CHAPTER 6

Teachers and Instruction

Chapter 6 presents information about mathematics teachers and instruction. Teachers' reports are given on their educational background, teaching preparation, and instructional practices. Information is also provided about how teachers spend their time related to teaching tasks, 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.

Teachers and the instructional approaches they use determine the mathematics students learn. They structure the content and pace of lessons, introducing new material, selecting various instructional activities, and monitoring students' developing understanding of the concepts studied. Teachers may help students use technology and tools to investigate mathematical ideas, analyze students' work for misconceptions, and promote positive attitudes towards mathematics. They may also assign homework and conduct formal and informal assessments to evaluate achievement. Chapter 6 presents mathematics teachers' reports on some of these issues.

Because the sampling for the teacher questionnaires was based on participating students, teachers' responses do not necessarily represent all eighth-grade mathematics teachers in each participating entity. Rather, they represent teachers of the representative samples of students assessed. It is important to note that when information from the teacher questionnaire is reported, the student is always the unit of analysis. That is, the data shown are the percentages of *students* whose teachers reported on various characteristics or instructional strategies. Using the student as the unit of analysis makes it possible to describe the mathematics instruction received by representative samples of students. Although this perspective may differ from that obtained by simply collecting information from teachers, it is consistent with the TIMSS goals of examining the educational contexts and performance of students.

The teachers who completed the questionnaires were the mathematics teachers of the students who took the TIMSS 1999 test. The general sampling procedure was to sample a mathematics class from each participating school, administer the test to those students, and ask their teacher to complete the questionnaire. Thus, the information about instruction is tied directly to the students tested. Sometimes, however, teachers did not complete the questionnaire assigned to them, so most entities had some percentage of students for whom no teacher questionnaire information is available. The exhibits in this chapter have special notations on this point. For a TIMSS 1999 participating entity (country, state, district, or consortium) where teacher responses are available for 70 to 84 percent of the students, an "r" is included next to the data. Where teacher responses are available for 50 to 69 percent of students, an "s" is included; where they are available for less than 50 percent, an "x" replaces the data.

What Preparation Do Teachers Have for Teaching Mathematics?

This section presents information about background characteristics of mathematics teachers, including age and gender, major area of study, and certification. Teachers' confidence in teaching various mathematics topics is also discussed.

As shown by the international average at the bottom of Exhibit 6.1, the majority of the eighth-grade students internationally were taught mathematics by teachers in their 30s and 40s. If there were a steady replenishing of the teaching force, one might expect approximately equivalent percentages of students taught by teachers in their 20s, 30s, 40s, and 50s. Very few countries, however, had a comparatively younger teaching force. Internationally on average, only 16 percent of students were taught by teachers younger than age 30. Although 21 percent of students internationally were taught by teachers age 50 or older, the teaching force was relatively older in a number of countries.

Most Benchmarking participants did not differ substantially from the international profile. However, the Academy School District and the Jersey City Public Schools had no students with teachers in their 20s and had larger percentages of students with teachers in their 40s and 50s than internationally. Similarly, the Chicago Public Schools, the Miami-Dade County Public Schools, the Project SMART Consortium, and the Southwest Pennsylvania Math and Science Collaborative had more than 65 percent of their students taught by teachers 40 years or older compared with 54 percent internationally. On the other hand, the teachers in the Fremont/Lincoln/Westside Public Schools were younger than the international average – 67 percent of the students had teachers under age 40 compared with 46 percent internationally.

Internationally on average, 60 percent of eighth-grade students were taught mathematics by females and 40 percent by males, and similar percentages were found in a number of countries. None of the TIMSS 1999 Benchmarking states differed from the international profile of having more students taught by female mathematics teachers than males. In South Carolina, in particular, 85 percent of the students were taught mathematics by female teachers. Among the Benchmarking districts and consortia, the First in the World Consortium, the Fremont/Lincoln/Westside Public Schools, Guilford County, and Montgomery County had more than three-fourths of their students taught by female mathematics teachers. In comparison, the Michigan Invitational Group, the Naperville School District, and the Southwest Pennsylvania Math and Science Collaborative had more male than female teachers.

Exhibit 6.2 presents teachers' reports about their major areas of study during their post-secondary teacher preparation programs. Teachers' undergraduate and graduate studies give some indication of their preparation to teach mathematics. Also, research shows that higher achievement in mathematics is associated with teachers having a bachelor's and/or master's degree in mathematics.[1] According to their teachers, however, U.S. eighth-grade students were less likely than those in other countries to be taught mathematics by teachers with a major area of study in mathematics.

On average internationally, 71 percent of students were taught by teachers who had mathematics as a major area of study. (Note that teachers can have dual majors, or different majors at the undergraduate and graduate level.) This compares with 41 percent for the United States, a figure not too different from that for many Benchmarking participants, although there was a range of 16 percent in Jersey City to 73 percent in First in the World and Naperville. Suffice it to say that in the United States and most Benchmarking entities, a smaller percentage of students than the international average was taught by mathematics teachers with a major in mathematics. Canada and Italy were the only nations that reported lower percentages than the United States.

