39 (4.9)
United States	99 (0.4)	100 (0.2)	99 (0.5)	100 (0.3)	98 (0.7)	97 (0.9)
International Avg.	99 (0.2)	98 (0.2)	94 (0.5)	93 (0.4)	88 (0.5)	83 (0.7)
Benchmarking Participants						
Indiana State, US	100 (0.0)	99 (1.0)	99 (0.9)	99 (1.0)	99 (0.9)	96 (2.0)
Ontario Province, Can.	99 (0.6)	99 (0.9)	100 (0.0)	98 (1.6)	98 (1.6)	97 (2.0)
Quebec Province, Can.	100 (0.0)	100 (0.2)	100 (0.1)	95 (2.0)	95 (1.9)	97 (1.5)

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

Background data provided by teachers.

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

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 6.9: Readiness to Teach Mathematics

Countries	Percentage of Students Whose Teachers Report Feeling They Are Ready to Teach Mathematics Topics					
	Data					
		Recognizing What Numbers, Symbols, and Points Mean in a Display	Displaying Data Using Tables, Pictographs, and Bar Graphs		Drawing Conclusions from Data	
Armenia	r	98 (1.2)	r	98 (1.1)	r	97 (1.4)
Australia		96 (0.7)		100 (0.1)		100 (0.1)
Belgium (Flemish)		97 (1.0)		98 (0.9)		98 (0.9)
Chinese Taipei		99 (0.6)		99 (0.6)		99 (1.0)
Cyprus		100 (0.0)		100 (0.4)		100 (0.0)
England		--		--		--
Hong Kong, SAR		99 (0.8)		100 (0.0)		100 (0.0)
Hungary		91 (2.7)		89 (3.0)		94 (2.1)
Iran, Islamic Rep. of		93 (2.3)		98 (1.2)		95 (1.8)
Italy		100 (0.0)		100 (0.0)		100 (0.0)
Japan		91 (2.5)		95 (1.8)		88 (2.8)
Latvia	r	93 (2.5)	r	98 (1.0)	r	97 (1.5)
Lithuania		96 (1.4)		97 (1.1)		99 (0.7)
Moldova, Rep. of		97 (1.6)		98 (1.1)		97 (1.4)
Morocco		x x		x x		x x
Netherlands		93 (2.7)		100 (0.0)		97 (1.5)
New Zealand		99 (0.7)		100 (0.0)		100 (0.0)
Norway		92 (2.0)		89 (2.2)		90 (2.2)
Philippines		92 (2.6)		92 (2.8)		90 (2.8)
Russian Federation		--		--		--
Scotland	r	97 (1.8)	r	100 (0.0)	r	100 (0.0)
Singapore		99 (0.8)		100 (0.0)		99 (0.8)
Slovenia		99 (0.8)		98 (1.4)		98 (1.4)
Tunisia	r	82 (3.6)	r	85 (3.2)	r	89 (2.8)
United States		98 (0.5)		100 (0.3)		99 (0.5)
International Avg.		96 (0.4)		97 (0.3)		97 (0.3)
Benchmarking Participants						
Indiana State, US		99 (1.0)		100 (0.0)		100 (0.0)
Ontario Province, Can.		98 (1.6)		100 (0.0)		100 (0.0)
Quebec Province, Can.		99 (0.3)		100 (0.1)		96 (1.6)

Background data provided by teachers.

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

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

An “r” indicates data are available for at least 70 but less than 85% of the students. An “x” indicates data are available for less than 50% of the students.