

Chapter 5

TEACHERS AND INSTRUCTION

Teachers and the instructional approaches they use are fundamental in building students' mathematical understanding. Primary among their many duties and responsibilities, teachers structure and guide the pace of individual, small-group, and whole-class work to present new material, engage students in mathematical tasks, and help deepen students' grasp of the mathematics being studied. Teachers may help students use technology and tools to investigate mathematical ideas, analyze students' work for misconceptions, and promote positive attitudes about mathematics. They also may assign homework and conduct informal as well as formal assessments to monitor progress in student learning, make ongoing instructional decisions, and evaluate achievement outcomes.

Effective teaching is a complex endeavor requiring knowledge about the subject matter of mathematics, the ways students learn, and effective pedagogy in mathematics. It can be fostered through institutional support and adequate resources. Teachers also can support each other in planning instructional strategies, devising real-world applications of mathematical concepts, and developing sequences that move students from concrete tasks to the ability to think for themselves and explore mathematical theories.

TIMSS administered a background questionnaire to teachers to gather information about their backgrounds, training, and how they think about mathematics. The questionnaire also asked about how they spend their time related to their teaching tasks and the instructional approaches they use in their classrooms. Information was collected about the materials used in instruction, the activities students do in class, the use of calculators and computers in mathematics lessons, the role of homework, and the reliance on different types of assessment approaches.

This chapter presents the results of teachers' responses to some of these questions. Because the sampling for the teacher questionnaires was based on participating students, the responses to the mathematics teacher questionnaire do not necessarily represent all of the eighth-grade mathematics teachers in each of the TIMSS countries. Rather, they represent teachers of the representative samples of students assessed. It is important to note that in this report, the student is always the unit of analysis, even when information from the teachers' questionnaires is being reported. Using the student as the unit of analysis makes it possible to describe the instruction received by representative samples of students. Although this approach may provide a different perspective 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.

Because countries were required to sample two classes (from adjacent grades), it was possible for an individual to be the mathematics or science teacher of both classes. In order to keep the response burden for teachers to a minimum, no teacher was asked to respond to more than one questionnaire, even where that teacher taught mathematics or science to more than one of the sampled classes. This, together with the fact that teachers sometimes did not complete the questionnaire assigned to them, meant that each country had some percentage of students for whom no teacher questionnaire information was available. The tables in this chapter contain special notation regarding the availability of teacher responses. For a country where teacher responses are available for 70% to 84% of the students, an “r” is included next to the data for that country. When teacher responses are available for 50% to 69% of the students, an “s” is included next to the data for that country. When teacher responses are available for less than 50% of the students, an “x” replaces the data.¹

WHO DELIVERS MATHEMATICS INSTRUCTION?

This section provides information about the mathematics teaching force in each of the participating countries, in terms of certification, degrees, age, gender, and years of teaching experience.

Table 5.1 summarizes information gathered from each country about the requirements for certification held by the majority of the seventh- and eighth-grade teachers. In many countries, the type of education required for qualification includes a university degree. In other countries, study at a teacher training institution is required, or even both a university degree and study at a teacher training institution. The number of years of post secondary education required for a teaching qualification ranged from two years in Iran to as much as six years in Canada, although many countries reported four years. All of the countries except Colombia, Cyprus, Greece, and Lithuania reported that teaching practice was required. A large number of countries reported that an evaluation or examination was required for certification. Those countries not having such a requirement included Canada, Colombia, Cyprus, Greece, Iran, Israel, Korea, Portugal, and the United States.

Table 5.2 contains teachers’ reports on their age and gender. If a constant supply of teachers were entering the teaching force, devoting their careers to the classroom, and then retiring, one might expect approximately equivalent percentages of students taught by teachers in their 20s, 30s, 40s, and 50s. However, this does not appear to hold for most countries. In most countries, the majority of the eighth-grade students were taught by teachers in their 30s or 40s. Very few countries seemed to have a comparatively younger teaching force, but those that did included Hong Kong, Iran, Kuwait, and Portugal. In these four countries, 40% or more of the students had mathematics teachers 29 years or younger and 70% had teachers in their 30s or younger. According to teachers’ reports, the teaching force in eighth-grade mathematics was comparatively older in a number of countries. The TIMSS participants

¹ Similar to Chapter 4, background data are not available for Bulgaria and South Africa.

where 70% or more of the eighth-grade students had mathematics teachers in their 40s or older included the Czech Republic, Denmark, France, Germany, Norway, Romania, the Slovak Republic, and Spain.

In about one-fourth of the countries, approximately equivalent percentages of eighth-grade students were taught mathematics by male teachers and female teachers. However, at least 70% of the eighth-grade students had female mathematics teachers in the Czech Republic, Hungary, Israel, Latvia (LSS), Lithuania, the Russian Federation, the Slovak Republic, and Slovenia. In contrast, at least 70% of the students had male teachers in Greece, Japan, the Netherlands, and Switzerland.

As might be expected from the differences in teachers' ages from country to country, the TIMSS data indicate differences in teachers' longevity across countries (see Table 5.3). Those countries with younger teaching forces tended to have more students taught by less experienced teachers. At least half the eighth-grade students had mathematics teachers with 10 years or less of experience in Hong Kong, Iran, Korea, Kuwait, Portugal, and Thailand. In contrast, at least half the students had mathematics teachers with more than 20 years of experience in Belgium (French), the Czech Republic, France, Romania, the Slovak Republic, and Spain.

The relationship between years of teaching experience and mathematics achievement was not consistent across countries. In about one-fourth of the countries, the eighth-grade students with the most experienced teachers (more than 20 years) had higher mathematics achievement than did those with less experienced teachers (5 years or fewer). This may reflect the practice of giving teachers with more seniority the more advanced classes. However, in several countries, this pattern of higher student performance for the more experienced teachers was reversed. For another one-fourth of the countries or so, there was essentially no difference in student performance in relation to years of teaching experience. For the remaining countries, there were inconsistent patterns of performance differences in relation to years of teaching experience.

Table 5.1**Requirements for Certification Held by the Majority of Lower- and Upper-Grade (Seventh and Eighth Grade*) Teachers¹**

Country	Type of Education Required for Qualification	Number of Years of Post-Secondary Education Required	Teaching or Practice Experience Required	Evaluation or Examination Required
Australia	University or Teacher Training Institution	4	yes	yes
Austria	Teacher Training Institution: Teachers in the general secondary schools (70%) are required to have an education from a teacher training institution. Teachers in the academic secondary schools (30%) are required to have a university education.	3–5	yes	yes
Belgium (Fl)	Teacher Training Institution	3	yes	yes
Belgium (Fr)	Teacher Training Institution	3	yes	yes
Bulgaria	University	5	yes	yes
Canada	University	5–6	yes	no
Colombia	University	4	no	no
Cyprus	University	4	no	no
Czech Republic	University	4–5	yes	yes
Denmark	Teacher Training Institution	4	yes	yes
England	University or Higher Education Institution: Teachers of lower- and upper-grade students normally study their specialist subject area for their degree for 3 or 4 years. This is followed by a one-year post graduate course. However, some teachers study education and specialty concurrently. All teachers who qualified since 1975 are graduates. Some teachers who qualified before this date hold teacher certificates but are not graduates.	3–5	yes	yes
France	University and Teacher Training: As of 1991, teachers of lower- and upper-grade students are required to have a 3-year university diploma, followed by a competitive examination and professional training. The majority of teachers (more than 50%) meet the requirements (more in the public schools than in the private sector). Yet, there are still many teachers recruited before 1991 who do not have the same level of qualification.	4 or 5	yes	yes
Germany	University and Post-University Teacher Training Institution	3–5 +2 years	yes	yes
Greece	University	4	no	no
Hong Kong	University and one year Post-Graduate training	4	yes	yes
Hungary	Teacher Training Institution	4	yes	yes
Iceland	University	3	yes	yes
Iran	Teacher Training Institution	2	yes	no
Ireland	University with Post Graduate University Training	4–5	yes	yes
Israel	University	4	yes	no
Japan	University	4	yes	yes

*Seventh and eighth grades in most countries; see Table 2 for more information about the grades tested in each country.

¹Certification pertains to the majority (more than 50%) of teachers of lower- and upper-grade students in each country.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95. Information provided by TIMSS National Research Coordinators.

Table 5.1 (Continued)**Requirements for Certification Held by the Majority of Lower- and Upper-Grade (Seventh and Eighth Grade*) Teachers¹**

Country	Type of Education Required for Qualification	Number of Years of Post-Secondary Education Required	Teaching or Practice Experience Required	Evaluation or Examination Required
Korea	University	4	yes	no
Kuwait	University	4	yes	yes
Latvia	Pedagogical Institution	4	yes	yes
Lithuania	University or Teacher Training Institution	5	no	yes
Netherlands	Teacher Training Institution	4	yes	yes
New Zealand	Teacher Training Institution or University with Teacher Training Institution: Teachers of students in the lower grade are required to attend a teacher training institution. Teachers in the upper grade are required to have a university and teacher training institution education.	3 (lower gr.) 4 (upper gr.)	yes	yes
Norway	Teacher Training Institution or University: Most teachers of students in the lower grade have a certificate from a teacher training institution. For teachers of students in the upper grade there is about an equal distribution between those who attended a teacher training institution and those who attended university.	3–4 ²	yes	yes
Philippines	Teacher Training Institution or University	4	yes	yes
Portugal	University	3–5	yes	no
Romania	University	4–5	yes	yes
Russian Federation	University or Teacher Training Institution or Post-Graduate University Training	4–5	yes	yes
Scotland	University or Teacher Training Institution	4	yes	yes
Singapore	Post-Graduate University Training	4–5	yes	yes
Slovak Republic	Teacher Training Institution or University	4–5 ³	yes	yes
Slovenia	University	4–5	yes	yes
South Africa	Teacher Training Institution	3	yes	yes
Spain	Teacher Training Institution or University	3	yes	yes
Sweden	Teacher Training Institution (lower grade) University (upper grade)	3–3.5 (lower gr.) ⁴ 4–4.5 (upper gr.)	yes	yes
Switzerland	University or Teacher Training Institution	2–4	yes	yes
Thailand	Teacher Training Institution or University	4	yes	yes
United States	University	4	yes	no

*Seventh and eighth grades in most countries; see Table 2 for more information about the grades tested in each country.

¹Certification pertains to the majority (more than 50%) of teachers of lower- and upper-grade students in each country.

²Norway: Until 1965 2 years of post-secondary education were required. Between 1965 and 1995 3 years were required.

As of 1996, new certified teachers are required to have completed 4 years of post-secondary education.

³Slovak Republic: In the past, 4 years of study at a teacher training institution were required. Currently, the requirement is 5 years at a teacher training institution or university.

⁴Sweden: Until 1988 3 years of post-secondary education were required for lower-grade teachers and 4 years for upper-grade teachers.

Since 1988 3.5 years of post-secondary education are required for lower-grade teachers and 4–4.5 years are required for upper-grade teachers.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994–95. Information provided by TIMSS National Research Coordinators.

Table 5.2**Teachers' Reports on Their Age and Gender
Mathematics - Upper Grade (Eighth Grade*)**

Country	Percent of Students Taught by Teachers				Percent of Students Taught by Teachers	
	29 Years or Under	30 - 39 Years	40 - 49 Years	50 Years or Older	Female	Male
<i>Australia</i>	22 (2.6)	27 (3.2)	41 (3.3)	10 (1.9)	44 (3.3)	56 (3.3)
<i>Austria</i>	r 9 (2.6)	38 (3.8)	42 (4.6)	10 (2.7)	r 48 (4.4)	52 (4.4)
Belgium (Fl)	13 (3.1)	28 (4.2)	30 (4.2)	29 (4.9)	66 (4.3)	34 (4.3)
<i>Belgium (Fr)</i>	s 5 (2.3)	26 (5.0)	46 (6.0)	23 (5.1)	s 51 (5.5)	49 (5.5)
Canada	15 (2.4)	21 (3.1)	39 (3.9)	26 (3.2)	38 (4.3)	62 (4.3)
<i>Colombia</i>	23 (4.4)	25 (4.1)	40 (4.5)	12 (2.9)	34 (4.2)	66 (4.2)
Cyprus	0 (0.0)	38 (4.7)	47 (5.2)	15 (3.5)	r 61 (5.6)	39 (5.6)
Czech Republic	8 (2.4)	20 (3.6)	41 (4.7)	31 (4.8)	82 (3.2)	18 (3.2)
<i>Denmark</i>	2 (1.4)	22 (4.0)	52 (4.7)	24 (4.0)	35 (4.5)	65 (4.5)
England	s 17 (2.5)	23 (3.1)	43 (2.8)	17 (2.4)	s 45 (3.6)	55 (3.6)
France	11 (2.7)	17 (3.7)	48 (5.0)	24 (3.8)	43 (4.5)	57 (4.5)
<i>Germany</i>	s 0 (0.0)	13 (3.5)	36 (5.2)	51 (5.3)	s 33 (4.9)	67 (4.9)
<i>Greece</i>	0 (0.4)	33 (4.4)	54 (4.2)	12 (4.2)	30 (3.8)	70 (3.8)
Hong Kong	48 (6.1)	29 (5.1)	11 (3.7)	12 (3.8)	40 (5.2)	60 (5.2)
Hungary	10 (2.5)	31 (4.4)	42 (4.4)	18 (3.1)	87 (3.1)	13 (3.1)
Iceland	r 12 (4.9)	39 (7.0)	29 (6.0)	20 (6.9)	r 39 (5.6)	61 (5.6)
Iran, Islamic Rep.	44 (4.8)	36 (5.1)	17 (3.0)	2 (1.6)	37 (4.8)	63 (4.8)
Ireland	17 (3.6)	34 (4.3)	35 (4.1)	14 (3.1)	58 (4.0)	42 (4.0)
<i>Israel</i>	r 12 (4.8)	27 (7.3)	41 (7.8)	20 (6.3)	r 95 (2.4)	5 (2.4)
Japan	22 (3.2)	43 (3.7)	25 (3.5)	10 (2.5)	28 (3.8)	72 (3.8)
Korea	26 (3.7)	43 (4.4)	12 (3.2)	19 (3.0)	45 (3.9)	55 (3.9)
<i>Kuwait</i>	40 (8.1)	40 (7.6)	16 (3.5)	3 (2.8)	51 (7.8)	49 (7.8)
Latvia (LSS)	15 (3.5)	41 (5.1)	20 (3.8)	24 (4.2)	90 (2.8)	10 (2.8)
Lithuania	8 (2.3)	36 (4.1)	22 (3.5)	34 (4.4)	87 (2.6)	13 (2.6)
<i>Netherlands</i>	6 (2.5)	33 (5.2)	50 (5.2)	11 (2.9)	22 (4.1)	78 (4.1)
New Zealand	12 (2.5)	38 (4.2)	35 (3.8)	15 (3.3)	42 (4.1)	58 (4.1)
Norway	7 (2.1)	23 (3.8)	39 (4.1)	31 (3.5)	32 (3.9)	68 (3.9)
Portugal	45 (4.5)	35 (4.1)	14 (2.2)	6 (2.2)	68 (3.8)	32 (3.8)
<i>Romania</i>	11 (2.4)	18 (3.1)	41 (4.3)	30 (4.0)	64 (4.0)	36 (4.0)
Russian Federation	18 (3.6)	29 (3.3)	33 (3.1)	21 (3.2)	97 (1.2)	3 (1.2)
<i>Scotland</i>	14 (3.3)	28 (4.4)	40 (4.9)	18 (3.2)	45 (4.6)	55 (4.6)
Singapore	26 (4.1)	18 (3.2)	33 (4.6)	23 (3.8)	60 (4.5)	40 (4.5)
Slovak Republic	7 (2.0)	22 (3.6)	50 (4.7)	22 (3.7)	79 (3.9)	21 (3.9)
<i>Slovenia</i>	r 9 (3.0)	59 (4.9)	22 (4.4)	10 (2.5)	r 87 (3.6)	13 (3.6)
Spain	0 (0.4)	24 (3.6)	48 (4.3)	28 (3.7)	37 (4.1)	63 (4.1)
Sweden	10 (2.2)	22 (3.5)	27 (3.2)	41 (4.3)	33 (3.3)	67 (3.3)
Switzerland	10 (3.5)	27 (3.9)	37 (4.4)	25 (3.9)	13 (2.3)	87 (2.3)
<i>Thailand</i>	r 25 (5.0)	43 (6.2)	29 (6.2)	3 (2.3)	r 61 (6.2)	39 (6.2)
United States	17 (3.0)	19 (3.2)	44 (4.4)	19 (2.9)	65 (4.0)	35 (4.0)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.3

Teachers' Reports on Their Years of Teaching Experience Mathematics - Upper Grade (Eighth Grade*)

Country	0 - 5 Years		6-10 Years		11-20 Years		More than 20 Years	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	18 (2.3)	517 (8.5)	19 (2.6)	528 (11.6)	35 (2.7)	540 (8.5)	28 (2.6)	533 (8.5)
<i>Austria</i>	r 7 (2.3)	516 (19.7)	13 (2.5)	546 (9.5)	51 (4.0)	554 (6.7)	28 (3.6)	549 (8.8)
Belgium (Fl)	10 (2.8)	556 (17.9)	9 (2.2)	590 (14.5)	32 (4.8)	554 (13.4)	49 (4.9)	575 (10.6)
<i>Belgium (Fr)</i>	s 8 (3.2)	536 (12.3)	8 (2.3)	528 (13.8)	31 (5.2)	558 (7.0)	54 (4.8)	543 (6.4)
Canada	17 (2.6)	527 (6.7)	15 (2.9)	527 (5.0)	22 (3.6)	526 (7.6)	46 (3.8)	528 (3.8)
<i>Colombia</i>	18 (3.0)	409 (7.7)	22 (5.0)	375 (11.7)	27 (4.3)	385 (6.0)	33 (4.2)	385 (5.0)
Cyprus	r 30 (4.6)	474 (4.6)	19 (4.3)	474 (7.6)	25 (5.0)	467 (6.4)	26 (4.7)	471 (5.5)
Czech Republic	12 (3.1)	566 (17.7)	9 (1.9)	538 (8.6)	17 (4.1)	584 (11.4)	62 (4.7)	562 (5.7)
<i>Denmark</i>	4 (1.9)	487 (2.6)	4 (2.0)	493 (14.4)	47 (4.9)	504 (3.3)	45 (4.8)	508 (4.4)
England	s 19 (2.5)	522 (10.8)	11 (2.1)	518 (13.5)	39 (3.5)	512 (8.1)	31 (3.0)	515 (11.3)
France	11 (2.5)	539 (8.1)	11 (3.1)	529 (10.2)	26 (4.6)	540 (8.8)	52 (4.3)	538 (5.4)
<i>Germany</i>	s 10 (2.2)	534 (14.5)	14 (4.3)	471 (12.1)	32 (5.1)	521 (10.6)	44 (5.5)	516 (9.3)
<i>Greece</i>	16 (3.1)	464 (7.2)	20 (3.4)	469 (5.3)	47 (4.3)	490 (3.5)	17 (4.4)	503 (11.9)
Hong Kong	53 (5.9)	585 (9.7)	14 (3.3)	606 (16.3)	18 (4.2)	574 (19.2)	15 (3.9)	596 (19.8)
Hungary	13 (2.9)	530 (12.7)	10 (2.8)	510 (7.4)	38 (4.1)	537 (5.6)	38 (4.1)	547 (5.2)
Iceland	r 19 (5.1)	478 (5.3)	14 (3.8)	480 (8.5)	33 (7.1)	492 (7.3)	35 (7.7)	496 (10.6)
Iran, Islamic Rep.	38 (4.5)	417 (3.7)	24 (4.8)	437 (3.8)	24 (4.3)	433 (3.2)	14 (3.0)	440 (4.8)
Ireland	13 (3.0)	513 (16.3)	18 (3.5)	512 (12.5)	42 (4.5)	535 (8.4)	28 (4.5)	523 (10.0)
<i>Israel</i>	r 16 (6.1)	490 (9.1)	12 (4.3)	555 (15.9)	45 (7.4)	510 (8.3)	27 (7.4)	548 (13.7)
Japan	19 (3.3)	606 (5.0)	25 (3.5)	607 (4.3)	36 (3.8)	598 (3.5)	19 (2.9)	614 (4.0)
Korea	28 (3.5)	610 (4.7)	29 (3.9)	622 (5.6)	23 (3.7)	597 (5.6)	20 (3.1)	606 (5.5)
<i>Kuwait</i>	r 30 (6.7)	397 (3.3)	33 (5.5)	388 (3.4)	31 (7.0)	388 (4.1)	6 (4.1)	418 (8.5)
Latvia (LSS)	12 (3.4)	496 (7.0)	16 (3.4)	482 (8.8)	38 (5.0)	496 (5.5)	34 (5.1)	490 (5.8)
Lithuania	r 5 (1.8)	455 (9.2)	15 (3.3)	465 (11.0)	33 (4.2)	482 (8.4)	47 (4.3)	481 (5.2)
<i>Netherlands</i>	13 (3.6)	530 (19.5)	21 (3.6)	525 (10.2)	42 (5.3)	548 (17.8)	24 (4.0)	556 (9.3)
New Zealand	17 (3.1)	497 (7.5)	28 (4.0)	515 (7.9)	34 (4.1)	517 (9.2)	20 (3.4)	487 (9.4)
Norway	12 (2.7)	499 (10.7)	10 (2.5)	500 (6.1)	35 (4.0)	508 (4.0)	43 (4.6)	503 (3.4)
Portugal	51 (4.7)	449 (3.0)	16 (3.1)	447 (5.4)	27 (3.9)	462 (4.3)	6 (2.3)	477 (8.6)
<i>Romania</i>	10 (2.3)	452 (14.2)	15 (3.1)	466 (9.9)	14 (3.1)	496 (12.8)	61 (4.2)	486 (5.7)
Russian Federation	16 (3.7)	541 (25.2)	14 (2.5)	532 (9.7)	29 (4.0)	526 (7.1)	41 (5.0)	538 (6.6)
<i>Scotland</i>	17 (3.4)	483 (9.2)	12 (3.2)	484 (14.3)	42 (4.4)	496 (8.5)	29 (4.3)	507 (12.3)
Singapore	30 (4.5)	617 (9.4)	11 (2.8)	658 (14.0)	11 (3.0)	664 (13.4)	48 (4.6)	652 (7.0)
Slovak Republic	6 (1.9)	556 (13.3)	15 (3.3)	531 (8.5)	21 (3.5)	539 (8.2)	58 (4.5)	553 (4.6)
<i>Slovenia</i>	r 4 (1.9)	537 (23.2)	19 (4.0)	533 (6.0)	55 (5.0)	542 (5.5)	22 (3.8)	550 (6.2)
Spain	3 (0.8)	472 (17.7)	8 (2.4)	487 (7.6)	39 (4.3)	488 (3.8)	50 (4.3)	488 (3.1)
Sweden	16 (2.4)	529 (7.1)	15 (2.8)	512 (9.5)	26 (3.1)	518 (6.2)	44 (4.1)	520 (4.4)
Switzerland	14 (3.3)	540 (10.1)	6 (1.8)	545 (19.0)	37 (4.6)	549 (8.4)	42 (4.9)	548 (7.4)
<i>Thailand</i>	s 48 (6.6)	517 (8.9)	12 (2.6)	499 (9.3)	35 (6.2)	540 (10.9)	5 (3.4)	615 (17.7)
United States	25 (3.4)	484 (6.3)	14 (2.7)	488 (9.8)	25 (3.2)	501 (7.3)	36 (3.3)	513 (7.5)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

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An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

WHAT ARE TEACHERS' PERCEPTIONS ABOUT MATHEMATICS?