Internationally on average, 31 percent of the students were taught by teachers with mathematics education as a major area of study. In comparison, more than half of the students were taught by teachers with this major in the states of Illinois, Michigan, and Pennsylvania, as well as in the districts and consortia of Chicago, First in the World, the Fremont/Lincoln/Westside Public Schools, Guilford County, Project SMART, Rochester, and the Southwest Pennsylvania Math and Science Collaborative.

Internationally on average, 32 percent of the students were taught by teachers with education as a major area of study. Significantly more students in the United States (54 percent) had mathematics teachers with an education major than did students internationally. In general across the Benchmarking participants, about twice as many teachers reported an education major as did internationally. It is clear that teachers in the United States have less "in field" mathematics preparation than their counterparts around the world.

To gauge teachers' confidence in their ability to teach mathematics topics, TIMSS constructed an index of teachers' confidence in their preparation to teach mathematics (CPTM), presented in Exhibit 6.3. Teachers were asked how well prepared they felt to teach each of 12 mathematics topics (e.g., properties of geometric figures, solving linear equations and

[1] Goldhaber, D.D. and Brewer, D.J. (1997), "Evaluating the Effect of Teacher Degree Level on Educational Performance" in W. Fowler (ed.), *Developments in School Finance*, 1996, NCES 97-535, Washington DC: National Center for Education Statistics; Darling-Hammond, L. (2000), *Teacher Quality and Student Achievement: A Review of State Policy Evidence*, Education Policy Analysis Archives, 8(1).

inequalities). There were three possible responses: very well prepared was assigned a value of three, somewhat prepared two, and not well prepared one. Students were assigned to the high level of the index if their teachers reported feeling very well prepared, on average, across the 12 topics (2.75 or higher). The medium level indicates that teachers reported being somewhat to well prepared (averages from 2.25 to 2.75), and the low level that they felt only somewhat prepared or less (averages less than 2.25).

The results show that average mathematics achievement is related to how well prepared teachers felt they were to teach mathematics, with higher achievement related to higher levels of teachers' confidence. On average internationally, teachers reported relatively high degrees of confidence, with 63 percent of students taught by teachers who believed they were very well prepared. Interestingly, for the United States as a whole and most Benchmarking entities, more students were taught mathematics by teachers confident about their preparation than in almost all the comparison countries. Interpreting these results should take several factors into account. For example, cultural issues may dictate that teachers in the high-scoring Asian countries are more reserved about reporting their strengths and abilities. Also, when the mathematics curriculum is more challenging, teachers may feel less confident in their academic and pedagogical preparation. Nevertheless, it appears that in relation to both high- and low-performing countries around the world, teachers in many Benchmarking entities and in the United States overall may be overconfident about their preparation to teach eighth-grade mathematics.

Exhibit R3.1 in the reference section provides the detail for the 12 topics comprising the confidence in preparation index. On average across countries, the topics having the most students (from 79 to 82 percent) taught by teachers who felt very well prepared were "fractions, decimals, and percentages;" "ratios and proportions;" "perimeter, area, and volume;" "evaluate and perform operations on algebraic expressions;" and "solving linear equations and inequalities." Teachers reported being least well prepared to teach "simple probabilities – understanding and calculations;" just more than half the students internationally (55 percent on average) were taught by teachers who felt very well prepared to teach this topic.

For the Benchmarking jurisdictions, almost all students had teachers confident in their preparation to teach the two number topics that were included in the TIMSS questionnaire: "fractions, decimals, and percentages;" and "ratios and proportions." Similarly, in algebra 90 percent or more of students in most Benchmarking entities were taught

by teachers who reported being very well prepared to teach the three algebra topics: "algebraic representation;" "evaluate and perform operations on algebraic expressions;" and "solving linear equations and inequalities." Similar results were obtained for the topics "representation and interpretation of data in graphs, charts, and tables;" and "simple probabilities – understanding and calculations," even though teachers in Idaho, Massachusetts, and North Carolina were less confident about this latter topic. Teachers also appeared confident in their preparation to teach "measurement – units, instruments, and accuracy,"except in North Carolina, the Fremont/Lincoln/Westside Public Schools, Guilford County, and Rochester, where less than 80 percent of the students were taught by teachers who felt very well prepared to teach this topic. The pattern of less confidence in teaching this measurement topic was found internationally and for the United States.

Teachers in the Benchmarking entities expressed the least confidence in their preparation to teach geometry. Less than 80 percent of the students in Idaho, Oregon, the Delaware Science Coalition, and the Fremont/Lincoln/Westside Public Schools had teachers confident about their preparation in any of the three geometry topics. Across nearly all the participating states as well as in a number of the districts and consortia, teachers expressed less than full confidence in their preparation to teach "geometric figures – symmetry, motions and transformations, congruence and similarity." Interestingly, this pattern was also noted internationally and for the United States, even though these topics are included in the curriculum and taught to substantial percentages of eighth-grade students in the U.S. and abroad. Beyond those already mentioned, Benchmarking entities where less than 80 percent of students had teachers confident about their preparation to teach "coordinate geometry" were Illinois, Indiana, Missouri, the Jersey City Public Schools, and the Miami-Dade County Public Schools.