Figure 5.1 depicts the percentages of eighth-grade students whose mathematics teachers reported certain beliefs about mathematics and the way mathematics should be taught. Teachers in many countries indicated a fairly practical view of mathematics, seeing it essentially as a way of modeling the real world. However, there was variation across countries in the amount of agreement with this view of the nature of mathematics. In Thailand and Iran, nearly all students had teachers who agreed or strongly agreed that mathematics is primarily a formal way of representing the real world, while in several of the Central or Eastern European countries (Slovenia, the Russian Federation, the Czech Republic, and Hungary), about 40% or fewer of the students' mathematics teachers agreed with this view.

There also appeared to be nearly uniform agreement by teachers across countries about the inherent nature of mathematical abilities. In most countries, 80% or more of the students had teachers who agreed that some students have a natural talent for mathematics.

Regarding perceptions about how to teach mathematics, teachers' opinions varied across countries concerning whether or not more practice during class is an effective approach to help students having difficulty. At least 80% of the eighth-grade students in the Czech Republic, Cyprus, Greece, Iran, the Slovak Republic, Thailand, Kuwait, Portugal, and Romania had teachers who agreed or strongly agreed with this approach. Conversely, fewer than 20% of the students in the Russian Federation and Norway had teachers who agreed with this approach.

There was nearly complete agreement by teachers across countries, however, that more than one representation should be used in teaching a mathematics topic. In only Hungary and Thailand did fewer than 80% of the eighth-grade students have teachers that agreed with this approach. This instructional approach is particularly useful in helping students with different learning styles understand key ideas. Also, using data in different formats reinforces the idea of mathematics as a network of interconnected concepts and procedures.

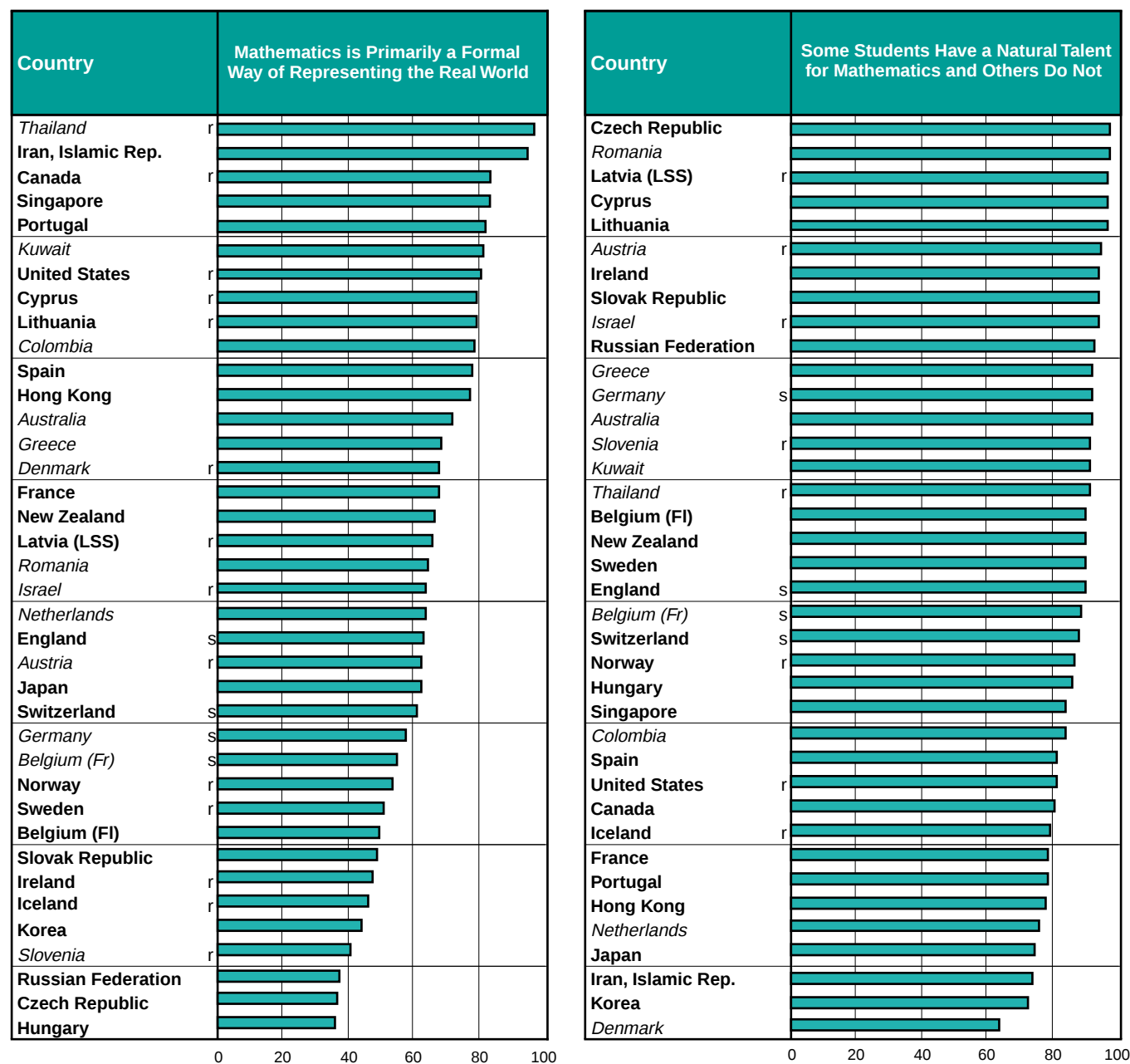
TIMSS also queried teachers about the cognitive demands of mathematics, asking them to rate the importance of various skills for success in the discipline. Figure 5.2 shows the percentages of students whose teachers rated each of four different skills as very important. Across the participating countries, the fewest students had teachers who felt the ability to remember formulas and procedures was very important. There was a range, however, with teachers of approximately 70% of the eighth-grade students in Kuwait and Ireland rating this ability as very important compared to those of fewer than 20% of the students in Slovenia, Sweden, Korea, Austria, Portugal, Israel, Denmark, the Czech Republic, and Switzerland.

Internationally, most mathematics teachers felt it was very important for students to be able to think creatively, to understand how mathematics is used in the real world, and to be able to provide reasons to support their solutions. However, there was some variation across countries. Fewer than 40% of the eighth-grade students in

Israel, Austria, Belgium (Flemish), Switzerland, Ireland, England, and France had teachers who felt it was very important to think creatively, and fewer than 40% in Latvia (LSS), Korea, Thailand, Belgium (Flemish), Hong Kong, France, Israel, the Netherlands, Switzerland, and Ireland had teachers who felt it was very important to understand how mathematics is used in the real world. With the current calls from business and industry for helping students improve their ability to apply mathematics and solve practical problems in job-related situations, it might be rather surprising that teachers in these countries do not place more importance on these latter two aspects of mathematics. In all countries except the Czech Republic, Switzerland, the Netherlands, and Austria, the majority of students had teachers who felt it was very important to be able to provide reasons to support mathematical solutions.

Figure 5.1

Percent of Students Whose Mathematics Teachers Agree or Strongly Agree with Statements About the Nature of Mathematics and Mathematics Teaching Upper Grade (Eighth Grade*)



*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in *italics* did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

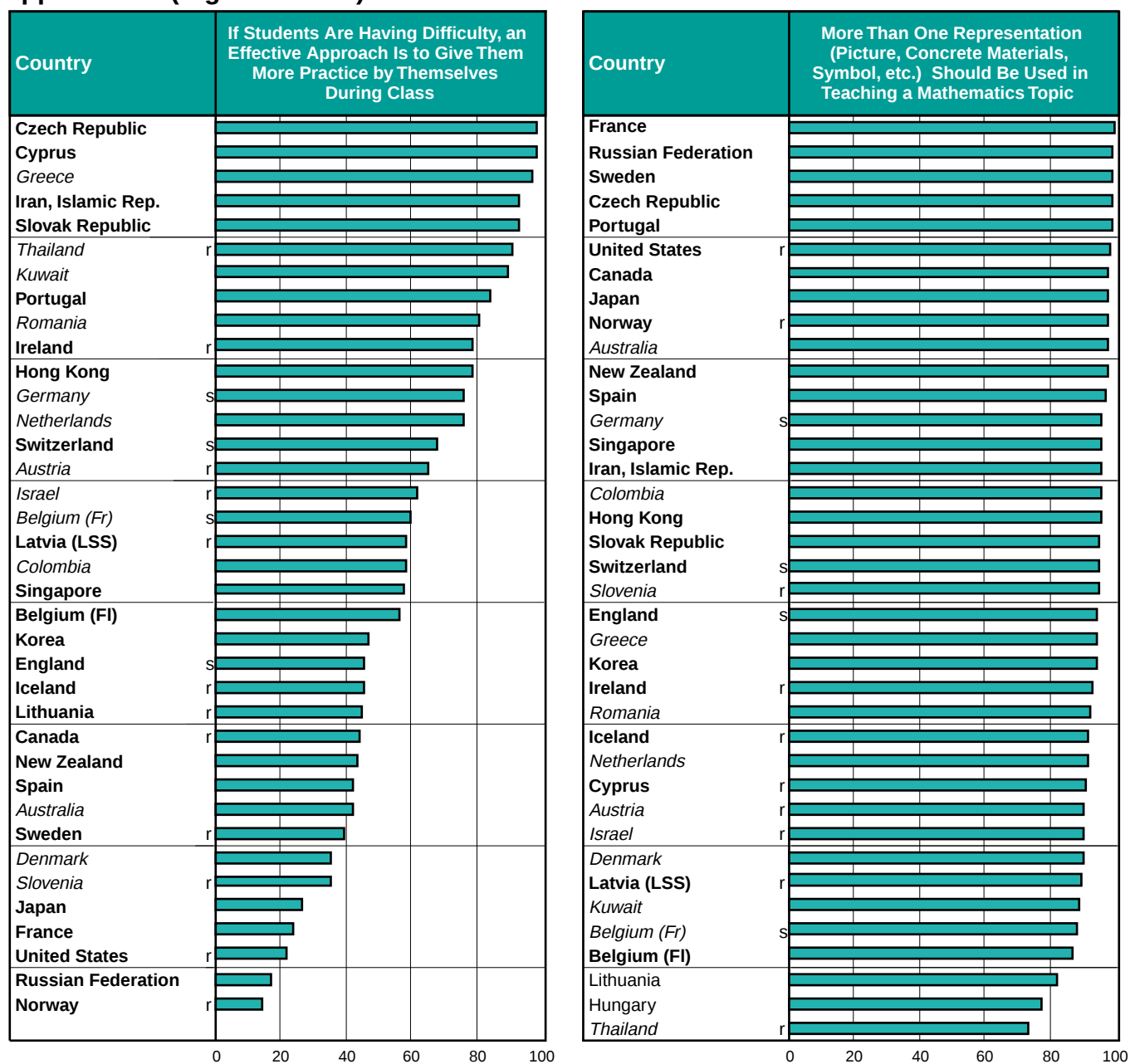
An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

Scotland did not ask these questions.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 5.1 (Continued)

Percent of Students Whose Mathematics Teachers Agree or Strongly Agree with Statements About the Nature of Mathematics and Mathematics Teaching Upper Grade (Eighth Grade*)



*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

Scotland did not ask these questions. Hungary did not ask teachers their opinions about the effectiveness of more individual practice.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 5.2

Percent of Students Whose Mathematics Teachers Think Particular Abilities Are Very Important for Students' Success in Mathematics in School - Upper Grade (Eighth Grade*)



*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

Scotland did not ask these questions.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 5.2 (Continued)

Percent of Students Whose Mathematics Teachers Think Particular Abilities Are Very Important for Students' Success in Mathematics in School - Upper Grade (Eighth Grade*)



*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

Scotland did not ask these questions.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

HOW DO MATHEMATICS TEACHERS SPEND THEIR SCHOOL-RELATED TIME?

The data in Table 5.4 reveal that in a number of countries, eighth-grade mathematics teachers are specialists. In Belgium (Flemish), Belgium (French), Cyprus, England, France, Kuwait, Lithuania, the Netherlands, New Zealand, Portugal, the Russian Federation, Scotland, and Slovenia, the majority of eighth-grade students had teachers who spent at least 75% of their formally scheduled school time teaching mathematics.

For most participating countries, there was little difference in students' achievement according to whether they were taught by specialists. However, in some countries, such as Austria, England, France, Germany, Ireland, and Switzerland those students with specialists for teachers had higher average mathematics achievement. In Switzerland, this is at least partially because specialists teach the students in the higher tracks and generalists the students in lower tracks, and a similar situation may exist in the other countries displaying this relationship between achievement and degree of teaching specialization. Generally, it is important to keep in mind the complexity of the relationships between instruction and achievement. In tracked systems, many characteristics of instruction can be related to the track.

As shown in Table 5.5, teachers in most countries reported that mathematics classes typically meet for at least 2 hours per week, but less than 3.5 hours. However, from 3.5 up to nearly 5 hours of weekly class time was reported for 50% or more of the eighth-grade students in Belgium (Flemish), Belgium (French), Canada, Colombia, the Czech Republic, France, Hong Kong, Kuwait, Latvia (LSS), New Zealand, the Russian Federation, Scotland, the Slovak Republic, Spain, Switzerland, and the United States. The data reveal no clear pattern between the number of in-class instructional hours and mathematics achievement either across or between countries. Common sense and research both support the idea that increased time on task can yield commensurate increases in achievement, yet this time also can be spent outside of school on homework or in special tutoring. The ability to use straightforward analyses such as these to disentangle complicated relationships also is made difficult by the practice of providing additional in-school instruction for lower-performing students.

In addition to their formally scheduled duties, teachers were asked about the number of hours per week spent on selected school-related activities outside the regular school day. Table 5.6 presents the results. For example, on average, eighth-grade students in Australia had mathematics teachers who spent 2.3 hours per week preparing or grading tests, and another 1.8 hours per week reading and grading papers. Their teachers spent 2.6 hours per week on lesson planning and 1.7 hours combined on meetings with students and parents. They spent 0.9 hours on professional reading and development and 3 hours on record keeping and administrative tasks combined. Across countries, teachers reported that grading tests, grading student work, and lesson planning were the most time consuming activities, averaging as much as 10 hours per week in Singapore. In general, teachers also reported several hours per week spent on keeping students' records and other administrative tasks.

Opportunities to meet with colleagues to plan curriculum or teaching approaches enable teachers to expand their views of mathematics, their resources for teaching, and their repertoire of teaching and learning skills. Table 5.7 contains teachers' reports on how often they meet with other teachers in their subject area to discuss and plan curriculum or teaching approaches. Teachers of the majority of the students reported weekly or even daily planning meetings in Belgium (French), Colombia, Cyprus, the Czech Republic, England, Hungary, Israel, Kuwait, Latvia (LSS), Lithuania, Norway, Scotland, the Slovak Republic, Slovenia, and Sweden. In the remaining countries, however, most students had mathematics teachers who reported only limited opportunities to plan curriculum or teaching approaches with other teachers (monthly or even yearly meetings).

Table 5.4**Teachers' Reports on the Proportion of Their Formally Scheduled School Time Spent Teaching Mathematics¹ - Upper Grade (Eighth Grade*)**

Country	Less Than 50 Percent		50-74 Percent		75-100 Percent	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	37 (3.1)	527 (5.4)	25 (3.2)	526 (8.2)	38 (3.6)	541 (8.8)
<i>Austria</i>	r 51 (3.3)	537 (6.3)	30 (3.1)	548 (7.8)	19 (3.2)	575 (13.8)
Belgium (Fl)	12 (3.0)	573 (16.9)	29 (4.4)	543 (14.0)	60 (4.4)	579 (9.2)
<i>Belgium (Fr)</i>	s 8 (3.0)	554 (9.6)	12 (4.0)	535 (14.1)	80 (4.9)	546 (4.5)
Canada	59 (3.3)	520 (3.2)	26 (3.2)	543 (7.7)	15 (2.2)	532 (7.2)
<i>Colombia</i>	34 (3.5)	381 (3.8)	36 (4.2)	402 (4.2)	30 (4.1)	384 (5.5)
Cyprus	r 3 (2.0)	472 (16.2)	6 (2.0)	472 (8.4)	91 (2.8)	471 (2.5)
Czech Republic	58 (4.7)	565 (7.0)	30 (4.5)	564 (9.7)	12 (3.3)	561 (7.8)
<i>Denmark</i>	65 (4.6)	505 (3.2)	27 (4.2)	499 (4.2)	8 (2.8)	519 (10.4)
England	s 10 (2.0)	495 (26.0)	21 (2.9)	499 (10.7)	69 (2.8)	524 (4.6)
France	6 (1.6)	496 (15.2)	9 (2.6)	529 (17.6)	85 (2.9)	542 (3.4)
<i>Germany</i>	s 49 (5.5)	499 (9.5)	35 (5.2)	518 (9.9)	17 (3.3)	552 (7.5)
<i>Greece</i>	- -	- -	- -	- -	- -	- -
Hong Kong	42 (6.1)	603 (10.0)	21 (5.1)	570 (15.1)	36 (4.8)	580 (11.7)
Hungary	- -	- -	- -	- -	- -	- -
Iceland	r 56 (6.6)	486 (4.9)	26 (8.2)	494 (8.7)	18 (6.5)	492 (18.8)
Iran, Islamic Rep.	23 (5.7)	430 (5.6)	32 (5.2)	431 (3.6)	45 (5.0)	430 (2.6)
Ireland	37 (4.3)	502 (9.5)	24 (3.6)	528 (10.7)	39 (4.7)	547 (8.9)
<i>Israel</i>	r 25 (6.7)	520 (15.9)	28 (7.8)	514 (14.0)	47 (8.4)	531 (9.8)
Japan	24 (3.3)	606 (6.0)	40 (4.0)	606 (4.5)	37 (3.5)	603 (4.3)
Korea	45 (4.5)	607 (4.1)	46 (4.5)	610 (4.1)	10 (2.6)	623 (8.3)
<i>Kuwait</i>	r 17 (5.8)	395 (5.5)	28 (6.9)	386 (3.9)	55 (8.0)	395 (4.3)
Latvia (LSS)	r 23 (4.2)	484 (6.5)	35 (4.5)	485 (6.4)	43 (4.9)	498 (4.5)
Lithuania	8 (1.9)	498 (7.3)	8 (2.1)	451 (9.4)	84 (2.9)	478 (4.4)
<i>Netherlands</i>	4 (2.0)	526 (44.0)	18 (4.5)	494 (25.9)	79 (4.9)	555 (6.8)
New Zealand	28 (3.5)	493 (8.2)	18 (3.4)	526 (12.6)	54 (4.0)	511 (6.1)
Norway	49 (4.4)	504 (3.5)	39 (4.5)	503 (3.6)	12 (2.5)	506 (3.9)
Portugal	5 (2.0)	452 (7.0)	15 (3.1)	447 (6.9)	80 (3.6)	456 (2.9)
<i>Romania</i>	73 (4.2)	485 (5.2)	20 (3.7)	480 (9.2)	6 (2.2)	437 (8.2)
Russian Federation	0 (0.2)	~ ~	2 (1.2)	~ ~	98 (1.2)	536 (5.4)
<i>Scotland</i>	r 2 (1.3)	~ ~	6 (2.4)	479 (36.5)	92 (2.7)	495 (6.4)
Singapore	22 (3.4)	626 (9.6)	53 (5.1)	658 (7.2)	25 (4.5)	630 (7.5)
Slovak Republic	61 (4.0)	547 (3.8)	26 (3.6)	544 (7.3)	13 (3.3)	553 (10.7)
<i>Slovenia</i>	r 14 (3.6)	550 (8.6)	22 (3.8)	531 (6.4)	63 (4.4)	543 (4.6)
Spain	69 (4.1)	487 (2.6)	26 (4.0)	486 (5.0)	5 (2.0)	499 (17.3)
Sweden	89 (2.3)	519 (3.2)	10 (2.1)	524 (10.2)	1 (0.8)	~ ~
Switzerland	52 (4.0)	532 (5.2)	30 (3.9)	552 (9.7)	18 (2.2)	579 (7.3)
<i>Thailand</i>	r 26 (5.6)	521 (14.6)	30 (5.0)	525 (11.8)	44 (5.9)	533 (9.7)
United States	38 (3.7)	494 (5.4)	31 (4.0)	506 (8.9)	31 (3.7)	501 (6.8)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

¹Formally scheduled school time included time scheduled for teaching all subjects, as well as student supervision, student counseling/appraisal, administrative duties, individual curriculum planning, cooperative curriculum planning, and other non-student contact time. Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.5**Teachers' Reports on Average Number of Hours Mathematics Is Taught Weekly to Their Mathematics Classes - Upper Grade (Eighth Grade*)**

Country	Less Than 2 Hours		2 Hours to < 3.5		3.5 Hours to < 5		5 Hours or More	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	r 5 (1.7)	528 (19.5)	50 (3.7)	518 (6.2)	44 (3.7)	552 (7.6)	1 (0.7)	~ ~
<i>Austria</i>	r 0 (0.0)	~ ~	99 (0.1)	549 (4.1)	1 (0.1)	~ ~	0 (0.0)	~ ~
Belgium (Fl)	s 0 (0.0)	~ ~	50 (4.4)	572 (5.6)	50 (4.4)	603 (5.4)	0 (0.0)	~ ~
<i>Belgium (Fr)</i>	s 0 (0.0)	~ ~	3 (1.8)	486 (12.9)	83 (4.2)	544 (4.7)	14 (3.8)	564 (10.0)
Canada	3 (1.2)	528 (11.8)	31 (3.8)	521 (5.0)	50 (3.6)	537 (4.3)	17 (3.1)	520 (10.2)
<i>Colombia</i>	r 4 (2.0)	389 (8.2)	25 (5.5)	367 (8.8)	58 (5.4)	397 (3.9)	13 (3.3)	390 (8.2)
Cyprus	x x	x x	x x	x x	x x	x x	x x	x x
Czech Republic	1 (0.9)	~ ~	6 (2.0)	587 (17.2)	90 (2.7)	561 (5.1)	3 (1.6)	535 (10.2)
<i>Denmark</i>	- -	- -	- -	- -	- -	- -	- -	- -
England	- -	- -	- -	- -	- -	- -	- -	- -
France	r 2 (1.4)	~ ~	10 (3.2)	532 (13.4)	87 (3.3)	539 (3.9)	2 (1.3)	~ ~
<i>Germany</i>	s 2 (1.5)	~ ~	85 (3.1)	523 (5.3)	12 (2.9)	463 (13.3)	1 (0.9)	~ ~
<i>Greece</i>	4 (1.7)	459 (10.8)	88 (2.8)	486 (3.5)	3 (1.6)	459 (12.3)	4 (1.6)	480 (8.9)
Hong Kong	5 (2.4)	612 (47.4)	26 (5.2)	590 (19.5)	63 (5.8)	590 (7.6)	6 (2.9)	567 (30.1)
Hungary	0 (0.0)	~ ~	75 (3.6)	538 (3.9)	23 (3.6)	536 (7.0)	1 (1.0)	~ ~
Iceland	r 0 (0.0)	~ ~	90 (2.9)	492 (5.3)	8 (2.9)	467 (3.5)	1 (0.2)	~ ~
Iran, Islamic Rep.	- -	- -	- -	- -	- -	- -	- -	- -
Ireland	r 1 (0.7)	~ ~	86 (3.7)	524 (6.4)	12 (3.4)	555 (15.2)	1 (1.1)	~ ~
<i>Israel</i>	r 6 (4.1)	523 (13.7)	41 (8.0)	520 (12.7)	47 (8.1)	514 (9.2)	6 (3.7)	579 (22.6)
Japan	4 (1.8)	607 (24.3)	91 (2.3)	602 (2.7)	4 (1.4)	649 (18.5)	0 (0.5)	~ ~
Korea	1 (0.7)	~ ~	90 (3.0)	610 (2.8)	5 (1.8)	608 (13.8)	5 (2.3)	604 (19.5)
<i>Kuwait</i>	2 (1.6)	~ ~	21 (6.5)	396 (6.8)	76 (6.6)	391 (2.3)	1 (1.0)	~ ~
Latvia (LSS)	1 (0.5)	~ ~	30 (4.8)	491 (5.8)	62 (5.3)	492 (4.3)	8 (2.6)	489 (15.0)
Lithuania	1 (0.8)	~ ~	61 (4.1)	482 (5.0)	29 (3.9)	481 (7.5)	9 (2.3)	448 (13.8)
<i>Netherlands</i>	3 (1.9)	529 (54.2)	97 (1.9)	542 (8.1)	0 (0.0)	~ ~	0 (0.0)	~ ~
New Zealand	5 (1.8)	484 (11.6)	42 (4.3)	514 (7.1)	50 (4.3)	507 (6.4)	3 (1.5)	503 (27.3)
Norway	r 7 (2.6)	502 (5.0)	80 (3.9)	508 (3.1)	8 (2.8)	502 (7.7)	5 (2.1)	513 (7.7)
Portugal	1 (0.8)	~ ~	89 (2.9)	455 (2.7)	10 (2.8)	452 (7.8)	0 (0.0)	~ ~
<i>Romania</i>	8 (2.6)	497 (17.6)	80 (3.4)	481 (5.0)	9 (2.5)	482 (12.4)	2 (0.6)	~ ~
Russian Federation	0 (0.0)	~ ~	17 (3.6)	519 (8.6)	70 (5.6)	533 (5.1)	14 (4.8)	567 (18.0)
<i>Scotland</i>	5 (2.0)	473 (14.7)	35 (4.4)	500 (11.6)	60 (4.6)	494 (7.1)	0 (0.0)	~ ~
Singapore	0 (0.0)	~ ~	52 (4.7)	654 (6.9)	48 (4.7)	633 (7.6)	0 (0.0)	~ ~
Slovak Republic	0 (0.0)	~ ~	2 (1.3)	~ ~	86 (3.0)	544 (3.2)	11 (2.9)	561 (11.0)
<i>Slovenia</i>	0 (0.0)	~ ~	87 (3.4)	542 (4.0)	12 (3.3)	525 (9.5)	1 (0.8)	~ ~
Spain	r 2 (1.1)	~ ~	28 (4.0)	480 (5.5)	62 (4.7)	490 (3.6)	8 (2.6)	494 (9.2)
Sweden	r 3 (1.2)	506 (24.2)	97 (1.3)	520 (3.2)	0 (0.4)	~ ~	0 (0.3)	~ ~
Switzerland	s 2 (1.4)	~ ~	14 (3.4)	520 (17.8)	71 (3.5)	557 (6.5)	13 (3.0)	566 (12.4)
<i>Thailand</i>	x x	x x	x x	x x	x x	x x	x x	x x
United States	s 8 (1.4)	492 (26.2)	24 (3.4)	501 (9.9)	58 (4.4)	507 (5.4)	11 (2.8)	498 (10.0)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

An "x" indicates teacher response data available for <50% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.6

Average Number of Hours¹ Students' Teachers Spend on Various School-Related Activities Outside the Formal School Day During the School Week
Mathematics - Upper Grade (Eighth Grade*)

Country	Preparing or Grading Tests	Reading and Grading Student Work	Planning Lessons by Self	Meeting with Students Outside Classroom Time	Meeting with Parents	Professional Reading and Development	Keeping Students' Records	Administrative Tasks
<i>Australia</i>	2.3 (0.1)	1.8 (0.1)	2.6 (0.1)	1.3 (0.1)	0.4 (0.0)	0.9 (0.1)	1.0 (0.1)	2.0 (0.1)
<i>Austria</i>	r 2.3 (0.1)	r 2.5 (0.1)	r 3.6 (0.1)	r 0.4 (0.1)	r 0.6 (0.0)	r 1.5 (0.1)	r 0.9 (0.1)	r 1.1 (0.1)
Belgium (Fl)	3.8 (0.1)	2.3 (0.1)	2.9 (0.2)	0.8 (0.1)	0.6 (0.1)	0.6 (0.1)	0.5 (0.0)	1.2 (0.1)
<i>Belgium (Fr)</i>	s 3.4 (0.2)	s 1.6 (0.1)	s 2.8 (0.2)	s 0.7 (0.1)	s 0.5 (0.1)	s 0.9 (0.1)	s 0.7 (0.1)	s 1.2 (0.1)
Canada	2.3 (0.1)	2.4 (0.1)	2.6 (0.1)	1.4 (0.1)	0.5 (0.0)	0.8 (0.1)	1.1 (0.0)	1.7 (0.1)
<i>Colombia</i>	2.8 (0.1)	r 1.8 (0.1)	3.1 (0.1)	1.2 (0.1)	0.8 (0.1)	1.9 (0.2)	r 0.8 (0.1)	1.1 (0.1)
Cyprus	3.4 (0.1)	r 1.3 (0.2)	r 3.2 (0.2)	r 0.3 (0.1)	r 1.1 (0.1)	r 0.9 (0.1)	r 0.5 (0.0)	r 1.0 (0.1)
Czech Republic	3.4 (0.1)	1.6 (0.1)	4.0 (0.1)	1.2 (0.1)	0.5 (0.0)	0.8 (0.1)	0.9 (0.1)	1.3 (0.1)
<i>Denmark</i>	- -	- -	- -	- -	- -	- -	- -	- -
England	s 2.1 (0.1)	s 3.7 (0.1)	s 2.6 (0.1)	s 1.4 (0.1)	s 0.6 (0.0)	s 0.9 (0.1)	s 0.7 (0.1)	s 2.2 (0.1)
France	4.0 (0.1)	r 1.1 (0.1)	3.4 (0.2)	0.7 (0.1)	0.6 (0.0)	r 1.2 (0.1)	0.7 (0.0)	1.0 (0.1)
<i>Germany</i>	s 3.1 (0.1)	s 2.2 (0.2)	s 4.2 (0.1)	s 0.8 (0.1)	s 0.8 (0.1)	s 1.8 (0.2)	s 1.1 (0.1)	s 1.7 (0.1)
<i>Greece</i>	2.4 (0.1)	1.0 (0.1)	2.0 (0.2)	0.4 (0.1)	0.9 (0.1)	2.1 (0.1)	r 0.5 (0.1)	1.2 (0.1)
Hong Kong	2.4 (0.2)	3.1 (0.2)	2.2 (0.2)	1.7 (0.2)	0.4 (0.1)	1.0 (0.2)	0.7 (0.1)	1.2 (0.1)
Hungary	3.0 (0.1)	2.5 (0.1)	4.0 (0.1)	1.9 (0.1)	0.8 (0.1)	1.8 (0.1)	0.8 (0.1)	2.3 (0.1)
Iceland	r 2.0 (0.2)	r 2.3 (0.3)	r 3.0 (0.2)	r 0.9 (0.1)	r 0.8 (0.1)	r 0.9 (0.1)	r 1.3 (0.2)	r 2.2 (0.2)
Iran, Islamic Rep.	2.6 (0.2)	1.9 (0.2)	2.1 (0.1)	1.0 (0.1)	0.8 (0.1)	0.5 (0.1)	2.0 (0.1)	1.1 (0.2)
Ireland	2.3 (0.1)	1.6 (0.1)	2.3 (0.1)	0.8 (0.1)	0.3 (0.0)	0.5 (0.1)	0.7 (0.0)	1.3 (0.1)
<i>Israel</i>	r 3.6 (0.2)	r 1.7 (0.2)	r 2.9 (0.3)	r 1.5 (0.2)	r 0.9 (0.1)	r 2.8 (0.3)	r 1.1 (0.2)	r 1.9 (0.2)
Japan	2.0 (0.1)	1.8 (0.1)	2.9 (0.1)	1.8 (0.1)	0.4 (0.0)	1.8 (0.1)	1.4 (0.1)	2.6 (0.2)
Korea	1.7 (0.1)	1.5 (0.1)	2.1 (0.1)	1.6 (0.1)	0.4 (0.0)	1.2 (0.1)	0.9 (0.1)	2.0 (0.1)
<i>Kuwait</i>	2.4 (0.2)	2.1 (0.3)	2.7 (0.2)	0.4 (0.1)	0.6 (0.1)	1.0 (0.2)	0.9 (0.2)	0.9 (0.2)
Latvia (LSS)	3.0 (0.2)	r 2.8 (0.2)	3.3 (0.1)	r 1.8 (0.1)	r 0.7 (0.1)	r 1.1 (0.1)	r 0.4 (0.1)	r 1.0 (0.1)
Lithuania	1.5 (0.1)	2.7 (0.2)	3.1 (0.1)	1.6 (0.1)	0.8 (0.1)	1.9 (0.1)	0.8 (0.1)	r 0.6 (0.1)
<i>Netherlands</i>	3.7 (0.2)	0.7 (0.1)	2.5 (0.2)	1.0 (0.1)	0.6 (0.0)	1.1 (0.1)	0.4 (0.0)	1.1 (0.1)
New Zealand	2.3 (0.1)	1.7 (0.1)	3.0 (0.1)	1.3 (0.1)	0.4 (0.0)	1.0 (0.1)	0.8 (0.0)	2.3 (0.1)
Norway	2.4 (0.1)	1.6 (0.1)	3.6 (0.1)	0.8 (0.1)	0.7 (0.0)	0.6 (0.1)	0.9 (0.1)	1.8 (0.1)
Portugal	2.8 (0.1)	1.9 (0.1)	3.3 (0.1)	0.9 (0.1)	0.5 (0.1)	1.0 (0.1)	0.9 (0.1)	1.2 (0.1)
<i>Romania</i>	2.8 (0.1)	2.4 (0.1)	3.6 (0.1)	2.0 (0.1)	1.0 (0.1)	1.3 (0.1)	1.6 (0.1)	2.2 (0.1)
Russian Federation	2.6 (0.1)	3.4 (0.1)	3.5 (0.2)	2.4 (0.1)	1.2 (0.1)	2.3 (0.1)	1.0 (0.1)	2.1 (0.1)
<i>Scotland</i>	1.5 (0.1)	r 2.0 (0.1)	1.8 (0.1)	1.0 (0.1)	0.5 (0.1)	0.8 (0.1)	1.0 (0.1)	1.5 (0.1)
Singapore	3.4 (0.1)	4.1 (0.1)	2.7 (0.1)	1.6 (0.1)	0.4 (0.0)	1.1 (0.1)	1.1 (0.1)	2.0 (0.1)
Slovak Republic	2.9 (0.1)	1.9 (0.1)	3.6 (0.1)	1.3 (0.1)	0.7 (0.0)	0.9 (0.1)	1.1 (0.1)	1.1 (0.1)
<i>Slovenia</i>	r 2.6 (0.1)	r 1.0 (0.1)	r 3.7 (0.1)	r 1.2 (0.1)	r 1.2 (0.1)	r 1.7 (0.1)	r 0.6 (0.0)	r 1.8 (0.1)
Spain	2.1 (0.1)	1.4 (0.1)	1.8 (0.1)	0.9 (0.1)	1.1 (0.0)	1.6 (0.1)	0.8 (0.0)	1.7 (0.1)
Sweden	2.2 (0.1)	1.6 (0.1)	4.0 (0.1)	0.7 (0.0)	0.8 (0.0)	1.3 (0.1)	0.9 (0.0)	2.3 (0.1)
Switzerland	3.0 (0.1)	r 2.0 (0.1)	r 3.9 (0.1)	r 0.9 (0.1)	r 0.8 (0.1)	r 1.8 (0.1)	r 0.7 (0.0)	r 2.2 (0.1)
<i>Thailand</i>	s 2.6 (0.2)	s 1.9 (0.2)	r 1.8 (0.2)	s 1.5 (0.2)	s 0.5 (0.1)	s 1.3 (0.2)	s 1.1 (0.1)	s 1.5 (0.2)
United States	2.7 (0.1)	r 2.7 (0.2)	2.4 (0.1)	2.0 (0.1)	0.7 (0.0)	0.9 (0.1)	1.6 (0.1)	2.0 (0.1)

¹Average hours based on: No time=0, Less Than 1 Hour=.5, 1-2 Hours=1.5; 3-4 Hours=3.5; More Than 4 Hours=5.

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

A dash (-) indicates data are not available.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.7

Teachers' Reports on How Often They Meet with Other Teachers in Their Subject Area to Discuss and Plan Curriculum or Teaching Approaches Mathematics - Upper Grade (Eighth Grade*)

Country	Percent of Students Taught by Teachers			
	Meeting Never or Once/Twice a Year	Meeting Monthly or Every Other Month	Meeting Once, Twice, or Three Times a Week	Meeting Almost Every Day
<i>Australia</i>	12 (2.2)	52 (3.3)	24 (2.8)	12 (2.4)
<i>Austria</i>	17 (2.9)	37 (4.0)	36 (3.7)	9 (3.0)
Belgium (Fl)	52 (4.8)	29 (4.1)	15 (3.3)	4 (1.7)
<i>Belgium (Fr)</i>	19 (4.0)	29 (4.9)	41 (5.4)	11 (3.6)
Canada	29 (3.0)	33 (3.2)	30 (3.7)	8 (2.5)
<i>Colombia</i>	17 (3.6)	32 (4.3)	48 (4.6)	4 (1.7)
Cyprus	3 (1.8)	4 (1.6)	77 (3.8)	17 (3.0)
Czech Republic	12 (2.7)	30 (4.8)	37 (5.3)	21 (3.9)
<i>Denmark</i>	- -	- -	- -	- -
England	7 (1.7)	33 (3.3)	52 (3.8)	9 (1.4)
France	35 (5.2)	32 (4.9)	30 (4.5)	3 (1.9)
<i>Germany</i>	42 (5.8)	33 (4.8)	15 (3.9)	10 (3.1)
<i>Greece</i>	41 (4.1)	28 (4.9)	22 (3.9)	9 (2.5)
Hong Kong	30 (5.2)	53 (5.8)	16 (4.1)	1 (1.2)
Hungary	2 (1.3)	10 (2.7)	41 (4.4)	46 (4.2)
Iceland	23 (4.3)	31 (6.0)	41 (7.2)	4 (3.7)
Iran, Islamic Rep.	21 (5.3)	38 (5.3)	35 (4.3)	6 (2.3)
Ireland	62 (4.4)	24 (4.0)	12 (3.1)	2 (1.2)
<i>Israel</i>	5 (3.5)	20 (6.8)	53 (8.0)	21 (5.0)
Japan	23 (3.6)	28 (3.8)	46 (4.3)	3 (1.3)
Korea	23 (3.6)	37 (4.1)	37 (4.4)	3 (1.8)
<i>Kuwait</i>	2 (1.6)	2 (2.2)	67 (6.2)	29 (5.7)
Latvia (LSS)	19 (3.7)	31 (3.8)	28 (4.1)	22 (3.8)
Lithuania	14 (2.6)	29 (4.3)	26 (3.5)	31 (3.8)
<i>Netherlands</i>	12 (3.6)	65 (5.6)	21 (4.2)	1 (1.4)
New Zealand	10 (2.5)	43 (4.0)	45 (4.0)	2 (1.0)
Norway	6 (2.1)	17 (3.4)	71 (3.8)	6 (2.0)
Portugal	7 (1.9)	72 (3.9)	18 (3.2)	3 (1.7)
<i>Romania</i>	7 (2.1)	45 (4.0)	24 (3.4)	24 (3.4)
Russian Federation	8 (3.0)	55 (4.3)	25 (3.8)	12 (3.3)
<i>Scotland</i>	5 (2.2)	20 (3.9)	69 (4.2)	6 (2.3)
Singapore	10 (3.1)	68 (4.5)	16 (3.4)	6 (2.4)
Slovak Republic	3 (1.4)	23 (3.6)	30 (4.1)	44 (4.3)
<i>Slovenia</i>	2 (1.4)	26 (4.5)	26 (4.2)	46 (4.4)
Spain	16 (3.0)	43 (4.4)	39 (4.6)	2 (1.2)
Sweden	9 (2.3)	17 (2.7)	49 (3.9)	24 (3.2)
Switzerland	38 (3.8)	33 (3.8)	26 (3.5)	3 (1.4)
<i>Thailand</i>	53 (6.2)	31 (5.7)	12 (4.1)	4 (2.6)
United States	29 (3.7)	37 (3.9)	26 (3.7)	8 (2.4)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

A dash (-) indicates data are not available.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

HOW ARE MATHEMATICS CLASSES ORGANIZED?

Table 5.8 presents teachers' reports about the size of eighth-grade mathematics classes for the TIMSS countries. The data reveal rather large variations from country to country. According to teachers, mathematics classes were relatively small in a number of countries. For example, 90% or more of the students were in mathematics classes of 30 or fewer students in Belgium (Flemish), Belgium (French), the Czech Republic, Denmark, France, Germany, Hungary, Iceland, Latvia (LSS), Lithuania, the Netherlands, Norway, Portugal, the Russian Federation, Scotland, Slovenia, Sweden, and Switzerland. At the other end of the spectrum, 93% of the students in Korea and 48% in Colombia were in mathematics classes with more than 40 students. In Hong Kong, Japan, and Singapore, 90% of the students were in classes with more than 30 students. Extensive research about class size in relation to achievement indicates that the existence of such a relationship is dependent on the situation. Dramatic reductions in class size can be related to gains in achievement, but the chief effects of smaller classes often are in relation to teacher attitudes and instructional behaviors. The TIMSS data support the complexity of this issue. Across countries, the four highest-performing countries at the eighth grade – Singapore, Korea, Japan, and Hong Kong – are among those with the largest mathematics classes. Within countries, several show little or no relationship between achievement and class size, often because students are mostly all in classes of similar size. Within other countries, there appears to be a curvilinear relationship, or those students with higher achievement appear to be in larger classes. In some countries, larger classes may represent the more usual situation for mathematics teaching, with smaller classes used primarily for students needing remediation or for those students in the less-advanced tracks.

Teachers can adopt a variety of organizational and interactive approaches in mathematics class. Whole-class instruction can be very efficient, because it requires less time on management functions and provides more time for developing mathematics concepts. Teachers can make presentations, conduct discussions, or demonstrate procedures and applications to all students simultaneously. Both whole-class and independent work have been standard features of mathematics classrooms. Students also can benefit from the type of cooperative learning that occurs with effective use of small-group work. Because they can help each other, students in groups can often handle challenging situations beyond their individual capabilities. Further, the positive affective impact of working together mirrors the use of mathematics in the workplace.

Table 5.8
Teachers' Reports on Average Size of Mathematics Class
Upper Grade (Eighth Grade*)

Country	1 - 20 Students		21 - 30 Students		31 - 40 Students		41 or More Students	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	r 13 (2.4)	497 (14.6)	71 (3.3)	528 (5.4)	16 (2.6)	583 (9.7)	1 (0.5)	~ ~
<i>Austria</i>	x x	x x	x x	x x	x x	x x	x x	x x
Belgium (Fl)	49 (3.6)	552 (8.2)	51 (3.6)	596 (4.4)	0 (0.0)	~ ~	0 (0.0)	~ ~
<i>Belgium (Fr)</i>	s 43 (5.3)	535 (6.2)	57 (5.3)	551 (6.1)	0 (0.0)	~ ~	0 (0.0)	~ ~
Canada	r 11 (2.1)	524 (10.3)	65 (4.0)	527 (3.4)	23 (3.6)	534 (11.7)	1 (0.5)	~ ~
<i>Colombia</i>	r 16 (4.2)	400 (24.3)	6 (2.2)	361 (4.1)	29 (4.0)	394 (6.5)	48 (4.6)	384 (3.9)
Cyprus	r 1 (0.0)	~ ~	37 (3.9)	467 (4.3)	62 (3.9)	474 (3.2)	0 (0.0)	~ ~
Czech Republic	13 (3.3)	534 (6.2)	77 (5.3)	564 (6.2)	11 (4.5)	591 (13.7)	0 (0.0)	~ ~
<i>Denmark</i>	r 49 (4.8)	504 (3.8)	51 (4.8)	506 (3.7)	0 (0.0)	~ ~	0 (0.0)	~ ~
England	s 18 (3.1)	482 (12.2)	62 (3.7)	511 (5.9)	20 (3.4)	554 (7.9)	0 (0.0)	~ ~
France	11 (2.6)	512 (8.8)	86 (2.9)	543 (3.9)	3 (1.8)	519 (8.7)	0 (0.0)	~ ~
<i>Germany</i>	s 25 (4.4)	493 (15.6)	72 (4.5)	522 (5.6)	3 (1.8)	558 (40.8)	0 (0.0)	~ ~
<i>Greece</i>	9 (2.3)	462 (9.7)	64 (4.4)	489 (3.3)	27 (3.9)	481 (7.2)	0 (0.0)	~ ~
Hong Kong	3 (1.9)	501 (63.7)	4 (2.2)	605 (35.3)	56 (5.7)	584 (10.7)	37 (5.9)	606 (10.1)
Hungary	37 (4.0)	528 (5.2)	57 (4.1)	541 (4.9)	6 (2.2)	551 (17.8)	0 (0.0)	~ ~
Iceland	r 36 (5.9)	478 (4.8)	64 (5.9)	497 (7.1)	0 (0.0)	~ ~	0 (0.0)	~ ~
Iran, Islamic Rep.	r 1 (0.9)	~ ~	26 (4.5)	428 (6.3)	54 (5.3)	431 (2.3)	19 (4.4)	424 (7.7)
Ireland	r 12 (2.7)	454 (8.5)	68 (4.5)	526 (6.7)	20 (3.9)	575 (9.5)	0 (0.0)	~ ~
<i>Israel</i>	r 14 (5.1)	495 (13.2)	36 (7.4)	524 (10.2)	49 (9.1)	529 (13.8)	2 (1.6)	~ ~
Japan	0 (0.2)	~ ~	4 (1.4)	598 (8.5)	88 (2.0)	600 (2.2)	8 (1.5)	667 (10.1)
Korea	2 (1.2)	~ ~	1 (1.0)	~ ~	4 (1.5)	562 (6.6)	93 (2.0)	611 (2.6)
<i>Kuwait</i>	0 (0.0)	~ ~	49 (6.5)	395 (2.9)	49 (6.3)	390 (4.3)	2 (1.9)	~ ~
Latvia (LSS)	r 41 (4.0)	482 (5.1)	51 (3.8)	501 (4.3)	4 (2.1)	502 (23.4)	4 (2.0)	469 (11.4)
Lithuania	r 43 (3.8)	461 (4.8)	54 (3.7)	491 (5.7)	3 (1.6)	502 (21.1)	0 (0.0)	~ ~
<i>Netherlands</i>	16 (4.7)	467 (21.0)	77 (5.6)	549 (6.5)	7 (3.6)	631 (18.1)	0 (0.0)	~ ~
New Zealand	11 (2.2)	460 (6.8)	68 (3.8)	508 (5.8)	21 (3.1)	536 (9.0)	0 (0.0)	~ ~
Norway	r 20 (3.5)	499 (6.2)	79 (3.7)	510 (2.9)	1 (0.5)	~ ~	1 (0.8)	~ ~
Portugal	12 (2.8)	440 (4.4)	80 (3.7)	456 (3.1)	7 (2.6)	469 (12.1)	0 (0.0)	~ ~
<i>Romania</i>	23 (2.7)	462 (7.9)	51 (4.3)	470 (5.3)	24 (4.1)	516 (9.0)	2 (1.2)	~ ~
Russian Federation	15 (2.7)	514 (12.1)	75 (3.6)	539 (5.8)	9 (2.3)	544 (8.6)	0 (0.0)	~ ~
<i>Scotland</i>	r 12 (2.8)	455 (11.6)	80 (3.8)	496 (6.9)	8 (2.7)	543 (18.4)	0 (0.0)	~ ~
Singapore	1 (0.7)	~ ~	10 (2.5)	645 (13.2)	72 (4.3)	640 (6.2)	18 (4.0)	656 (8.8)
Slovak Republic	15 (2.8)	526 (8.5)	67 (4.2)	546 (4.1)	19 (3.6)	556 (8.5)	0 (0.0)	~ ~
<i>Slovenia</i>	r 15 (3.1)	513 (6.8)	80 (3.6)	545 (4.0)	5 (1.8)	554 (18.5)	0 (0.0)	~ ~
Spain	r 13 (2.8)	470 (5.9)	48 (4.0)	484 (4.5)	36 (4.2)	497 (4.6)	4 (1.7)	476 (10.9)
Sweden	r 36 (3.9)	492 (5.8)	61 (4.0)	534 (3.9)	2 (1.2)	~ ~	0 (0.0)	~ ~
Switzerland	s 56 (4.5)	543 (8.1)	44 (4.5)	565 (6.6)	0 (0.0)	~ ~	0 (0.0)	~ ~
<i>Thailand</i>	x x	x x	x x	x x	x x	x x	x x	x x
United States	s 24 (3.0)	504 (9.6)	59 (3.9)	507 (5.7)	12 (2.2)	506 (17.0)	4 (1.8)	490 (22.3)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

An "x" indicates teacher response data available for <50% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 5.3 provides a pictorial view of the emphasis on individual, small-group, and whole-class work as reported by the mathematics teachers in the TIMSS countries. Because learning may be enhanced with teacher guidance and monitoring individual and small-group activities, the frequency of lessons using each of these organizational approaches is shown both with and without assistance of the teacher. Internationally, teachers reported that students working together as a class with the teacher teaching the whole class is a frequently used instructional approach. In most countries, approximately 50% or even more of the eighth-grade students were taught this way during most or every lesson. In contrast, students working together as a class and responding to each other appeared to be a much less common approach, used for a third or fewer of the students on a frequent basis (except in Israel).

Equally as popular as having students working together as a class with the teacher teaching the whole class, was having students work individually with assistance from the teacher. Group work was reported to be the least frequent approach, but when such an approach was indicated, it was more often with than without the assistance of the teacher. In general, having students work without the assistance of the teacher, either individually or in groups, was not common in most countries, except Israel and possibly Latvia (LSS).

Figure 5.3

Teachers' Reports About Classroom Organization During Mathematics Lessons Upper Grade (Eighth Grade*)

Country	Percent of Students Whose Teachers Report Using Each Organizational Approach "Most or Every Lesson"					
	Work Together as a Class with Students Responding to One Another	Work Together as a Class with Teacher Teaching the Whole Class	Work Individually with Assistance from Teacher	Work Individually without Assistance from Teacher	Work in Pairs or Small Groups with Assistance from Teacher	Work in Pairs or Small Groups without Assistance from Teacher
<i>Australia</i>	r 14	r 46	r 64	r 27	r 25	r 9
<i>Austria</i>	r 6	r 52	r 51	r 23	r 19	r 7
Belgium (Fl)	10	59	57	36	6	5
<i>Belgium (Fr)</i>	s 7	s 38	s 55	s 29	s 11	s 5
Canada	r 12	37	57	r 25	r 28	r 14
<i>Colombia</i>	25	41	55	r 19	44	r 22
Cyprus	r 13	r 61	r 73	r 23	r 26	r 9
Czech Republic	5	47	72	42	13	8
<i>Denmark</i>	5	41	74	16	18	4
England	s 19	s 46	s 57	s 25	s 14	s 8
France	11	48	56	26	17	4
<i>Germany</i>	s 23	s 70	s 54	s 15	s 20	s 9
<i>Greece</i>	4	58	60	18	14	3
Hong Kong	11	37	62	17	9	4
Hungary	11	60	65	22	7	1
Iceland	r 2	r 39	r 82	r 38	r 32	r 17
Iran, Islamic Rep.	33	66	55	8	42	10
Ireland	r 7	67	47	37	9	6
<i>Israel</i>	r 70	r 65	r 35	r 68	r 51	r 62
Japan	22	78	27	15	7	1

Percent for "Most or Every Lesson" →

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country. Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable. Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only. An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 5.3 (Continued)

Teachers' Reports About Classroom Organization During Mathematics Lessons Upper Grade (Eighth Grade*)

Country	Percent of Students Whose Teachers Report Using Each Organizational Approach "Most or Every Lesson"					
	Work Together as a Class with Students Responding to One Another	Work Together as a Class with Teacher Teaching the Whole Class	Work Individually with Assistance from Teacher	Work Individually without Assistance from Teacher	Work in Pairs or Small Groups with Assistance from Teacher	Work in Pairs or Small Groups without Assistance from Teacher
Korea	39	89	41	30	12	11
Kuwait	3	34	48	14	7	5
Latvia (LSS)	24	86	90	^r 55	28	^r 11
Lithuania	10	55	72	25	32	10
Netherlands	7	56	65	38	49	34
New Zealand	19	52	63	28	25	14
Norway	^r 17	^r 58	^r 71	^s 4	^r 36	^s 6
Portugal	10	67	69	5	50	4
Romania	12	86	56	19	18	3
Russian Federation	6	66	65	37	22	13
Scotland	^r 5	^r 34	^r 62	^r 28	^r 7	^r 3
Singapore	15	61	48	27	20	6
Slovak Republic	35	47	50	31	8	7
Slovenia	^r 11	^r 60	^r 87	^r 34	^r 40	^r 11
Spain	^r 15	^r 68	^r 58	^r 24	^r 15	^r 10
Sweden	^r 24	^r 50	^r 72	^r 1	^r 43	^r 5
Switzerland	^s 4	^s 48	^s 61	^s 25	^s 35	^s 20
Thailand	^r 19	^s 58	^r 41	^r 18	^r 22	^r 5
United States	^r 22	^r 49	^r 50	^r 19	^r 26	^r 12

Percent for "Most or Every Lesson" →

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

WHAT ACTIVITIES DO STUDENTS DO IN THEIR MATHEMATICS LESSONS?

As shown in Table 5.9, mathematics teachers in the participating countries generally reported heavier reliance on curriculum guides than textbooks or examination specifications in deciding which topics to teach. Only Japan, Korea, the Netherlands, Sweden, and Thailand used textbooks more for this purpose than both other sources of information. In contrast, in almost all countries, the textbook was the major written source mathematics teachers used in deciding how to present a topic to their classes. Internationally, the textbook appears to play a role in mathematics classrooms in many countries. For nearly all students in all countries, teachers reported using a textbook in their mathematics classes (see Figure 5.4).

The types of activities teachers asked eighth-grade students to do, however, varied from country to country. Teachers were asked how often they asked students to practice computational skills, and the responses are shown in Table 5.10. It appears that in most countries, the majority of the students practice computation in most or every lesson.

The data in Table 5.11 reveal that the majority of students in most countries were asked to do some type of mathematics reasoning tasks in most or every lesson. The activities TIMSS asked about included explaining the reasoning behind an idea, using tables, charts, or graphs to represent and analyze relationships, working on problems for which there is no immediately obvious solution, and/or writing equations to represent relationships. In Cyprus, Romania, and the Russian Federation, 55% or more of the students were asked to do at least one of these types of reasoning tasks in every lesson.

Teachers were not asked about the emphasis placed on using things from everyday life in solving mathematics problems, but students were (see Table 5.12). According to eighth-grade students, only a moderate emphasis is placed on doing these types of problems in mathematics class. Only in Canada, Cyprus, England, Greece, Iran, Latvia(LSS), New Zealand, Spain, and the United States did more than 50% of the students report being asked to do such problems on a frequent basis (pretty often or almost always).

Table 5.9

Teachers' Reports on Their Main Sources of Written Information When Deciding Which Topics to Teach and How to Present a Topic Mathematics - Upper Grade (Eighth Grade*)¹

Country	Percent of Students Taught by Teachers					
	Deciding Which Topics to Teach			Deciding How to Present a Topic		
	Curriculum Guide	Textbook	Examination Specifications	Curriculum Guide	Textbook	Examination Specifications
<i>Australia</i>	r 91 (2.0)	9 (2.0)	- -	r 13 (2.4)	87 (2.4)	- -
<i>Austria</i>	r 75 (4.2)	25 (4.2)	0 (0.2)	r 28 (3.9)	72 (3.8)	0 (0.2)
Belgium (Fl)	92 (2.7)	8 (2.7)	- -	r 8 (2.3)	92 (2.3)	- -
<i>Belgium (Fr)</i>	s 87 (4.6)	13 (4.6)	- -	s 2 (1.4)	98 (1.4)	- -
Canada	- -	- -	- -	- -	- -	- -
<i>Colombia</i>	r 63 (5.2)	35 (5.1)	3 (1.3)	r 43 (5.9)	56 (5.8)	1 (0.7)
Cyprus	r 67 (5.7)	33 (5.7)	0 (0.0)	r 17 (4.3)	83 (4.3)	0 (0.0)
Czech Republic	79 (4.6)	21 (4.6)	- -	9 (3.4)	91 (3.4)	- -
<i>Denmark</i>	- -	- -	- -	- -	- -	- -
England	- -	- -	- -	- -	- -	- -
France	89 (2.6)	10 (2.4)	1 (0.9)	r 13 (2.9)	87 (2.9)	0 (0.0)
<i>Germany</i>	s 80 (4.1)	20 (4.1)	- -	s 25 (5.4)	75 (5.4)	- -
<i>Greece</i>	53 (4.1)	47 (4.1)	- -	5 (1.9)	95 (1.9)	- -
Hong Kong	61 (6.3)	30 (6.0)	9 (2.2)	15 (4.5)	85 (4.5)	0 (0.0)
Hungary	79 (3.1)	19 (3.1)	2 (1.3)	18 (3.2)	81 (3.1)	1 (0.8)
Iceland	s 63 (8.1)	36 (8.1)	1 (0.1)	s 12 (3.9)	87 (4.0)	1 (0.1)
Iran, Islamic Rep.	r 64 (4.9)	31 (4.7)	5 (2.1)	r 55 (5.9)	36 (5.6)	9 (2.7)
Ireland	r 65 (4.8)	35 (4.8)	- -	r 14 (3.6)	86 (3.6)	- -
<i>Israel</i>	r 91 (4.9)	5 (3.1)	5 (3.6)	r 28 (6.5)	69 (7.2)	3 (3.3)
Japan	24 (3.4)	74 (3.5)	1 (1.1)	11 (2.4)	87 (2.8)	2 (1.4)
Korea	22 (3.4)	76 (3.6)	2 (1.1)	22 (3.2)	74 (3.5)	4 (1.7)
<i>Kuwait</i>	- -	- -	- -	- -	- -	- -
Latvia (LSS)	r 81 (4.0)	16 (3.7)	3 (1.5)	r 17 (3.2)	80 (3.8)	4 (1.8)
Lithuania	r 88 (3.1)	10 (2.8)	2 (1.3)	r 6 (2.3)	93 (2.2)	1 (0.9)
<i>Netherlands</i>	2 (1.3)	87 (4.0)	12 (3.8)	1 (0.8)	94 (2.8)	5 (2.7)
New Zealand	91 (2.6)	5 (1.9)	4 (1.7)	47 (4.3)	53 (4.3)	0 (0.0)
Norway	r 53 (4.8)	47 (4.8)	- -	s 9 (2.9)	91 (2.9)	- -
Portugal	86 (3.1)	14 (3.1)	- -	64 (4.9)	36 (4.9)	- -
<i>Romania</i>	94 (2.2)	3 (1.5)	3 (1.6)	28 (3.7)	67 (3.8)	5 (2.1)
Russian Federation	76 (4.4)	13 (2.8)	11 (3.2)	7 (2.5)	86 (3.6)	6 (2.7)
<i>Scotland</i>	s 79 (4.3)	10 (3.5)	11 (3.6)	s 28 (4.7)	68 (5.1)	4 (2.9)
Singapore	82 (3.5)	18 (3.5)	0 (0.2)	10 (2.8)	89 (2.8)	1 (0.4)
Slovak Republic	83 (3.6)	17 (3.6)	0 (0.0)	16 (3.0)	83 (3.1)	1 (0.8)
<i>Slovenia</i>	r 87 (3.7)	9 (3.1)	4 (2.0)	r 27 (4.5)	71 (4.8)	2 (1.6)
Spain	- -	- -	- -	- -	- -	- -
Sweden	r 46 (3.8)	54 (3.8)	- -	r 6 (1.7)	94 (1.7)	- -
Switzerland	s 69 (4.6)	30 (4.6)	1 (0.6)	x x	x x	x x
<i>Thailand</i>	s 44 (6.3)	50 (6.4)	6 (3.3)	r 17 (4.5)	83 (4.5)	0 (0.0)
United States	s 64 (3.7)	30 (3.3)	6 (1.3)	s 9 (2.3)	88 (2.4)	3 (1.2)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

¹Curriculum Guides include national, regional, and school curriculum guides; Textbooks include teacher and student editions, as well as other resource books; and Examination Specifications include national and regional levels.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

A dash (-) indicates data are not available.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

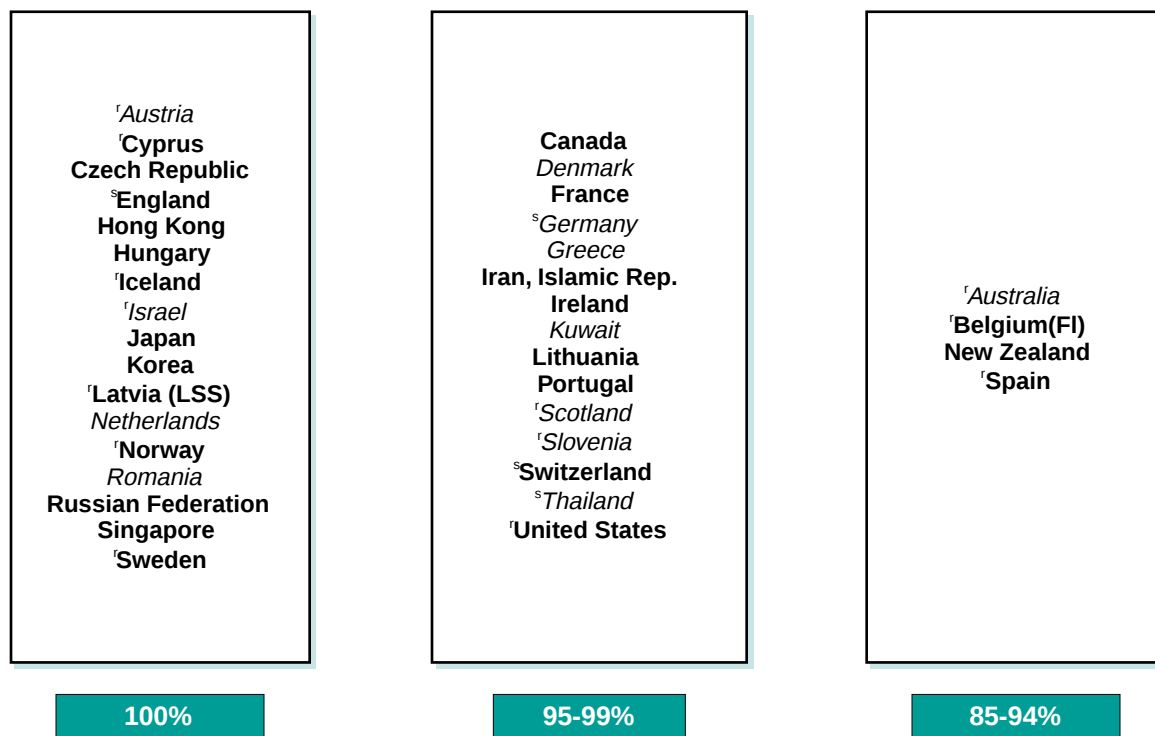
An "x" indicates teacher response data available for <50% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 5.4

Teachers' Reports About Using a Textbook in Teaching Mathematics Upper Grade (Eighth Grade*)

Countries are classified by percentage of students whose teachers reported that they use a textbook in teaching their mathematics class.



Note: Seventy percent of students in Colombia, and 49 percent in ^sBelgium (French) had teachers who reported using a textbook in their mathematics class.

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students. The Slovak Republic did not ask this question.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.10**Teachers' Reports on How Often They Ask Students to Practice Computational Skills Mathematics - Upper Grade (Eighth Grade*)**

Country	Never or Almost Never		Some Lessons		Most Lessons		Every Lesson	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	r 10 (2.2)	527 (16.0)	40 (3.4)	544 (7.0)	38 (3.5)	529 (7.0)	13 (2.2)	507 (14.1)
<i>Austria</i>	r 3 (1.7)	607 (12.8)	27 (3.6)	568 (7.3)	49 (3.7)	546 (7.0)	21 (2.7)	517 (10.3)
Belgium (Fl)	0 (0.0)	~ ~	33 (3.8)	603 (6.6)	49 (4.7)	574 (7.9)	18 (3.8)	524 (17.4)
<i>Belgium (Fr)</i>	s 4 (4.0)	553 (0.0)	28 (5.2)	530 (8.4)	52 (6.0)	548 (6.6)	16 (4.4)	551 (15.3)
Canada	4 (1.7)	529 (5.1)	36 (4.0)	527 (6.2)	42 (4.1)	531 (5.6)	18 (2.8)	525 (11.2)
<i>Colombia</i>	2 (1.2)	~ ~	13 (2.9)	391 (8.7)	50 (5.0)	383 (3.9)	35 (5.0)	391 (9.1)
Cyprus	r 5 (1.3)	490 (24.7)	38 (5.3)	464 (4.8)	43 (5.3)	469 (3.8)	15 (4.1)	477 (11.2)
Czech Republic	0 (0.0)	~ ~	23 (4.8)	558 (7.6)	37 (4.6)	567 (8.3)	40 (5.2)	559 (8.2)
<i>Denmark</i>	2 (1.4)	~ ~	51 (4.1)	507 (4.1)	42 (4.3)	500 (3.6)	6 (2.1)	497 (14.9)
England	s 7 (1.6)	542 (20.8)	52 (2.6)	515 (6.0)	34 (2.8)	506 (8.0)	8 (1.9)	539 (17.3)
France	6 (2.1)	534 (10.2)	44 (4.8)	549 (4.5)	44 (4.2)	536 (5.4)	7 (2.1)	517 (15.7)
<i>Germany</i>	s 17 (3.3)	479 (12.1)	51 (5.0)	522 (8.4)	25 (4.4)	525 (11.2)	7 (2.8)	501 (26.4)
<i>Greece</i>	7 (2.0)	456 (9.6)	52 (4.3)	482 (4.8)	33 (3.8)	491 (4.5)	8 (2.1)	491 (11.8)
Hong Kong	21 (5.3)	591 (16.1)	23 (4.9)	598 (16.9)	35 (5.1)	575 (13.2)	21 (4.4)	595 (15.4)
Hungary	0 (0.0)	~ ~	13 (3.1)	543 (10.8)	51 (4.3)	536 (5.1)	35 (4.3)	537 (5.5)
Iceland	r 0 (0.0)	~ ~	12 (4.4)	489 (6.5)	40 (6.1)	479 (6.9)	49 (6.7)	498 (7.7)
Iran, Islamic Rep.	7 (2.8)	416 (14.3)	51 (5.6)	431 (2.3)	29 (5.3)	432 (3.8)	13 (3.3)	432 (6.9)
Ireland	19 (3.9)	524 (14.8)	29 (4.2)	527 (10.7)	37 (4.5)	527 (9.7)	15 (3.1)	531 (19.1)
<i>Israel</i>	r 18 (5.9)	518 (18.9)	36 (7.4)	520 (11.2)	41 (6.3)	522 (12.8)	4 (2.6)	545 (44.6)
Japan	- -	- -	- -	- -	- -	- -	- -	- -
Korea	19 (3.4)	610 (5.9)	53 (4.3)	609 (3.7)	24 (4.0)	613 (5.3)	4 (1.3)	603 (10.8)
<i>Kuwait</i>	1 (0.6)	~ ~	28 (7.3)	390 (3.6)	51 (8.1)	391 (2.9)	20 (5.3)	393 (5.9)
Latvia (LSS)	- -	- -	- -	- -	- -	- -	- -	- -
Lithuania	0 (0.0)	~ ~	2 (1.0)	~ ~	30 (3.7)	482 (7.5)	68 (3.9)	476 (4.7)
<i>Netherlands</i>	- -	- -	- -	- -	- -	- -	- -	- -
New Zealand	7 (2.3)	519 (17.9)	45 (3.8)	509 (6.2)	40 (3.6)	505 (6.4)	7 (2.2)	509 (21.2)
Norway	r 5 (2.0)	506 (7.9)	59 (4.4)	505 (3.4)	34 (4.4)	509 (4.5)	2 (1.2)	~ ~
Portugal	- -	- -	- -	- -	- -	- -	- -	- -
<i>Romania</i>	0 (0.0)	~ ~	12 (2.6)	476 (15.0)	35 (4.1)	482 (8.4)	53 (4.4)	483 (6.2)
Russian Federation	0 (0.4)	~ ~	13 (2.3)	517 (12.4)	43 (3.6)	545 (9.0)	44 (3.5)	530 (7.9)
<i>Scotland</i>	- -	- -	- -	- -	- -	- -	- -	- -
Singapore	20 (3.7)	645 (11.6)	30 (4.2)	644 (9.4)	36 (4.4)	639 (7.4)	13 (3.3)	652 (15.2)
Slovak Republic	3 (1.3)	533 (16.2)	35 (4.6)	545 (6.3)	36 (4.2)	550 (5.7)	27 (4.1)	541 (5.8)
<i>Slovenia</i>	r 0 (0.0)	~ ~	21 (4.3)	535 (8.2)	36 (5.5)	551 (6.0)	43 (5.4)	533 (4.8)
Spain	r 30 (4.1)	481 (4.8)	42 (4.8)	490 (4.3)	23 (4.3)	491 (7.3)	4 (2.4)	477 (7.0)
Sweden	r 2 (0.9)	~ ~	18 (2.6)	512 (6.8)	51 (3.7)	523 (4.5)	29 (3.6)	515 (6.6)
Switzerland	s 4 (1.9)	545 (30.8)	21 (4.0)	560 (18.4)	59 (5.0)	552 (5.9)	16 (3.7)	548 (12.4)
<i>Thailand</i>	r 0 (0.0)	~ ~	13 (4.7)	547 (20.4)	42 (5.9)	519 (10.1)	45 (6.5)	529 (9.6)
United States	r 11 (1.9)	536 (12.9)	31 (3.4)	510 (9.2)	38 (4.4)	485 (6.2)	21 (3.9)	499 (10.4)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.11
Teachers' Reports on How Often They Ask Students to Do Reasoning Tasks¹
Mathematics - Upper Grade (Eighth Grade*)

Country	Never or Almost Never		Some Lessons		Most Lessons		Every Lesson	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	r 1 (0.9)	~ ~	38 (3.0)	520 (8.6)	48 (3.2)	538 (6.0)	13 (2.4)	547 (8.5)
<i>Austria</i>	r 0 (0.0)	~ ~	25 (3.4)	539 (10.2)	57 (4.5)	548 (6.4)	18 (3.4)	561 (10.3)
Belgium (Fl)	0 (0.3)	~ ~	25 (4.3)	549 (13.7)	56 (4.7)	577 (8.4)	19 (3.4)	604 (9.2)
<i>Belgium (Fr)</i>	s 0 (0.0)	~ ~	21 (4.3)	531 (8.7)	48 (6.1)	542 (6.1)	31 (5.7)	556 (9.3)
Canada	0 (0.0)	~ ~	19 (3.0)	527 (8.1)	62 (3.8)	529 (4.0)	19 (3.6)	529 (8.7)
<i>Colombia</i>	0 (0.0)	~ ~	18 (3.5)	377 (4.4)	56 (5.1)	392 (3.4)	26 (5.0)	382 (11.7)
Cyprus	r 0 (0.0)	~ ~	4 (2.2)	468 (41.8)	39 (4.8)	469 (5.6)	58 (5.2)	471 (2.8)
Czech Republic	0 (0.0)	~ ~	9 (3.4)	570 (20.6)	56 (5.5)	558 (7.3)	36 (5.1)	566 (8.0)
<i>Denmark</i>	4 (2.6)	477 (8.1)	59 (4.8)	507 (3.4)	31 (4.5)	504 (4.3)	5 (2.3)	500 (16.6)
England	s 0 (0.0)	~ ~	25 (2.7)	506 (9.5)	60 (3.0)	518 (5.4)	14 (2.1)	524 (12.3)
France	0 (0.0)	~ ~	32 (4.3)	528 (5.2)	48 (4.7)	550 (5.5)	20 (3.8)	537 (9.9)
<i>Germany</i>	s 1 (1.0)	~ ~	24 (4.4)	515 (13.5)	58 (4.8)	518 (7.6)	17 (3.9)	510 (11.4)
<i>Greece</i>	1 (0.6)	~ ~	15 (2.9)	475 (6.7)	47 (4.1)	485 (4.8)	37 (3.9)	488 (6.4)
Hong Kong	1 (1.2)	~ ~	33 (5.5)	595 (12.6)	58 (5.6)	585 (9.8)	8 (3.2)	578 (28.7)
Hungary	0 (0.0)	~ ~	8 (2.4)	502 (6.6)	54 (4.6)	538 (5.2)	38 (4.5)	543 (5.8)
Iceland	r 1 (1.3)	~ ~	72 (6.4)	489 (5.1)	22 (5.9)	497 (15.0)	5 (2.3)	468 (19.5)
Iran, Islamic Rep.	0 (0.0)	~ ~	30 (6.3)	427 (5.6)	47 (6.0)	429 (3.0)	23 (4.5)	434 (4.0)
Ireland	1 (0.6)	~ ~	55 (4.8)	525 (8.1)	33 (4.3)	520 (8.8)	12 (3.3)	562 (18.0)
<i>Israel</i>	r 3 (2.7)	474 (0.0)	9 (4.3)	532 (12.5)	68 (8.1)	528 (9.9)	20 (5.9)	502 (15.7)
Japan	0 (0.0)	~ ~	7 (2.2)	594 (5.1)	55 (4.4)	604 (2.9)	37 (4.3)	608 (4.4)
Korea	1 (0.7)	~ ~	3 (1.5)	640 (9.6)	72 (3.7)	608 (3.0)	24 (3.4)	612 (6.8)
<i>Kuwait</i>	2 (2.4)	~ ~	49 (6.5)	392 (3.5)	41 (6.1)	392 (2.9)	8 (4.1)	386 (3.3)
Latvia (LSS)	r 0 (0.0)	~ ~	16 (3.6)	482 (8.6)	60 (4.8)	490 (4.2)	24 (4.4)	499 (7.1)
Lithuania	0 (0.0)	~ ~	15 (2.8)	467 (10.6)	59 (4.4)	475 (5.5)	26 (4.0)	490 (6.4)
<i>Netherlands</i>	- -	- -	- -	- -	- -	- -	- -	- -
New Zealand	0 (0.0)	~ ~	35 (3.4)	493 (6.9)	53 (3.9)	514 (6.6)	12 (2.7)	525 (12.7)
Norway	r 0 (0.0)	~ ~	47 (4.4)	506 (4.0)	48 (4.3)	508 (3.6)	5 (2.2)	509 (13.0)
Portugal	0 (0.0)	~ ~	16 (3.1)	454 (5.7)	66 (4.0)	454 (3.1)	18 (3.5)	456 (6.5)
<i>Romania</i>	0 (0.0)	~ ~	5 (1.7)	444 (21.5)	22 (3.2)	476 (9.4)	74 (3.4)	486 (4.9)
Russian Federation	0 (0.0)	~ ~	6 (1.9)	508 (13.3)	39 (4.0)	525 (6.1)	55 (4.8)	545 (7.0)
<i>Scotland</i>	- -	- -	- -	- -	- -	- -	- -	- -
Singapore	0 (0.0)	~ ~	34 (4.1)	637 (9.5)	57 (4.5)	648 (6.2)	8 (2.3)	642 (20.7)
Slovak Republic	0 (0.0)	~ ~	5 (2.0)	531 (7.2)	66 (4.0)	545 (4.0)	29 (3.9)	548 (5.7)
<i>Slovenia</i>	r 0 (0.0)	~ ~	13 (3.4)	537 (7.0)	77 (4.6)	541 (4.2)	10 (3.2)	539 (6.9)
Spain	r 0 (0.0)	~ ~	15 (3.3)	469 (5.2)	67 (4.2)	488 (3.5)	18 (3.3)	497 (6.2)
Sweden	r 1 (0.5)	~ ~	35 (3.8)	515 (6.6)	46 (3.7)	520 (4.0)	18 (2.8)	523 (7.5)
Switzerland	s 2 (1.6)	~ ~	31 (4.7)	538 (12.0)	52 (5.0)	556 (7.3)	15 (3.2)	583 (8.9)
<i>Thailand</i>	r 0 (0.0)	~ ~	49 (6.7)	526 (11.5)	34 (6.2)	521 (10.7)	17 (4.7)	544 (11.3)
United States	r 0 (0.0)	~ ~	24 (3.4)	495 (0.0)	50 (3.5)	498 (5.9)	26 (3.3)	514 (10.2)

¹Based on most frequent response for: explain reasoning behind an idea; represent and analyze relationships using tables, charts or graphs; work on problems for which there is no immediately obvious method of solution; and write equations to represent relationships.

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.12**Students' Reports on Frequency of Using Things from Everyday Life in Solving Mathematics Problems - Upper Grade (Eighth Grade*)**

Country	Never		Once in a While		Pretty Often		Almost Always	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	14 (0.6)	512 (5.4)	39 (0.9)	543 (3.9)	34 (0.8)	536 (4.7)	13 (0.6)	513 (5.5)
<i>Austria</i>	21 (1.1)	536 (4.6)	44 (1.2)	546 (4.1)	23 (0.8)	545 (4.8)	12 (0.8)	519 (6.3)
Belgium (Fl)	34 (1.5)	563 (5.0)	41 (1.4)	576 (7.8)	20 (1.0)	567 (5.6)	5 (0.5)	512 (10.2)
<i>Belgium (Fr)</i>	39 (1.5)	525 (4.4)	39 (1.4)	543 (4.1)	15 (1.0)	514 (7.7)	8 (0.7)	510 (11.8)
Canada	13 (1.0)	528 (6.9)	36 (0.8)	534 (2.3)	34 (1.0)	530 (3.3)	17 (0.6)	517 (3.9)
<i>Colombia</i>	20 (1.6)	386 (4.9)	32 (1.5)	392 (4.5)	23 (1.0)	392 (4.5)	25 (1.2)	382 (5.5)
Cyprus	18 (1.0)	464 (3.6)	28 (0.9)	483 (3.4)	38 (1.0)	481 (3.5)	16 (0.9)	462 (4.4)
Czech Republic	16 (0.8)	553 (5.6)	41 (1.1)	565 (5.8)	34 (1.3)	573 (5.5)	9 (0.6)	552 (8.3)
<i>Denmark</i>	28 (1.3)	494 (4.7)	51 (1.5)	510 (3.5)	16 (1.3)	508 (5.2)	5 (0.5)	485 (11.0)
England	11 (0.9)	509 (7.4)	36 (1.2)	508 (4.3)	41 (1.3)	512 (2.7)	12 (0.8)	487 (6.9)
France	24 (1.5)	526 (3.7)	38 (1.0)	543 (3.2)	26 (1.3)	549 (4.5)	12 (0.8)	536 (5.8)
<i>Germany</i>	26 (1.4)	505 (4.8)	45 (1.5)	519 (5.1)	19 (1.1)	511 (6.7)	10 (0.8)	488 (6.6)
<i>Greece</i>	16 (0.8)	467 (5.3)	28 (0.9)	482 (3.9)	36 (1.1)	496 (3.8)	20 (0.7)	484 (4.3)
Hong Kong	26 (1.3)	578 (7.8)	45 (1.1)	599 (6.7)	20 (0.9)	593 (7.2)	8 (0.6)	570 (10.7)
Hungary	29 (1.2)	537 (4.5)	48 (1.2)	545 (4.0)	18 (0.8)	534 (6.3)	6 (0.5)	508 (9.7)
Iceland	35 (2.6)	491 (6.4)	36 (2.4)	497 (4.8)	21 (1.3)	482 (6.9)	8 (1.2)	451 (10.6)
Iran, Islamic Rep.	15 (0.9)	424 (5.6)	24 (1.0)	429 (4.1)	28 (1.2)	432 (2.5)	33 (1.0)	432 (3.4)
Ireland	39 (1.3)	529 (5.0)	33 (0.9)	543 (5.6)	18 (0.9)	524 (7.2)	9 (0.7)	495 (7.5)
<i>Israel</i>	19 (1.9)	527 (10.7)	41 (1.5)	533 (8.6)	23 (1.5)	516 (6.3)	16 (1.1)	511 (6.7)
Japan	25 (1.1)	594 (3.8)	57 (0.9)	608 (2.1)	16 (0.8)	612 (3.4)	2 (0.2)	~ ~
Korea	31 (1.1)	604 (3.4)	50 (1.0)	613 (3.3)	13 (0.7)	613 (6.7)	5 (0.5)	571 (10.8)
<i>Kuwait</i>	22 (1.5)	399 (3.9)	35 (1.6)	396 (2.8)	23 (1.5)	390 (3.3)	21 (1.7)	381 (3.6)
Latvia (LSS)	8 (0.9)	494 (7.2)	18 (0.9)	498 (5.3)	29 (1.0)	495 (4.0)	45 (1.4)	492 (3.9)
Lithuania	20 (1.0)	479 (5.1)	39 (1.0)	481 (4.1)	27 (1.1)	480 (4.8)	14 (0.8)	466 (6.4)
<i>Netherlands</i>	27 (1.5)	522 (10.0)	48 (1.5)	549 (6.1)	17 (1.1)	558 (7.1)	8 (0.7)	545 (11.1)
New Zealand	8 (0.6)	488 (7.1)	38 (1.0)	516 (5.1)	39 (1.1)	512 (4.7)	15 (0.7)	495 (5.9)
Norway	31 (1.2)	493 (3.1)	46 (1.1)	508 (2.5)	18 (0.9)	522 (4.5)	6 (0.5)	487 (8.2)
Portugal	20 (0.9)	457 (3.5)	36 (1.0)	459 (3.1)	24 (0.9)	452 (3.4)	20 (0.9)	448 (3.2)
<i>Romania</i>	15 (0.8)	483 (5.9)	41 (1.2)	492 (4.9)	23 (0.8)	479 (5.2)	21 (0.9)	469 (5.2)
Russian Federation	17 (1.1)	532 (5.0)	52 (1.2)	542 (5.0)	21 (1.6)	541 (9.4)	9 (0.8)	502 (8.5)
<i>Scotland</i>	17 (1.0)	492 (6.2)	35 (1.1)	511 (6.1)	33 (1.1)	502 (6.6)	15 (0.9)	479 (8.4)
Singapore	20 (0.9)	633 (6.3)	41 (1.0)	652 (5.2)	30 (0.9)	645 (5.7)	10 (0.5)	627 (5.9)
Slovak Republic	36 (1.6)	531 (3.7)	43 (1.2)	560 (4.4)	16 (0.9)	557 (5.3)	5 (0.5)	527 (11.2)
<i>Slovenia</i>	15 (0.9)	536 (4.1)	55 (1.2)	543 (3.8)	21 (0.9)	546 (5.0)	8 (0.8)	522 (7.0)
Spain	15 (1.0)	469 (3.6)	31 (1.1)	492 (2.7)	26 (1.0)	495 (2.8)	27 (1.1)	486 (3.1)
Sweden	29 (1.1)	509 (3.8)	41 (0.9)	525 (3.6)	23 (0.8)	525 (3.9)	7 (0.6)	517 (5.8)
Switzerland	17 (1.0)	543 (5.1)	51 (1.1)	552 (3.0)	25 (1.2)	549 (4.3)	7 (0.6)	523 (8.9)
<i>Thailand</i>	19 (0.8)	513 (5.4)	44 (0.9)	524 (5.3)	26 (0.9)	530 (8.1)	11 (0.7)	518 (7.5)
United States	14 (0.8)	491 (6.3)	34 (1.1)	515 (4.7)	31 (1.0)	504 (5.0)	21 (0.9)	481 (5.4)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

HOW ARE CALCULATORS AND COMPUTERS USED?

As shown in Table 5.13, nearly all eighth-grade students reported having a calculator in the home, except in Iran (61%), Romania (62%), and Thailand (68%). Internationally, fewer students reported a computer in the home, even though more than three-fourths did so in Denmark, England, Iceland, Ireland, Israel, the Netherlands, and Scotland. Between 50% and 75% so reported in Australia, Austria, Belgium (Flemish), Belgium (French), Canada, Germany, Kuwait, New Zealand, Norway, Sweden, Switzerland, and the United States. Fewer than 20% of the eighth-grade students reported home computers in Colombia, Iran, Latvia (LSS), Romania, and Thailand.

Table 5.14 provides teachers' reports about how often calculators are used in eighth-grade mathematics classes. Even though calculators appear to be widely available in most countries, teachers reported considerable variation from country to country in the frequency of calculator use in mathematics classrooms. Although using calculators can take the drudgery out of mathematics and free the learner to concentrate on higher-order problem-solving skills, another point of view is that permitting unrestricted use of calculators may damage students' mastery of basic skills in mathematics.

According to teachers in many of the TIMSS countries, three-fourths or more of the eighth-grade students use calculators almost every day in their mathematics classes. The exceptions to at least weekly usage for the majority of the students were Belgium (Flemish), Greece, Iran, Ireland, Japan, Korea, Romania, and Thailand. As revealed in Table 5.15, teachers reported that students use calculators for a variety of purposes. Across countries, no single use appears to predominate, although checking answers, routine computation, and solving complex problems are frequent purposes in many countries. Using calculators on tests and exams was often less frequent than other uses, ranging from 0% of the students in Japan and Thailand to 64% in Austria.

Students' reports about the frequency of calculator usage in mathematics classes are presented in Table 5.16. Because different response categories were used for the student and teacher versions of the question, a direct comparison is difficult. It does appear that fewer students than teachers indicated nearly always using calculators. However, combining the two most frequent categories for students (pretty often and almost always) and comparing those percentages of responses to the two most frequent response categories for teachers (almost every day and once or twice a week) yields a fair degree of agreement between teachers' and students' reports.

Table 5.17 contains teachers' reports about how often computers are used in mathematics class to solve exercises or problems, and Table 5.18 contains students' responses to a similar question. Internationally, substantial percentages of teachers and students agreed that the computer is almost never used in most students' mathematics lessons. Teachers and students agree on moderate use of computers (more than 20% of the students in some lessons) in Austria, Denmark, England, Sweden, and the United States.

Table 5.13
Students' Reports on Having a Calculator and Computer in the Home
Mathematics - Upper Grade (Eighth Grade*)

Country	Calculator				Computer			
	Yes		No		Yes		No	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	97 (0.3)	533 (4.0)	3 (0.3)	447 (11.1)	73 (1.2)	539 (4.3)	27 (1.2)	510 (4.5)
<i>Austria</i>	100 (0.1)	540 (3.2)	0 (0.1)	~ ~	59 (1.5)	546 (3.5)	41 (1.5)	532 (4.0)
Belgium (Fl)	97 (0.8)	569 (5.2)	3 (0.8)	465 (20.2)	67 (1.3)	573 (5.8)	33 (1.3)	551 (6.3)
<i>Belgium (Fr)</i>	98 (0.3)	528 (3.4)	2 (0.3)	~ ~	60 (1.4)	538 (3.2)	40 (1.4)	511 (4.7)
Canada	98 (0.2)	529 (2.3)	2 (0.2)	~ ~	61 (1.3)	537 (2.4)	39 (1.3)	512 (3.2)
<i>Colombia</i>	88 (1.5)	389 (3.0)	12 (1.5)	356 (8.6)	11 (1.2)	405 (8.7)	89 (1.2)	382 (3.4)
Cyprus	96 (0.4)	477 (2.0)	4 (0.4)	418 (7.3)	39 (0.9)	484 (2.9)	61 (0.9)	469 (2.4)
Czech Republic	99 (0.2)	564 (4.9)	1 (0.2)	~ ~	36 (1.2)	579 (5.3)	64 (1.2)	555 (5.1)
<i>Denmark</i>	99 (0.3)	504 (2.9)	1 (0.3)	~ ~	76 (1.2)	508 (2.9)	24 (1.2)	490 (4.9)
England	99 (0.2)	508 (2.7)	1 (0.2)	~ ~	89 (0.8)	506 (3.1)	11 (0.8)	512 (8.2)
France	99 (0.2)	540 (3.1)	1 (0.2)	~ ~	50 (1.3)	547 (3.6)	50 (1.3)	531 (3.6)
<i>Germany</i>	99 (0.2)	510 (4.4)	1 (0.2)	~ ~	71 (1.0)	512 (4.3)	29 (1.0)	504 (5.6)
<i>Greece</i>	87 (0.6)	491 (3.0)	13 (0.6)	437 (4.6)	29 (1.0)	500 (5.3)	71 (1.0)	478 (2.8)
Hong Kong	99 (0.1)	590 (6.4)	1 (0.1)	~ ~	39 (1.9)	606 (7.2)	61 (1.9)	580 (6.5)
Hungary	97 (0.4)	541 (3.1)	3 (0.4)	457 (12.9)	37 (1.2)	569 (3.7)	63 (1.2)	521 (3.4)
Iceland	100 (0.1)	488 (4.5)	0 (0.1)	~ ~	77 (1.4)	488 (4.7)	23 (1.4)	483 (5.7)
Iran, Islamic Rep.	61 (1.8)	437 (2.2)	39 (1.8)	417 (2.9)	4 (0.4)	440 (6.9)	96 (0.4)	429 (2.1)
Ireland	97 (0.3)	529 (5.0)	3 (0.3)	497 (13.3)	78 (1.1)	531 (5.3)	22 (1.1)	521 (6.4)
<i>Israel</i>	99 (0.3)	524 (6.1)	1 (0.3)	~ ~	76 (2.1)	534 (5.8)	24 (2.1)	496 (9.1)
Japan	- -	- -	- -	- -	- -	- -	- -	- -
Korea	91 (0.5)	610 (2.5)	9 (0.5)	578 (8.1)	39 (1.2)	632 (3.6)	61 (1.2)	592 (2.8)
<i>Kuwait</i>	84 (1.4)	395 (2.5)	16 (1.4)	380 (3.6)	53 (2.1)	394 (3.4)	47 (2.1)	390 (2.8)
Latvia (LSS)	94 (0.5)	495 (3.1)	6 (0.5)	473 (8.1)	13 (0.9)	492 (5.6)	87 (0.9)	495 (3.1)
Lithuania	90 (1.0)	482 (3.6)	10 (1.0)	443 (6.3)	42 (1.4)	478 (3.9)	58 (1.4)	477 (4.2)
<i>Netherlands</i>	100 (0.1)	542 (7.0)	0 (0.1)	~ ~	85 (1.2)	545 (8.1)	15 (1.2)	524 (7.7)
New Zealand	99 (0.2)	509 (4.5)	1 (0.2)	~ ~	60 (1.3)	520 (5.0)	40 (1.3)	491 (4.6)
Norway	99 (0.2)	504 (2.2)	1 (0.2)	~ ~	64 (1.1)	512 (2.7)	36 (1.1)	489 (3.1)
Portugal	99 (0.2)	455 (2.5)	1 (0.2)	~ ~	39 (1.8)	469 (3.4)	61 (1.8)	446 (2.2)
<i>Romania</i>	62 (1.5)	491 (4.7)	38 (1.5)	467 (5.1)	19 (1.2)	496 (7.3)	81 (1.2)	479 (4.0)
Russian Federation	92 (0.8)	539 (5.0)	8 (0.8)	498 (10.8)	35 (1.5)	537 (5.6)	65 (1.5)	535 (6.2)
<i>Scotland</i>	98 (0.4)	500 (5.7)	2 (0.4)	~ ~	90 (0.6)	499 (5.8)	10 (0.6)	504 (7.4)
Singapore	100 (0.1)	644 (4.9)	0 (0.1)	~ ~	49 (1.5)	657 (5.1)	51 (1.5)	630 (5.0)
Slovak Republic	99 (0.2)	548 (3.3)	1 (0.2)	~ ~	31 (1.2)	563 (4.4)	69 (1.2)	540 (3.6)
<i>Slovenia</i>	98 (0.3)	542 (3.0)	2 (0.3)	~ ~	47 (1.3)	560 (3.7)	53 (1.3)	524 (3.4)
Spain	99 (0.2)	488 (2.0)	1 (0.2)	~ ~	42 (1.2)	499 (2.9)	58 (1.2)	479 (2.1)
Sweden	99 (0.1)	519 (2.9)	1 (0.1)	~ ~	60 (1.3)	531 (2.8)	40 (1.3)	500 (3.6)
Switzerland	99 (0.2)	547 (2.8)	1 (0.2)	~ ~	66 (1.2)	554 (3.1)	34 (1.2)	531 (3.8)
<i>Thailand</i>	68 (2.2)	530 (7.1)	32 (2.2)	508 (4.1)	4 (0.9)	573 (14.2)	96 (0.9)	521 (5.4)
United States	98 (0.3)	502 (4.5)	2 (0.3)	~ ~	59 (1.7)	518 (4.8)	41 (1.7)	474 (4.1)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.14**Teachers' Reports on Frequency of Students' Use of Calculators in Mathematics Class¹
Upper Grade (Eighth Grade*)**

Country	Never or Hardly Ever		Once or Twice a Month		Once or Twice a Week		Almost Every Day	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	r 6 (2.0)	512 (26.3)	1 (0.7)	~ ~	10 (1.7)	511 (14.7)	83 (2.6)	537 (5.0)
<i>Austria</i>	r 2 (1.3)	~ ~	3 (1.7)	470 (14.6)	7 (2.1)	560 (17.4)	87 (3.1)	550 (4.2)
Belgium (Fl)	39 (4.9)	577 (12.1)	23 (3.9)	572 (16.4)	14 (3.8)	584 (15.6)	24 (3.5)	571 (6.4)
<i>Belgium (Fr)</i>	s 18 (5.1)	553 (11.0)	25 (5.0)	551 (9.9)	27 (4.9)	537 (8.7)	30 (5.5)	543 (9.2)
Canada	5 (1.4)	489 (17.5)	3 (0.9)	515 (13.1)	12 (2.5)	518 (9.9)	80 (2.8)	533 (3.8)
<i>Colombia</i>	33 (4.6)	383 (4.0)	11 (2.7)	397 (8.9)	22 (4.7)	401 (17.5)	34 (4.7)	377 (3.5)
Cyprus	r 27 (4.6)	471 (6.4)	8 (2.5)	464 (4.3)	21 (4.1)	463 (6.9)	44 (5.2)	475 (4.3)
Czech Republic	3 (1.9)	523 (19.8)	6 (2.3)	552 (17.5)	17 (4.4)	566 (9.2)	74 (4.9)	563 (5.7)
<i>Denmark</i>	28 (4.9)	502 (5.6)	15 (3.6)	503 (7.6)	18 (3.7)	507 (6.2)	39 (4.9)	507 (4.1)
England	s 0 (0.0)	~ ~	2 (0.7)	~ ~	15 (2.2)	479 (9.8)	83 (2.2)	523 (4.5)
France	4 (2.0)	537 (21.7)	3 (1.6)	565 (23.3)	19 (3.4)	538 (6.0)	74 (4.2)	537 (4.1)
<i>Germany</i>	s 19 (3.8)	511 (9.8)	5 (2.4)	579 (25.4)	15 (3.2)	526 (19.4)	62 (4.5)	508 (7.0)
<i>Greece</i>	46 (4.1)	486 (3.8)	23 (4.1)	475 (7.3)	12 (2.4)	483 (9.1)	19 (3.6)	490 (6.0)
Hong Kong	8 (3.0)	558 (38.8)	7 (2.9)	581 (21.4)	18 (3.7)	555 (18.4)	67 (4.9)	601 (8.0)
Hungary	29 (3.8)	533 (7.5)	5 (1.9)	512 (18.3)	6 (1.9)	534 (16.8)	60 (4.2)	540 (4.9)
Iceland	r 0 (0.0)	~ ~	0 (0.0)	~ ~	4 (1.8)	476 (15.8)	96 (1.8)	490 (5.2)
Iran, Islamic Rep.	54 (5.9)	422 (3.4)	32 (5.9)	437 (2.3)	9 (2.6)	432 (8.7)	5 (2.0)	442 (5.8)
Ireland	68 (4.6)	535 (8.0)	7 (2.3)	490 (15.9)	13 (3.5)	515 (16.2)	11 (3.2)	521 (16.6)
<i>Israel</i>	r 11 (5.7)	501 (9.0)	5 (3.7)	588 (34.8)	11 (4.6)	517 (34.6)	73 (6.9)	518 (7.6)
Japan	79 (3.7)	603 (2.9)	16 (3.4)	609 (9.1)	4 (1.6)	620 (22.6)	2 (1.2)	~ ~
Korea	76 (4.1)	613 (2.9)	16 (3.5)	608 (7.3)	8 (2.7)	585 (6.8)	1 (0.6)	~ ~
<i>Kuwait</i>	23 (4.4)	400 (5.5)	11 (2.9)	396 (6.5)	23 (7.2)	390 (4.3)	43 (7.9)	388 (3.2)
Latvia (LSS)	r 13 (3.0)	499 (7.8)	13 (3.6)	479 (8.6)	27 (4.4)	492 (7.1)	46 (4.9)	492 (5.2)
Lithuania	r 12 (2.9)	453 (10.8)	6 (2.2)	496 (22.0)	20 (3.7)	461 (9.0)	62 (4.4)	485 (4.9)
<i>Netherlands</i>	0 (0.0)	~ ~	2 (1.5)	~ ~	17 (4.3)	535 (20.4)	81 (4.5)	545 (9.2)
New Zealand	7 (2.1)	536 (18.4)	5 (1.6)	507 (12.6)	21 (3.4)	510 (9.3)	66 (4.0)	505 (6.0)
Norway	r 2 (1.3)	~ ~	1 (1.0)	~ ~	15 (3.8)	504 (6.2)	82 (3.8)	507 (2.8)
Portugal	1 (0.9)	~ ~	4 (1.3)	452 (10.4)	21 (3.4)	454 (5.9)	74 (3.8)	455 (2.8)
<i>Romania</i>	63 (4.2)	470 (5.1)	7 (2.3)	494 (12.2)	10 (2.5)	521 (10.0)	19 (3.1)	490 (10.5)
Russian Federation	9 (2.1)	512 (11.0)	6 (2.1)	556 (21.4)	18 (3.0)	533 (7.9)	67 (3.9)	536 (7.4)
<i>Scotland</i>	- -	- -	- -	- -	- -	- -	- -	- -
Singapore	1 (0.8)	~ ~	5 (1.9)	617 (23.0)	12 (2.7)	636 (14.1)	82 (3.2)	647 (5.4)
Slovak Republic	2 (1.1)	~ ~	6 (2.0)	547 (11.6)	10 (2.5)	547 (12.2)	82 (3.1)	546 (3.6)
<i>Slovenia</i>	r 35 (4.7)	539 (5.2)	13 (3.3)	542 (10.3)	17 (4.0)	534 (8.9)	35 (4.7)	543 (6.1)
Spain	r 40 (4.4)	487 (4.7)	4 (1.9)	490 (12.2)	11 (2.6)	479 (7.0)	45 (4.7)	489 (4.3)
Sweden	7 (2.2)	495 (17.2)	21 (3.0)	523 (6.5)	37 (4.0)	520 (5.0)	35 (3.9)	521 (5.6)
Switzerland	s 36 (4.6)	545 (10.7)	8 (2.6)	547 (13.1)	24 (4.0)	545 (13.4)	32 (3.5)	567 (7.9)
<i>Thailand</i>	r 72 (5.8)	532 (9.3)	15 (4.9)	525 (12.0)	9 (3.6)	501 (4.7)	4 (1.8)	523 (13.1)
United States	r 8 (2.3)	489 (17.7)	10 (2.0)	460 (8.4)	20 (3.4)	492 (7.6)	62 (4.2)	513 (5.8)

¹Based on most frequent response for: checking answers, test and exams, routine computations, solving complex problems, and exploring number concepts.

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.15**Teachers' Reports on Ways in Which Calculators Are Used at Least Once or Twice a Week - Mathematics - Upper Grade (Eighth Grade*)**

Country	Percent of Students by Type of Use					
	Never or Hardly Ever Use Calculators	Checking Answers	Tests and Exams	Routine Computations	Solving Complex Problems	Exploring Number Concepts
<i>Australia</i>	r 6 (2.0)	r 84 (3.0)	r 47 (3.5)	r 92 (2.1)	r 76 (3.1)	r 48 (3.9)
<i>Austria</i>	r 2 (1.3)	r 91 (2.9)	r 64 (4.2)	r 91 (2.2)	r 70 (4.6)	s 28 (3.7)
Belgium (Fl)	39 (4.9)	24 (3.4)	10 (2.5)	28 (4.3)	15 (3.2)	10 (2.3)
<i>Belgium (Fr)</i>	s 18 (5.1)	s 53 (6.3)	s 16 (4.3)	s 41 (5.8)	s 39 (5.7)	s 24 (5.5)
Canada	5 (1.4)	85 (2.4)	r 52 (4.4)	82 (2.5)	86 (2.7)	r 63 (4.2)
<i>Colombia</i>	33 (4.6)	33 (4.4)	18 (3.8)	34 (4.7)	32 (4.4)	30 (4.9)
Cyprus	r 27 (4.6)	r 57 (5.3)	r 4 (2.3)	r 51 (5.8)	r 35 (4.3)	r 21 (4.6)
Czech Republic	3 (1.9)	80 (4.2)	22 (5.1)	67 (5.2)	80 (4.0)	16 (5.2)
<i>Denmark</i>	28 (4.9)	52 (4.9)	r 5 (2.0)	48 (5.1)	33 (4.4)	25 (4.2)
England	s 0 (0.0)	s 86 (2.4)	s 42 (3.4)	s 96 (1.0)	s 73 (2.6)	s 55 (3.4)
France	4 (2.0)	r 91 (2.8)	r 57 (4.8)	82 (3.5)	50 (5.0)	r 39 (5.3)
<i>Germany</i>	s 19 (3.8)	s 67 (4.8)	s 39 (4.9)	s 72 (4.4)	s 64 (5.4)	s 27 (5.5)
<i>Greece</i>	46 (4.1)	24 (3.5)	2 (1.0)	21 (3.5)	21 (3.4)	8 (2.4)
Hong Kong	8 (3.0)	74 (5.0)	53 (6.1)	79 (5.1)	62 (5.8)	29 (5.4)
Hungary	29 (3.8)	r 56 (5.1)	r 14 (2.9)	r 43 (4.4)	r 53 (4.7)	r 53 (4.4)
Iceland	r 0 (0.0)	r 91 (3.8)	r 51 (8.4)	r 97 (2.1)	r 99 (0.1)	r 69 (6.2)
Iran, Islamic Rep.	54 (5.9)	4 (1.6)	2 (1.7)	8 (2.4)	8 (2.8)	6 (1.6)
Ireland	68 (4.6)	18 (4.0)	4 (2.0)	r 17 (3.9)	r 7 (2.5)	r 4 (1.8)
<i>Israel</i>	r 11 (5.7)	r 75 (6.4)	r 57 (7.9)	r 72 (6.3)	r 56 (7.4)	r 43 (8.5)
Japan	79 (3.7)	1 (0.6)	0 (0.0)	3 (1.5)	2 (0.7)	3 (1.4)
Korea	76 (4.1)	1 (0.9)	1 (0.6)	6 (2.5)	4 (1.6)	1 (0.8)
<i>Kuwait</i>	23 (4.4)	51 (8.0)	25 (6.6)	52 (7.7)	48 (6.3)	22 (6.4)
Latvia (LSS)	r 13 (3.0)	r 50 (4.9)	r 8 (2.8)	r 59 (4.2)	r 49 (5.2)	r 17 (3.9)
Lithuania	r 12 (2.9)	r 72 (4.1)	r 9 (2.9)	r 66 (4.1)	r 58 (4.5)	r 18 (3.7)
<i>Netherlands</i>	0 (0.0)	83 (4.5)	50 (6.1)	97 (1.8)	67 (4.9)	46 (5.3)
New Zealand	7 (2.1)	41 (4.3)	20 (3.1)	85 (3.0)	70 (4.0)	54 (4.5)
Norway	r 2 (1.3)	r 93 (2.4)	r 24 (4.0)	r 91 (2.8)	r 72 (4.7)	r 35 (4.8)
Portugal	1 (0.9)	86 (2.6)	31 (3.5)	76 (3.4)	67 (3.7)	55 (4.2)
<i>Romania</i>	63 (4.2)	20 (3.4)	1 (1.1)	25 (3.3)	11 (2.7)	9 (2.3)
Russian Federation	9 (2.1)	73 (4.5)	15 (2.8)	76 (3.9)	45 (5.2)	6 (1.7)
<i>Scotland</i>	- -	- -	- -	- -	- -	- -
Singapore	1 (0.8)	89 (2.7)	47 (4.7)	83 (3.4)	82 (3.7)	57 (4.4)
Slovak Republic	2 (1.1)	79 (3.7)	31 (4.1)	72 (4.6)	77 (3.8)	60 (4.3)
<i>Slovenia</i>	r 35 (4.7)	r 39 (5.2)	r 4 (2.1)	r 38 (5.3)	r 28 (4.6)	r 6 (2.5)
Spain	r 40 (4.4)	r 46 (4.6)	r 16 (3.4)	r 35 (4.4)	r 39 (4.8)	r 29 (4.2)
Sweden	7 (2.2)	r 42 (4.1)	r 13 (2.8)	r 57 (4.1)	r 60 (3.6)	r 25 (3.5)
Switzerland	s 36 (4.6)	s 47 (4.9)	s 16 (2.7)	s 48 (4.3)	s 35 (3.9)	s 17 (2.8)
<i>Thailand</i>	r 72 (5.8)	r 7 (3.0)	r 0 (0.0)	r 5 (2.4)	r 9 (3.1)	s 10 (3.6)
United States	r 8 (2.3)	r 71 (3.8)	r 47 (4.2)	r 68 (3.6)	r 76 (3.4)	r 58 (3.9)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

A dash (-) indicates data are not available.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.16

Students' Reports on Frequency of Using Calculators in Mathematics Class Upper Grade (Eighth Grade*)

Country	Never		Once in a While		Pretty Often		Almost Always	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	4 (1.1)	495 (28.4)	10 (0.9)	509 (7.5)	31 (1.1)	533 (4.4)	55 (1.9)	539 (4.6)
<i>Austria</i>	2 (0.7)	~ ~	7 (0.8)	515 (9.9)	17 (1.2)	542 (7.2)	74 (2.1)	542 (3.3)
Belgium (Fl)	34 (4.1)	571 (12.4)	36 (2.4)	577 (6.1)	20 (2.5)	556 (10.5)	10 (1.6)	530 (11.7)
<i>Belgium (Fr)</i>	37 (2.7)	526 (4.6)	41 (1.9)	543 (3.9)	14 (1.6)	516 (8.4)	9 (1.1)	491 (8.6)
Canada	6 (1.2)	493 (8.7)	22 (1.6)	523 (3.6)	33 (1.2)	532 (3.0)	38 (2.2)	534 (4.4)
<i>Colombia</i>	54 (2.5)	394 (3.2)	26 (1.3)	382 (4.4)	9 (0.9)	393 (6.9)	11 (1.1)	371 (4.1)
Cyprus	30 (2.0)	480 (3.5)	39 (1.4)	477 (3.1)	21 (1.0)	475 (4.2)	10 (0.9)	452 (4.5)
Czech Republic	5 (1.2)	552 (12.0)	33 (2.5)	553 (6.1)	37 (2.1)	578 (6.8)	24 (1.9)	560 (5.5)
<i>Denmark</i>	32 (3.7)	506 (4.0)	37 (2.6)	499 (4.2)	19 (1.7)	514 (6.3)	12 (1.7)	498 (5.0)
England	0 (0.1)	~ ~	9 (0.9)	467 (6.6)	46 (1.6)	507 (4.3)	45 (1.8)	517 (3.3)
France	2 (0.9)	~ ~	27 (1.5)	539 (4.0)	40 (1.3)	548 (3.4)	30 (1.4)	530 (5.1)
<i>Germany</i>	25 (2.8)	502 (7.1)	19 (1.7)	527 (9.1)	20 (1.5)	517 (7.6)	35 (2.0)	504 (6.2)
<i>Greece</i>	51 (2.6)	482 (3.9)	26 (1.3)	494 (4.0)	14 (1.1)	489 (5.6)	9 (1.0)	473 (6.0)
Hong Kong	8 (2.3)	572 (27.9)	9 (1.2)	567 (15.8)	33 (1.9)	593 (6.4)	49 (2.5)	595 (7.0)
Hungary	20 (2.2)	521 (6.2)	39 (1.9)	539 (4.0)	24 (1.3)	547 (5.9)	17 (1.3)	547 (5.7)
Iceland	1 (0.3)	~ ~	6 (0.9)	474 (10.9)	32 (2.0)	491 (5.5)	61 (2.3)	487 (4.8)
Iran, Islamic Rep.	79 (1.4)	432 (2.4)	13 (1.0)	435 (4.7)	4 (0.5)	415 (4.4)	4 (0.5)	400 (6.5)
Ireland	79 (1.7)	535 (5.3)	14 (1.0)	517 (7.0)	4 (0.6)	493 (9.4)	3 (0.5)	484 (11.7)
<i>Israel</i>	7 (1.8)	517 (12.5)	21 (2.2)	536 (7.6)	27 (1.6)	532 (8.6)	45 (3.4)	515 (6.2)
Japan	75 (2.3)	607 (2.1)	21 (1.9)	603 (3.4)	3 (0.7)	575 (7.0)	0 (0.1)	~ ~
Korea	93 (0.5)	613 (2.5)	5 (0.4)	570 (9.7)	1 (0.3)	~ ~	1 (0.2)	~ ~
<i>Kuwait</i>	27 (3.2)	394 (3.7)	35 (2.1)	395 (3.1)	23 (1.5)	391 (3.8)	14 (1.7)	387 (3.3)
Latvia (LSS)	14 (1.4)	502 (5.7)	27 (1.4)	499 (4.1)	35 (1.3)	492 (4.1)	24 (2.0)	487 (5.2)
Lithuania	17 (1.7)	476 (6.5)	34 (1.5)	472 (3.9)	24 (1.2)	484 (4.5)	25 (1.7)	482 (5.8)
<i>Netherlands</i>	1 (0.2)	~ ~	9 (1.3)	514 (16.9)	36 (1.7)	547 (7.2)	54 (2.1)	544 (7.4)
New Zealand	6 (1.1)	519 (13.3)	20 (1.7)	503 (6.9)	37 (1.3)	511 (5.3)	36 (2.0)	510 (6.1)
Norway	4 (1.0)	465 (9.6)	25 (1.7)	497 (3.3)	39 (1.2)	509 (3.1)	33 (1.9)	508 (3.1)
Portugal	3 (0.6)	455 (7.3)	27 (1.6)	457 (3.1)	34 (1.2)	454 (3.5)	35 (1.5)	454 (2.8)
<i>Romania</i>	57 (1.7)	484 (4.7)	25 (1.2)	490 (5.4)	9 (0.6)	475 (6.8)	9 (0.8)	465 (7.3)
Russian Federation	9 (1.4)	538 (11.3)	37 (2.3)	537 (7.2)	25 (1.6)	537 (5.3)	29 (1.6)	534 (5.7)
<i>Scotland</i>	2 (0.7)	~ ~	16 (1.5)	498 (7.0)	48 (1.5)	501 (5.3)	34 (2.0)	498 (8.8)
Singapore	1 (0.4)	~ ~	16 (1.5)	613 (6.0)	54 (1.2)	648 (5.0)	29 (1.7)	655 (5.6)
Slovak Republic	4 (0.7)	550 (13.7)	24 (1.7)	543 (4.9)	37 (1.3)	554 (4.3)	35 (1.7)	544 (4.5)
<i>Slovenia</i>	44 (3.0)	544 (4.1)	38 (2.2)	540 (4.2)	10 (1.0)	534 (7.9)	8 (0.8)	535 (8.5)
Spain	49 (3.3)	493 (2.9)	23 (1.9)	492 (3.4)	12 (1.1)	479 (5.3)	17 (2.0)	471 (4.3)
Sweden	4 (0.9)	482 (13.1)	42 (2.2)	520 (3.2)	36 (1.7)	527 (3.9)	18 (2.2)	511 (5.2)
Switzerland	45 (2.9)	538 (4.6)	22 (1.6)	552 (5.1)	16 (1.2)	553 (5.5)	16 (1.3)	561 (6.3)
<i>Thailand</i>	59 (2.2)	514 (4.7)	34 (1.7)	535 (8.0)	5 (0.8)	543 (16.3)	2 (0.3)	~ ~
United States	10 (1.6)	464 (9.4)	20 (1.6)	498 (5.8)	26 (1.2)	501 (5.3)	44 (2.7)	511 (5.6)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.17**Teachers' Reports on Frequency of Using Computers in Mathematics Class to Solve Exercises or Problems - Upper Grade (Eighth Grade*)**

Country	Never or Almost Never		Some Lessons		Most or Every Lesson	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	r 78 (3.2)	531 (5.3)	21 (3.2)	535 (9.6)	0 (0.2)	~ ~
<i>Austria</i>	r 69 (4.5)	551 (5.6)	29 (4.4)	543 (7.3)	1 (0.5)	~ ~
Belgium (Fl)	99 (0.7)	574 (4.6)	1 (0.7)	~ ~	0 (0.0)	~ ~
<i>Belgium (Fr)</i>	s 95 (2.4)	543 (4.4)	4 (2.2)	555 (25.7)	1 (1.0)	~ ~
Canada	82 (3.5)	533 (2.9)	18 (3.5)	511 (10.3)	1 (0.5)	~ ~
<i>Colombia</i>	r 94 (2.2)	387 (3.8)	5 (2.0)	391 (12.9)	1 (0.9)	~ ~
Cyprus	r 89 (3.3)	468 (2.9)	11 (3.3)	476 (11.4)	0 (0.0)	~ ~
Czech Republic	74 (5.4)	560 (6.4)	23 (5.1)	568 (8.8)	4 (2.8)	549 (0.7)
<i>Denmark</i>	38 (4.5)	500 (4.5)	62 (4.5)	507 (2.9)	0 (0.0)	~ ~
England	s 53 (3.9)	517 (5.9)	46 (3.7)	514 (6.9)	2 (1.0)	~ ~
France	86 (3.2)	541 (3.3)	14 (3.2)	536 (11.5)	0 (0.0)	~ ~
<i>Germany</i>	s 87 (3.1)	510 (5.8)	13 (3.1)	550 (12.3)	0 (0.0)	~ ~
<i>Greece</i>	85 (2.9)	481 (3.3)	12 (2.5)	500 (7.7)	2 (1.4)	~ ~
Hong Kong	90 (3.5)	590 (7.3)	9 (3.7)	576 (29.4)	1 (1.2)	~ ~
Hungary	- -	- -	- -	- -	- -	- -
Iceland	- -	- -	- -	- -	- -	- -
Iran, Islamic Rep.	93 (5.5)	430 (2.3)	6 (5.5)	435 (18.2)	1 (1.0)	~ ~
Ireland	99 (0.9)	528 (6.0)	1 (0.9)	~ ~	0 (0.0)	~ ~
<i>Israel</i>	- -	- -	- -	- -	- -	- -
Japan	90 (2.7)	604 (2.5)	9 (2.6)	612 (10.1)	1 (0.5)	~ ~
Korea	96 (1.6)	610 (2.5)	3 (1.3)	618 (21.6)	1 (1.0)	~ ~
<i>Kuwait</i>	73 (7.1)	393 (2.9)	21 (6.6)	387 (3.4)	6 (3.4)	389 (10.6)
Latvia (LSS)	r 97 (1.6)	490 (3.3)	3 (1.6)	494 (14.9)	0 (0.0)	~ ~
Lithuania	94 (1.8)	480 (4.1)	6 (1.8)	450 (12.3)	0 (0.0)	~ ~
<i>Netherlands</i>	- -	- -	- -	- -	- -	- -
New Zealand	r 86 (3.1)	506 (4.4)	14 (3.1)	526 (15.7)	0 (0.0)	~ ~
Norway	r 90 (2.6)	507 (2.7)	10 (2.6)	509 (5.1)	0 (0.0)	~ ~
Portugal	97 (1.5)	454 (2.6)	3 (1.5)	482 (23.2)	0 (0.0)	~ ~
<i>Romania</i>	96 (1.7)	481 (4.4)	4 (1.7)	512 (20.6)	0 (0.0)	~ ~
Russian Federation	78 (2.6)	533 (6.8)	15 (2.2)	537 (6.9)	6 (2.4)	566 (14.6)
<i>Scotland</i>	- -	- -	- -	- -	- -	- -
Singapore	92 (2.7)	643 (5.3)	8 (2.7)	652 (15.3)	0 (0.0)	~ ~
Slovak Republic	95 (1.5)	543 (3.3)	4 (1.3)	592 (13.5)	1 (0.8)	~ ~
<i>Slovenia</i>	r 69 (4.5)	539 (4.5)	27 (4.5)	545 (7.2)	4 (2.1)	527 (21.9)
Spain	r 89 (3.1)	488 (2.6)	11 (3.1)	472 (9.1)	0 (0.0)	~ ~
Sweden	r 74 (2.9)	519 (4.1)	25 (2.9)	515 (7.3)	0 (0.3)	~ ~
Switzerland	s 87 (3.2)	549 (5.6)	13 (3.3)	577 (13.0)	1 (0.8)	~ ~
<i>Thailand</i>	r 97 (2.0)	528 (7.5)	1 (1.5)	~ ~	2 (1.3)	~ ~
United States	r 76 (3.1)	502 (5.9)	21 (3.2)	497 (9.1)	3 (1.7)	506 (22.2)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.18

Students' Reports on Frequency of Using Computers in Mathematics Class Upper Grade (Eighth Grade*)

Country	Never		Once in a While		Always or Pretty Often	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	77 (2.1)	536 (4.4)	18 (1.7)	536 (7.6)	5 (0.9)	477 (11.4)
<i>Austria</i>	62 (2.6)	545 (3.8)	32 (2.2)	540 (5.4)	6 (0.8)	487 (7.9)
Belgium (Fl)	94 (1.1)	568 (5.7)	4 (0.9)	544 (15.7)	2 (0.6)	~ ~
<i>Belgium (Fr)</i>	94 (1.4)	532 (3.3)	3 (0.7)	531 (22.2)	4 (0.9)	437 (20.4)
Canada	82 (1.4)	532 (2.4)	13 (1.3)	528 (8.4)	5 (0.4)	476 (6.7)
<i>Colombia</i>	95 (0.5)	389 (2.9)	3 (0.4)	390 (6.9)	3 (0.3)	370 (5.9)
Cyprus	73 (0.9)	485 (1.8)	16 (0.9)	459 (4.9)	11 (0.8)	432 (4.3)
Czech Republic	88 (2.9)	564 (5.1)	8 (1.9)	560 (12.5)	4 (1.8)	570 (18.0)
<i>Denmark</i>	40 (3.6)	505 (4.0)	51 (3.0)	507 (3.6)	9 (1.3)	486 (8.4)
England	45 (2.6)	512 (4.9)	46 (2.3)	514 (4.3)	9 (1.2)	457 (6.8)
France	88 (2.4)	542 (3.3)	8 (2.0)	531 (10.8)	4 (0.8)	492 (9.6)
<i>Germany</i>	84 (2.1)	511 (4.6)	11 (1.9)	533 (9.3)	5 (0.7)	455 (7.7)
<i>Greece</i>	83 (1.0)	490 (2.9)	10 (0.7)	471 (6.4)	7 (0.6)	443 (6.2)
Hong Kong	91 (0.7)	592 (6.2)	6 (0.5)	580 (11.4)	3 (0.4)	559 (16.7)
Hungary	92 (0.8)	539 (3.2)	5 (0.8)	548 (12.3)	2 (0.4)	~ ~
<i>Iceland</i>	81 (2.4)	494 (4.4)	11 (1.3)	479 (5.1)	8 (1.6)	442 (9.8)
Iran, Islamic Rep.	92 (0.8)	432 (2.3)	3 (0.4)	416 (5.2)	4 (0.5)	399 (5.6)
Ireland	96 (1.1)	531 (5.0)	3 (0.9)	498 (30.4)	1 (0.3)	~ ~
<i>Israel</i>	76 (4.5)	530 (6.9)	12 (2.6)	523 (11.5)	11 (3.0)	489 (15.7)
Japan	77 (3.3)	604 (2.9)	19 (2.6)	611 (4.6)	4 (1.2)	604 (14.5)
Korea	93 (0.7)	611 (2.4)	5 (0.5)	587 (9.4)	2 (0.3)	~ ~
<i>Kuwait</i>	78 (2.0)	398 (2.5)	8 (0.9)	380 (7.6)	14 (1.7)	371 (2.8)
Latvia (LSS)	91 (1.1)	497 (3.1)	6 (0.9)	484 (8.5)	3 (0.4)	458 (12.9)
Lithuania	92 (1.0)	481 (3.4)	5 (0.8)	456 (8.8)	3 (0.5)	456 (13.2)
<i>Netherlands</i>	81 (3.4)	536 (7.8)	18 (3.3)	575 (13.8)	2 (0.4)	~ ~
New Zealand	79 (2.5)	512 (4.5)	17 (2.1)	514 (8.7)	4 (0.6)	442 (9.1)
Norway	88 (1.5)	508 (2.4)	10 (1.5)	487 (6.1)	2 (0.3)	~ ~
Portugal	97 (0.6)	455 (2.5)	2 (0.6)	~ ~	1 (0.2)	~ ~
<i>Romania</i>	78 (1.2)	487 (4.5)	8 (0.7)	471 (8.7)	14 (0.9)	468 (8.8)
Russian Federation	94 (0.8)	538 (5.7)	4 (0.6)	528 (6.8)	2 (0.3)	~ ~
<i>Scotland</i>	54 (3.1)	504 (6.9)	37 (2.5)	503 (6.1)	9 (1.3)	459 (4.7)
Singapore	90 (1.5)	644 (5.2)	8 (1.4)	653 (8.2)	2 (0.4)	~ ~
Slovak Republic	94 (1.0)	549 (3.5)	5 (1.0)	539 (9.6)	1 (0.2)	~ ~
<i>Slovenia</i>	89 (0.7)	547 (3.1)	7 (0.6)	494 (7.0)	3 (0.4)	492 (10.1)
Spain	93 (1.3)	490 (2.0)	4 (0.8)	466 (7.5)	3 (0.7)	452 (12.4)
Sweden	61 (3.2)	527 (3.5)	30 (2.7)	521 (3.8)	9 (1.1)	467 (5.6)
Switzerland	82 (2.1)	549 (3.2)	14 (1.8)	546 (6.0)	4 (0.6)	512 (16.9)
<i>Thailand</i>	91 (1.0)	522 (5.8)	6 (0.6)	535 (10.3)	3 (0.5)	510 (9.2)
United States	69 (2.5)	504 (4.6)	21 (1.8)	514 (6.8)	10 (1.5)	458 (7.5)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

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

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

HOW MUCH HOMEWORK ARE STUDENTS ASSIGNED?

Although teachers often give students time to begin or review homework assignments in class, homework is generally considered a method of extending the time spent on regular classroom lessons. Table 5.19 presents teachers' reports about how often they assigned homework and the typical lengths of such assignments. Internationally, most eighth-grade students are assigned homework at least three times a week. Most typically, for the majority of students the assignments were 30 minutes or less in length. Homework assignments were more than 30 minutes for the majority of students in Cyprus, Greece, Romania, the Russian Federation, Singapore, and Thailand. The majority of students were assigned mathematics homework less frequently than three times a week in Belgium (Flemish), the Czech Republic, England, Iran, Japan, Korea, Scotland, and Sweden, although teachers in England and Iran gave longer assignments for about half of their students.

Homework generally has its biggest impact when it is commented on and graded by teachers. Table 5.20 presents teachers' reports about their use of students' written mathematics homework. In most countries, for at least 70% of the students, teachers reported at least sometimes, if not always, correcting homework assignments and returning those assignments to students. The exceptions were France, Germany, Hungary, Iceland, Japan, the Netherlands, Portugal, the Slovak Republic, and Slovenia.

Many teachers do not count mathematics homework directly in determining grades, but use it more as a method to monitor students' understanding and to correct misconceptions. In general, for the TIMSS countries, teachers reported that mathematics homework assignments contributed only sometimes to students' grades or marks. In some countries, however, it had even less impact on grades. According to their teachers, homework never or only rarely contributed to the grades for the majority of the students in Austria, Belgium (Flemish), the Czech Republic, Denmark, France, Germany, Hungary, Ireland, Japan, Korea, Latvia (LSS), Lithuania, the Netherlands, Norway, Singapore, the Slovak Republic, Slovenia, Sweden, and Switzerland. At the other end of the continuum, teachers reported that homework always contributed to the grades for the majority of the students in Cyprus, England, Portugal, the Russian Federation, and the United States.

Table 5.19

Teachers' Reports About the Amount of Mathematics Homework Assigned Upper Grade (Eighth Grade*)

Country	Percent of Students Taught by Teachers						
	Never Assigning Homework	Assigning Homework Less Than Once a Week		Assigning Homework Once or Twice a Week		Assigning Homework Three Times a Week or More Often	
		30 Minutes or Less	More Than 30 Minutes	30 Minutes or Less	More Than 30 Minutes	30 Minutes or Less	More Than 30 Minutes
<i>Australia</i>	r 1 (0.8)	6 (1.6)	0 (0.2)	21 (2.6)	4 (1.9)	62 (3.4)	5 (1.7)
<i>Austria</i>	r 0 (0.0)	1 (0.5)	0 (0.0)	24 (4.4)	3 (1.4)	63 (5.0)	10 (2.1)
Belgium (Fl)	0 (0.0)	17 (3.5)	2 (1.1)	52 (4.8)	10 (2.6)	15 (2.9)	5 (2.1)
<i>Belgium (Fr)</i>	1 (1.2)	2 (1.4)	0 (0.0)	30 (5.1)	5 (2.2)	55 (5.5)	7 (2.8)
Canada	r 2 (1.1)	2 (0.9)	1 (0.7)	22 (3.4)	2 (0.9)	59 (3.7)	13 (2.7)
<i>Colombia</i>	0 (0.0)	1 (0.9)	1 (0.8)	17 (4.7)	13 (2.9)	29 (4.2)	39 (4.2)
Cyprus	r 0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	50 (5.3)	50 (5.3)
Czech Republic	0 (0.4)	14 (4.5)	0 (0.0)	62 (5.2)	0 (0.3)	23 (3.5)	1 (0.6)
<i>Denmark</i>	0 (0.0)	4 (1.8)	0 (0.0)	42 (4.7)	3 (1.6)	49 (5.2)	2 (1.0)
England	0 (0.0)	3 (1.0)	1 (0.6)	44 (3.8)	47 (3.7)	3 (1.4)	2 (1.1)
France	0 (0.0)	0 (0.0)	2 (0.9)	7 (2.5)	4 (1.2)	77 (3.9)	10 (2.8)
<i>Germany</i>	1 (1.4)	1 (1.4)	0 (0.0)	22 (4.4)	0 (0.0)	73 (5.0)	3 (1.8)
<i>Greece</i>	0 (0.0)	1 (0.9)	0 (0.0)	0 (0.0)	0 (0.2)	31 (3.4)	67 (3.5)
Hong Kong	1 (1.4)	4 (2.2)	3 (1.8)	25 (4.7)	15 (4.1)	38 (6.0)	14 (4.1)
<i>Hungary</i>	0 (0.0)	1 (0.7)	0 (0.0)	2 (1.3)	0 (0.0)	82 (3.0)	15 (3.1)
Iceland	0 (0.0)	0 (0.0)	0 (0.0)	5 (2.0)	1 (1.0)	75 (5.5)	19 (5.5)
Iran, Islamic Rep.	0 (0.0)	1 (0.5)	3 (1.4)	10 (3.0)	59 (4.4)	2 (1.1)	26 (4.3)
Ireland	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.9)	0 (0.0)	94 (2.2)	5 (2.0)
<i>Israel</i>	r 0 (0.0)	1 (1.2)	0 (0.0)	3 (2.2)	0 (0.0)	48 (7.1)	48 (6.8)
Japan	0 (0.0)	27 (4.0)	4 (1.7)	37 (3.7)	10 (2.3)	16 (2.9)	6 (1.5)
Korea	0 (0.0)	5 (1.6)	8 (2.2)	27 (3.7)	21 (3.3)	21 (3.2)	18 (3.4)
<i>Kuwait</i>	0 (0.0)	0 (0.0)	0 (0.0)	19 (6.1)	2 (2.0)	60 (8.3)	18 (6.0)
Latvia (LSS)	0 (0.0)	0 (0.0)	0 (0.0)	8 (2.8)	1 (0.9)	83 (3.9)	9 (2.4)
Lithuania	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.3)	0 (0.0)	76 (3.9)	22 (3.9)
<i>Netherlands</i>	1 (1.2)	1 (0.9)	0 (0.0)	12 (3.5)	2 (1.4)	81 (4.2)	4 (2.2)
New Zealand	0 (0.0)	5 (1.9)	2 (0.1)	34 (4.3)	4 (1.5)	54 (4.2)	2 (1.2)
Norway	r 0 (0.0)	0 (0.0)	0 (0.0)	7 (2.7)	8 (2.7)	67 (4.3)	18 (4.0)
Portugal	0 (0.0)	1 (0.9)	1 (0.5)	30 (4.0)	2 (1.1)	57 (4.1)	9 (2.4)
<i>Romania</i>	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.8)	1 (0.6)	11 (2.8)	87 (2.8)
Russian Federation	0 (0.0)	0 (0.0)	0 (0.0)	2 (0.9)	1 (0.8)	42 (3.5)	55 (3.4)
<i>Scotland</i>	r 0 (0.4)	20 (4.3)	4 (2.0)	46 (5.1)	6 (2.3)	24 (4.1)	0 (0.0)
Singapore	0 (0.0)	1 (0.9)	0 (0.0)	3 (1.5)	11 (3.1)	26 (4.1)	58 (4.5)
Slovak Republic	0 (0.0)	1 (0.9)	0 (0.0)	12 (2.8)	1 (0.7)	83 (3.4)	4 (1.7)
<i>Slovenia</i>	r 0 (0.0)	0 (0.0)	0 (0.0)	2 (1.4)	0 (0.0)	74 (4.4)	24 (4.2)
Spain	r 0 (0.0)	4 (1.6)	0 (0.0)	18 (3.3)	9 (2.7)	47 (4.4)	22 (3.7)
Sweden	r 0 (0.4)	19 (3.0)	7 (1.9)	45 (4.0)	26 (3.3)	2 (1.2)	1 (1.2)
Switzerland	0 (0.0)	1 (0.4)	1 (0.3)	26 (4.2)	4 (1.5)	61 (4.4)	6 (2.3)
<i>Thailand</i>	r 0 (0.0)	0 (0.0)	0 (0.0)	6 (3.5)	20 (4.8)	16 (4.7)	58 (6.6)
United States	r 0 (0.1)	3 (1.3)	0 (0.0)	7 (1.8)	3 (0.9)	64 (2.9)	23 (3.1)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

An "r" indicates teacher response data available for 70-84% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.20**Teachers' Reports on Their Use of Students' Written Mathematics Homework¹
Upper Grade (Eighth Grade*)**

Country	Percent of Students Taught by Teachers							
	Collecting, Correcting, and then Returning Assignments to Students				Using Homework to Contribute Towards Students' Grades or Marks			
	Never	Rarely	Sometimes	Always	Never	Rarely	Sometimes	Always
<i>Australia</i>	r 7 (1.9)	14 (2.5)	41 (3.7)	38 (3.6)	r 23 (3.1)	17 (2.6)	41 (3.4)	20 (2.8)
<i>Austria</i>	r 1 (0.5)	25 (3.4)	22 (3.2)	53 (3.8)	r 22 (3.8)	34 (4.0)	27 (3.4)	17 (3.6)
Belgium (Fl)	5 (1.6)	5 (2.9)	9 (2.3)	80 (3.7)	34 (4.9)	16 (3.0)	21 (3.9)	29 (3.9)
<i>Belgium (Fr)</i>	s 7 (3.2)	7 (2.9)	28 (5.2)	58 (6.0)	s 21 (4.6)	20 (4.0)	25 (4.9)	33 (5.7)
Canada	r 4 (1.6)	21 (2.9)	50 (4.2)	25 (3.3)	r 12 (2.7)	10 (2.7)	49 (4.3)	29 (3.4)
<i>Colombia</i>	0 (0.0)	9 (2.2)	11 (2.9)	80 (3.7)	1 (1.0)	10 (2.2)	49 (5.1)	40 (4.8)
Cyprus	r 8 (2.9)	18 (3.4)	56 (5.0)	17 (4.4)	r 0 (0.0)	2 (0.6)	37 (4.7)	62 (4.7)
Czech Republic	4 (2.8)	2 (1.3)	24 (3.9)	70 (4.7)	42 (4.9)	35 (5.2)	19 (4.5)	3 (1.5)
<i>Denmark</i>	10 (3.8)	17 (3.7)	45 (5.0)	27 (4.8)	44 (5.0)	29 (4.4)	17 (3.7)	10 (2.9)
England	s 2 (1.1)	3 (1.0)	42 (3.6)	53 (3.9)	s 4 (1.5)	7 (1.5)	39 (3.2)	50 (3.4)
France	11 (2.8)	43 (4.6)	26 (4.0)	19 (3.7)	44 (4.4)	33 (4.5)	14 (2.7)	9 (2.9)
<i>Germany</i>	s 13 (4.0)	34 (5.1)	47 (6.0)	7 (2.0)	s 32 (5.1)	33 (5.0)	28 (4.4)	6 (2.9)
<i>Greece</i>	9 (2.4)	20 (3.2)	49 (3.9)	22 (3.6)	3 (1.4)	7 (1.8)	43 (3.6)	46 (3.9)
Hong Kong	0 (0.0)	1 (1.1)	12 (3.5)	87 (3.6)	23 (4.4)	25 (4.9)	19 (4.3)	33 (5.3)
Hungary	9 (2.5)	35 (4.2)	49 (4.5)	7 (2.3)	20 (3.7)	40 (4.2)	28 (3.7)	11 (2.8)
Iceland	r 8 (3.7)	25 (7.1)	62 (7.5)	6 (1.8)	r 9 (3.9)	16 (4.3)	40 (6.4)	35 (7.6)
Iran, Islamic Rep.	10 (2.9)	14 (3.1)	40 (4.7)	37 (4.8)	11 (2.3)	27 (5.9)	41 (5.2)	21 (4.4)
Ireland	6 (2.4)	16 (3.8)	57 (5.1)	20 (4.2)	35 (5.2)	20 (4.1)	37 (4.5)	7 (2.4)
<i>Israel</i>	r 0 (0.0)	17 (5.2)	59 (8.1)	24 (8.3)	r 0 (0.0)	11 (5.3)	59 (8.4)	30 (8.5)
Japan	21 (3.4)	34 (4.3)	25 (3.9)	21 (3.6)	32 (3.6)	37 (4.5)	18 (4.0)	13 (3.1)
Korea	1 (1.0)	10 (2.4)	61 (3.9)	28 (3.7)	26 (3.2)	34 (4.0)	35 (4.0)	6 (1.7)
<i>Kuwait</i>	1 (0.8)	3 (2.6)	28 (6.9)	68 (6.6)	9 (3.9)	11 (4.6)	38 (8.0)	42 (7.6)
Latvia (LSS)	r 2 (1.6)	11 (3.0)	30 (4.1)	57 (4.7)	r 32 (4.0)	23 (3.4)	25 (3.4)	20 (3.6)
Lithuania	5 (1.7)	9 (2.6)	52 (4.4)	35 (4.5)	r 48 (5.0)	9 (2.7)	28 (4.2)	15 (3.2)
<i>Netherlands</i>	49 (5.2)	29 (5.0)	22 (3.9)	1 (0.8)	67 (5.2)	17 (4.6)	12 (3.8)	4 (1.9)
New Zealand	3 (1.7)	20 (3.1)	48 (4.2)	28 (3.7)	15 (2.9)	28 (3.8)	41 (4.3)	16 (3.2)
Norway	r 7 (2.4)	17 (3.6)	64 (4.6)	13 (3.5)	r 16 (3.5)	48 (5.0)	29 (4.6)	7 (2.6)
Portugal	9 (2.5)	23 (4.0)	43 (4.0)	26 (4.0)	2 (1.2)	13 (3.1)	34 (4.3)	51 (4.4)
<i>Romania</i>	4 (1.9)	11 (2.5)	49 (4.0)	37 (4.2)	8 (2.4)	16 (2.9)	44 (4.3)	32 (3.5)
Russian Federation	0 (0.1)	2 (1.1)	23 (3.7)	75 (4.0)	2 (0.9)	3 (1.3)	38 (5.5)	57 (5.1)
<i>Scotland</i>	- -	- -	- -	- -	- -	- -	- -	- -
Singapore	0 (0.0)	0 (0.0)	6 (2.2)	94 (2.2)	33 (4.6)	26 (4.2)	32 (4.0)	9 (2.5)
Slovak Republic	6 (2.6)	30 (3.8)	57 (4.7)	7 (2.2)	51 (4.7)	30 (4.3)	18 (3.0)	1 (0.6)
<i>Slovenia</i>	r 4 (2.0)	28 (4.9)	60 (5.1)	8 (2.8)	r 39 (4.1)	40 (5.0)	19 (4.2)	2 (1.6)
Spain	r 9 (2.9)	4 (1.8)	26 (4.6)	61 (4.8)	r 3 (1.6)	7 (2.5)	41 (4.8)	49 (4.8)
Sweden	r 6 (2.0)	8 (2.0)	24 (3.1)	62 (3.9)	r 27 (3.7)	23 (3.2)	32 (3.5)	18 (2.8)
Switzerland	s 5 (1.8)	23 (3.8)	56 (4.6)	16 (2.9)	s 42 (4.5)	42 (4.7)	15 (3.4)	0 (0.2)
<i>Thailand</i>	s 0 (0.0)	1 (0.6)	19 (4.9)	80 (4.9)	s 16 (4.8)	11 (3.1)	57 (5.8)	16 (4.7)
United States	r 5 (1.4)	15 (2.3)	42 (4.2)	38 (4.4)	r 1 (0.4)	4 (1.6)	27 (4.3)	68 (4.3)

¹Based on those teachers who assign homework.

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

A dash (-) indicates data are not available.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

WHAT ASSESSMENT AND EVALUATION PROCEDURES DO TEACHERS USE?

Teachers in participating countries were asked about the importance they place on different types of assessment and how they use assessment information. Their responses to these two questions are presented in Tables 5.21 and 5.22, respectively. The weight given to each type of assessment varied greatly from country to country. Internationally, the least weight reportedly was given to external standardized tests and teacher-made objective tests. Across all participating countries, fewer than 80% of the eighth-grade students had mathematics teachers who reported giving quite a lot or a great deal of weight to these types of assessments.

The Hungarian teachers reported the heaviest emphasis on projects or practical exercises. They reported relying on this type of assessment for 90% of the students, with the next highest countries being Colombia with 77%, Denmark with 74%, and Israel with 70%. However, the most heavily weighted types of assessment were teacher-made tests requiring explanations, observations of students, and students' responses in class. One or more of these assessment types was weighted heavily for 80% or more of the eighth-grade students in many European and Eastern European countries. In contrast, teachers were in less agreement about assessment approaches within Australia, Canada, England, Hong Kong, Israel, Japan, Korea, New Zealand, Singapore, Slovenia, Switzerland, Thailand, and the United States, where no type of assessment was weighted heavily for as many as 80% of the students.

As might be anticipated, mathematics teachers in most countries reported using assessment information to provide grades or marks, to provide student feedback, to diagnose learning problems, and to plan future lessons. Teachers in fewer countries reported considerable use of assessment information to report to parents or for the purpose of tracking or making program assignments.

As reported in Table 5.23, eighth-grade students reported substantial variation in the frequency of testing in mathematics classes. The majority of the students reported having quizzes and tests only once in a while or never in Austria, the Czech Republic, Denmark, England, Germany, Hungary, Iceland, Ireland, Japan, Korea, Latvia (LSS), Norway, Scotland, and the Slovak Republic. In contrast, one-third or more of the students reported almost always having quizzes or tests in Colombia, Hong Kong, Kuwait, Romania, Spain, and the United States. In a number of countries, there was a tendency for the reports of the most frequent testing to be associated with lower-achieving students. One could argue that these students can least afford time diverted from their ongoing instructional program. However, teachers may provide shorter lessons and follow-up quizzes for lower-achieving students to more closely monitor their grasp of the subject matter.

Table 5.21

**Teachers' Reports on the Types of Assessment Given "Quite A Lot" or "A Great Deal" of Weight in Assessing Students' Work in Mathematics Class
Upper Grade (Eighth Grade*)**

Country	Percent of Students Taught by Teachers Relying on Different Types of Assessment						
	External Standardized Tests	Teacher-Made Tests Requiring Explanations	Teacher-Made Objective Tests	Homework Assignments	Projects or Practical Exercises	Observations of Students	Students' Responses in Class
<i>Australia</i>	r 8 (1.8)	r 42 (2.9)	r 24 (2.9)	r 26 (2.9)	r 29 (2.9)	r 37 (3.4)	r 34 (3.3)
<i>Austria</i>	r 4 (1.1)	r 29 (3.1)	r 1 (0.5)	r 47 (3.7)	s 23 (3.8)	r 97 (1.6)	r 81 (4.0)
Belgium (Fl)	10 (2.6)	94 (1.9)	11 (3.1)	15 (2.7)	16 (2.6)	50 (4.0)	55 (4.0)
<i>Belgium (Fr)</i>	s 6 (2.5)	s 85 (4.8)	s 16 (4.4)	s 35 (6.0)	s 6 (3.6)	s 47 (6.3)	s 58 (5.5)
Canada	r 16 (3.3)	r 49 (4.0)	r 18 (3.0)	r 44 (4.5)	r 32 (3.6)	r 43 (4.5)	r 41 (3.9)
<i>Colombia</i>	16 (3.7)	81 (4.0)	55 (4.7)	90 (2.5)	77 (3.9)	88 (3.2)	94 (2.0)
Cyprus	r 40 (3.7)	r 71 (4.9)	r 56 (4.7)	r 96 (2.0)	r 67 (4.7)	r 88 (3.1)	r 100 (0.0)
Czech Republic	r 43 (5.4)	100 (0.3)	r 19 (5.1)	14 (3.1)	r 29 (4.9)	74 (4.4)	96 (2.6)
<i>Denmark</i>	54 (5.2)	75 (4.8)	21 (4.0)	66 (5.2)	74 (4.2)	97 (1.8)	91 (2.9)
England	s 36 (3.2)	s 32 (3.0)	s 7 (1.8)	s 68 (3.3)	s 48 (3.5)	s 71 (2.9)	s 66 (3.4)
France	23 (3.7)	83 (3.7)	25 (3.9)	28 (4.8)	r 16 (3.6)	49 (4.6)	54 (4.9)
<i>Germany</i>	s 0 (0.0)	s 55 (5.1)	s 7 (2.9)	s 18 (4.6)	s 40 (4.7)	s 74 (5.2)	s 81 (4.3)
<i>Greece</i>	32 (4.9)	92 (2.2)	44 (4.3)	58 (4.7)	r 45 (4.3)	87 (3.0)	99 (0.6)
Hong Kong	32 (5.4)	40 (5.4)	40 (5.8)	74 (5.4)	12 (3.7)	68 (5.2)	74 (4.8)
Hungary	34 (4.1)	71 (3.5)	24 (3.6)	43 (4.6)	90 (2.7)	69 (4.2)	87 (2.9)
Iceland	r 45 (8.3)	s 42 (9.0)	s 9 (3.5)	r 92 (3.0)	r 53 (7.0)	r 73 (7.3)	r 68 (6.1)
Iran, Islamic Rep.	22 (3.6)	88 (5.2)	24 (4.0)	60 (5.2)	r 14 (3.3)	r 45 (5.3)	86 (3.8)
Ireland	r 35 (4.7)	r 26 (4.2)	25 (4.3)	75 (4.1)	r 37 (4.9)	r 76 (4.0)	86 (3.6)
<i>Israel</i>	r 77 (6.0)	r 29 (7.4)	r 64 (7.0)	r 61 (7.6)	r 70 (7.7)	r 54 (7.1)	r 46 (6.1)
Japan	16 (2.5)	54 (3.8)	20 (3.2)	44 (3.8)	34 (3.7)	68 (3.7)	71 (3.6)
Korea	36 (3.9)	54 (4.3)	32 (3.8)	24 (3.9)	20 (3.6)	31 (3.8)	62 (3.9)
<i>Kuwait</i>	30 (8.1)	78 (6.4)	77 (5.3)	62 (7.5)	32 (6.4)	61 (5.6)	88 (5.3)
Latvia (LSS)	r 52 (4.7)	r 61 (5.2)	r 33 (4.4)	r 79 (4.3)	r 62 (4.9)	r 83 (3.6)	r 100 (0.0)
Lithuania	r 10 (3.0)	r 31 (4.0)	s 11 (3.1)	r 34 (4.8)	s 16 (3.3)	s 24 (4.5)	r 83 (3.3)
<i>Netherlands</i>	29 (5.8)	99 (1.1)	31 (6.2)	30 (5.4)	14 (4.1)	36 (5.1)	42 (5.6)
New Zealand	14 (2.9)	52 (4.5)	20 (3.3)	34 (4.0)	36 (4.5)	52 (4.3)	46 (4.3)
Norway	r 27 (4.0)	r 100 (0.0)	r 3 (1.6)	r 25 (3.9)	r 15 (3.6)	r 55 (4.6)	r 59 (4.8)
Portugal	14 (2.8)	69 (3.9)	16 (3.4)	79 (3.2)	61 (4.4)	89 (3.1)	97 (1.5)
<i>Romania</i>	48 (4.0)	90 (2.7)	51 (4.2)	81 (3.6)	37 (4.1)	78 (3.7)	97 (1.6)
Russian Federation	- -	100 (0.4)	54 (4.6)	64 (3.9)	52 (5.3)	97 (1.5)	- -
<i>Scotland</i>	- -	- -	- -	- -	- -	- -	- -
Singapore	- -	30 (3.8)	6 (2.2)	72 (4.9)	37 (4.7)	61 (5.2)	70 (4.7)
Slovak Republic	75 (3.8)	97 (1.3)	24 (4.4)	35 (4.7)	36 (4.3)	89 (2.8)	99 (0.9)
<i>Slovenia</i>	r 56 (5.2)	r 76 (4.2)	r 22 (4.4)	r 59 (5.2)	r 44 (5.0)	r 70 (4.0)	r 73 (3.9)
Spain	r 5 (2.1)	r 92 (2.5)	r 23 (3.8)	r 75 (4.3)	r 42 (4.6)	r 90 (2.1)	r 95 (1.7)
Sweden	r 59 (3.2)	r 90 (2.4)	r 19 (2.9)	r 50 (4.3)	r 53 (4.3)	r 87 (2.8)	r 79 (3.2)
Switzerland	s 28 (3.5)	s 77 (4.2)	s 6 (2.1)	s 13 (2.8)	s 14 (2.8)	s 47 (5.1)	s 54 (5.0)
<i>Thailand</i>	s 22 (5.1)	r 52 (6.2)	s 71 (5.0)	s 75 (5.4)	s 21 (4.5)	s 51 (7.0)	s 66 (6.6)
United States	r 20 (2.2)	r 51 (3.7)	r 26 (3.7)	r 57 (3.9)	r 35 (3.3)	r 44 (3.3)	r 45 (3.3)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

A dash (-) indicates data are not available.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.22**Teachers' Reports on Ways Assessment Information Is Used "Quite A Lot" or "A Great Deal" - Mathematics - Upper Grade (Eighth Grade*)**

Country	Percent of Students Taught by Teachers Using Assessment Information					
	To Provide Grades or Marks	To Provide Student Feedback	To Diagnose Learning Problems	To Report to Parents	To Assign Students to Programs or Tracks	To Plan for Future Lessons
<i>Australia</i>	r 86 (2.8)	r 89 (2.3)	r 75 (3.5)	r 76 (3.1)	r 55 (3.9)	r 73 (3.0)
<i>Austria</i>	- -	r 72 (3.8)	r 75 (3.7)	r 39 (4.3)	r 17 (3.5)	r 53 (3.9)
Belgium (Fl)	r 70 (4.1)	r 78 (3.7)	r 88 (2.7)	r 80 (3.8)	r 84 (3.3)	r 54 (4.8)
<i>Belgium (Fr)</i>	s 92 (3.1)	s 81 (4.3)	s 92 (2.9)	s 61 (5.6)	- -	s 89 (3.0)
Canada	87 (2.6)	92 (1.8)	84 (3.1)	79 (3.0)	52 (3.6)	79 (3.2)
<i>Colombia</i>	68 (4.3)	90 (2.5)	92 (2.5)	53 (5.2)	37 (5.3)	94 (2.2)
Cyprus	r 100 (0.0)	r 93 (3.2)	r 96 (2.5)	r 96 (2.3)	r 60 (6.0)	r 91 (3.2)
Czech Republic	94 (3.2)	93 (2.7)	100 (0.5)	67 (4.5)	38 (5.2)	98 (1.3)
<i>Denmark</i>	26 (4.3)	85 (3.6)	r 85 (3.6)	54 (5.2)	68 (4.7)	85 (3.6)
England	s 91 (1.8)	s 91 (1.8)	s 84 (2.3)	s 81 (2.7)	s 78 (2.6)	s 85 (2.1)
France	89 (2.9)	93 (2.4)	90 (3.0)	61 (4.3)	36 (4.4)	91 (2.6)
<i>Germany</i>	s 84 (4.3)	s 86 (3.6)	s 89 (3.6)	s 48 (5.5)	s 28 (4.8)	s 86 (3.8)
<i>Greece</i>	97 (1.4)	88 (2.8)	90 (2.0)	89 (3.7)	41 (4.2)	77 (3.4)
Hong Kong	72 (5.1)	82 (4.7)	81 (4.9)	13 (4.1)	13 (4.1)	74 (4.4)
Hungary	58 (4.2)	71 (3.9)	95 (2.0)	81 (3.5)	83 (3.5)	79 (3.7)
Iceland	r 84 (6.2)	r 71 (7.7)	r 82 (6.8)	r 78 (7.3)	r 10 (4.5)	r 91 (4.5)
Iran, Islamic Rep.	83 (3.6)	r 71 (4.1)	81 (3.8)	63 (4.5)	62 (4.2)	79 (3.4)
Ireland	r 72 (4.3)	83 (3.5)	r 84 (3.5)	76 (3.8)	r 54 (4.6)	85 (3.5)
<i>Israel</i>	r 14 (5.9)	r 14 (4.2)	r 20 (5.8)	r 27 (7.3)	r 36 (6.2)	r 7 (3.8)
Japan	73 (3.6)	60 (3.9)	66 (3.6)	9 (2.1)	29 (3.3)	58 (3.9)
Korea	39 (3.7)	42 (4.3)	65 (3.8)	10 (2.7)	3 (1.4)	56 (4.3)
<i>Kuwait</i>	70 (8.0)	75 (6.7)	r 81 (5.8)	r 53 (7.2)	r 66 (5.9)	r 83 (5.7)
Latvia (LSS)	r 97 (1.6)	r 69 (4.3)	r 96 (2.1)	r 39 (4.7)	r 42 (4.9)	r 95 (2.2)
Lithuania	r 78 (4.1)	52 (4.4)	r 54 (4.5)	54 (4.8)	45 (4.6)	r 78 (4.1)
<i>Netherlands</i>	86 (3.6)	68 (5.6)	65 (5.3)	57 (5.7)	68 (5.4)	50 (5.7)
New Zealand	87 (2.9)	87 (2.7)	81 (3.0)	86 (3.1)	45 (4.2)	76 (3.4)
Norway	r 69 (4.6)	r 77 (4.4)	r 47 (5.2)	r 31 (4.1)	r 57 (5.0)	r 82 (3.9)
Portugal	92 (2.3)	80 (3.7)	95 (2.0)	64 (4.5)	43 (4.1)	90 (2.7)
<i>Romania</i>	94 (1.8)	90 (2.5)	94 (1.9)	75 (3.6)	78 (3.1)	95 (1.8)
Russian Federation	90 (2.8)	97 (1.2)	98 (1.2)	25 (4.2)	90 (2.7)	98 (1.0)
<i>Scotland</i>	- -	- -	- -	- -	- -	- -
Singapore	71 (3.7)	87 (3.3)	88 (3.2)	39 (4.4)	31 (4.4)	76 (4.3)
Slovak Republic	74 (4.0)	79 (3.4)	90 (2.7)	68 (4.3)	12 (2.8)	78 (4.2)
<i>Slovenia</i>	r 73 (4.1)	r 97 (2.0)	r 95 (2.4)	r 76 (4.7)	r 40 (5.2)	r 92 (2.9)
Spain	r 95 (2.1)	r 93 (2.3)	r 90 (2.8)	r 86 (3.5)	r 72 (4.1)	r 92 (2.6)
Sweden	r 73 (3.6)	r 91 (2.4)	r 85 (2.9)	r 53 (4.2)	r 32 (3.7)	r 93 (1.9)
Switzerland	s 85 (3.5)	s 92 (2.7)	s 88 (2.9)	s 47 (4.3)	s 23 (3.3)	s 80 (4.2)
<i>Thailand</i>	r 65 (6.2)	r 77 (5.4)	s 84 (4.7)	s 41 (6.4)	s 72 (5.1)	s 87 (4.2)
United States	r 96 (1.0)	r 91 (2.4)	r 80 (2.8)	r 82 (2.6)	r 30 (3.1)	r 86 (2.4)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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

A dash (-) indicates data are not available.

An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 5.23**Students' Reports on Frequency of Having a Quiz or Test in Their Mathematics Lessons - Upper Grade (Eighth Grade*)**

Country	Once in a While or Never		Pretty Often		Almost Always	
	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement	Percent of Students	Mean Achievement
<i>Australia</i>	46 (1.2)	540 (5.1)	38 (0.9)	537 (4.1)	16 (0.9)	501 (6.0)
<i>Austria</i>	77 (1.6)	548 (3.5)	15 (1.2)	525 (5.9)	9 (0.8)	488 (5.6)
Belgium (Fl)	7 (0.8)	558 (12.7)	71 (1.7)	575 (5.8)	22 (2.0)	541 (8.3)
<i>Belgium (Fr)</i>	27 (1.7)	528 (4.9)	49 (1.7)	531 (3.8)	24 (1.2)	521 (5.0)
Canada	27 (1.3)	533 (4.2)	52 (1.2)	535 (2.4)	20 (1.3)	505 (4.0)
<i>Colombia</i>	22 (1.2)	385 (2.8)	35 (0.8)	389 (4.6)	43 (1.4)	388 (3.4)
Cyprus	22 (1.2)	466 (3.8)	63 (1.1)	482 (2.3)	15 (0.8)	455 (4.3)
Czech Republic	72 (1.3)	563 (5.1)	24 (1.2)	572 (6.8)	5 (0.4)	531 (7.5)
<i>Denmark</i>	69 (1.8)	508 (3.3)	21 (1.5)	500 (4.7)	10 (0.9)	489 (6.5)
England	50 (1.4)	511 (3.9)	40 (1.2)	511 (3.5)	10 (0.8)	479 (6.1)
France	30 (1.4)	540 (3.9)	51 (1.4)	543 (3.7)	20 (0.9)	528 (4.4)
<i>Germany</i>	66 (2.0)	521 (4.9)	22 (1.4)	499 (6.2)	12 (1.1)	474 (7.3)
<i>Greece</i>	44 (1.6)	488 (4.0)	40 (1.2)	491 (3.8)	16 (0.8)	458 (3.6)
Hong Kong	21 (2.2)	576 (12.1)	43 (1.3)	604 (5.7)	36 (2.4)	581 (8.3)
Hungary	80 (1.2)	542 (3.3)	15 (0.9)	540 (5.8)	5 (0.6)	486 (8.1)
Iceland	70 (1.7)	490 (4.0)	24 (1.8)	493 (6.1)	6 (1.2)	445 (18.8)
Iran, Islamic Rep.	45 (1.8)	434 (2.9)	28 (1.2)	428 (3.4)	27 (1.2)	425 (3.8)
Ireland	51 (2.1)	536 (6.1)	36 (1.6)	534 (5.6)	14 (1.0)	493 (7.5)
<i>Israel</i>	43 (3.3)	544 (5.8)	39 (2.4)	519 (7.3)	18 (2.0)	488 (8.0)
Japan	59 (2.3)	605 (2.6)	30 (1.6)	608 (4.1)	11 (1.5)	595 (4.7)
Korea	74 (1.5)	610 (2.6)	19 (1.3)	616 (5.3)	7 (0.6)	571 (7.5)
<i>Kuwait</i>	29 (1.7)	389 (3.1)	29 (1.3)	396 (5.1)	42 (2.1)	392 (2.7)
Latvia (LSS)	80 (1.4)	496 (3.0)	17 (1.2)	490 (5.7)	3 (0.4)	465 (11.2)
Lithuania	30 (1.6)	465 (4.3)	59 (1.4)	487 (4.0)	11 (0.8)	462 (7.5)
<i>Netherlands</i>	45 (1.6)	555 (9.5)	43 (1.3)	536 (7.1)	12 (0.9)	515 (7.4)
New Zealand	45 (1.7)	518 (5.3)	35 (1.1)	509 (4.9)	20 (1.2)	489 (5.4)
Norway	66 (1.3)	512 (2.5)	31 (1.3)	494 (3.4)	3 (0.4)	441 (7.5)
Portugal	49 (1.6)	461 (2.7)	28 (1.2)	451 (3.3)	23 (1.0)	446 (2.8)
<i>Romania</i>	30 (1.1)	478 (5.6)	36 (1.1)	490 (4.7)	34 (1.1)	479 (4.6)
Russian Federation	23 (1.5)	524 (5.8)	53 (2.0)	544 (5.9)	24 (1.4)	529 (5.7)
<i>Scotland</i>	63 (1.8)	505 (6.4)	28 (1.4)	498 (6.1)	9 (0.9)	468 (8.7)
Singapore	27 (1.2)	644 (5.6)	55 (1.0)	646 (5.2)	18 (0.9)	635 (6.2)
Slovak Republic	51 (1.6)	554 (4.0)	42 (1.4)	545 (4.2)	7 (0.5)	510 (6.8)
<i>Slovenia</i>	36 (1.6)	550 (4.2)	44 (1.4)	543 (3.4)	20 (1.0)	518 (4.6)
Spain	25 (1.4)	488 (2.8)	37 (1.2)	498 (2.8)	39 (1.3)	478 (2.7)
Sweden	43 (1.6)	522 (3.6)	49 (1.4)	523 (3.2)	7 (0.5)	473 (5.5)
Switzerland	41 (1.2)	550 (4.0)	45 (1.2)	553 (3.2)	14 (0.7)	519 (5.4)
<i>Thailand</i>	41 (1.7)	525 (6.2)	28 (0.9)	527 (6.7)	31 (1.2)	517 (5.9)
United States	15 (0.9)	497 (6.7)	47 (1.1)	517 (4.5)	38 (1.1)	483 (4.8)

*Eighth grade in most countries; see Table 2 for more information about the grades tested in each country.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Figure A.3). Background data for Bulgaria and South Africa are unavailable.

Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