Exhibit R3.2 shows principals' opinions about the degree to which shortages of qualified mathematics teachers affect the capacity to provide instruction. On average internationally, principals reported that such shortages affect the quality of instruction some or a lot for one-third of the students. This compares with 16 percent in the United States. Benchmarking entities where principals reported that such shortages affect the capacity to provide instruction for more than one-fourth of the students were Maryland, South Carolina, Texas, Chicago, Guilford County, Jersey City, Montgomery County, and Rochester.

Teachers' beliefs about mathematics learning and instruction are to some degree related to their preparation. Exhibits R3.3 and R3.4 in the reference section show the percentages of eighth-grade students whose mathematics teachers reported certain beliefs about mathematics, the way mathematics should be taught, and the importance of various cognitive skills in achieving success in the discipline. In general, more students in the Benchmarking entities than internationally were taught by teachers agreeing that mathematics is primarily a formal way of representing the real world. Conversely, more students internationally than in the Benchmarking entities had teachers who agreed that some students have a natural talent for mathematics, and that an effective teaching approach is to give students having difficulty more practice by themselves during class. There was nearly complete agreement by teachers throughout the Benchmarking jurisdictions and around the world that more than one representation should be used in teaching a mathematics topic. Views varied substantially, for both the countries and the Benchmarking entities, regarding the importance of being able to remember formulas and procedures. Less than one-quarter of the students in the Delaware Science Coalition (similar to Chinese Taipei and Korea) were taught by teachers who believed remembering formulas and procedures was very important for students' success in mathematics. In contrast, more than half the students in Idaho, South Carolina, Guilford County, Jersey City, and Rochester (similar to the Russian Federation) had teachers who believed this to be the case.

How teachers spend their time in school is determined mainly by school and district policies and practices, but the perspectives they gain during their teacher preparation can also have an effect. Across countries, students' mathematics teachers spent only about 60 percent of their formally scheduled school time teaching mathematics (see Exhibit R3.5 in the reference section). Additionally, about 10 percent was spent teaching subjects other than mathematics, about 10 percent on curriculum planning, and about 20 percent on various administrative and other duties. The results for the United States as a whole and for most of the Benchmarking entities were very similar to the international profile.

	Percentage of Students by Age of Teachers				Percentage of Students by Gender of Teachers	
	29 Years or Under	30-39 Years	40-49 Years	50 Years or Older	Female	Male
Countries						
United States	11 (2.0)	25 (3.5)	37 (3.9)	27 (2.9)	60 (3.0)	40 (3.0)
Belgium (Flemish)	20 (2.7)	15 (2.4)	38 (3.0)	27 (3.1)	66 (4.8)	34 (4.8)
Canada	17 (2.4)	33 (2.7)	25 (3.1)	26 (3.0)	53 (3.0)	47 (3.0)
Chinese Taipei	10 (2.6)	34 (4.0)	30 (4.0)	26 (3.4)	51 (4.1)	49 (4.1)
Czech Republic	7 (2.5)	29 (4.8)	22 (5.0)	43 (5.6)	73 (4.0)	27 (4.0)
England	s 20 (2.9)	23 (3.5)	35 (3.6)	22 (2.7)	s 48 (3.8)	52 (3.8)
Hong Kong, SAR	32 (4.2)	38 (4.5)	19 (3.3)	11 (2.6)	44 (4.1)	56 (4.1)
Italy	0 (0.0)	8 (2.0)	58 (4.1)	34 (3.8)	76 (3.1)	24 (3.1)
Japan	21 (3.3)	39 (4.3)	33 (3.7)	7 (2.1)	27 (3.6)	73 (3.6)
Korea, Rep. of	19 (3.0)	53 (3.7)	15 (2.5)	13 (2.8)	59 (3.4)	41 (3.4)
Netherlands	r 15 (4.3)	17 (3.9)	41 (5.4)	26 (5.3)	28 (5.0)	72 (5.0)
Russian Federation	8 (2.0)	32 (3.7)	29 (2.9)	31 (4.0)	93 (2.6)	7 (2.6)
Singapore	37 (4.4)	25 (4.0)	15 (3.2)	23 (3.6)	75 (4.1)	25 (4.1)
States						
Connecticut	r 17 (5.9)	18 (4.1)	35 (7.4)	30 (7.6)	r 77 (6.7)	23 (6.7)
Idaho	r 7 (3.0)	28 (6.6)	43 (7.4)	22 (6.3)	r 56 (6.1)	44 (6.1)
Illinois	22 (5.7)	17 (3.8)	31 (5.9)	30 (7.1)	75 (4.7)	25 (4.7)
Indiana	26 (7.5)	18 (4.2)	26 (6.3)	30 (6.2)	57 (6.9)	43 (6.9)
Maryland	r 24 (5.0)	19 (4.1)	32 (5.7)	26 (6.0)	r 69 (4.8)	31 (4.8)
Massachusetts	17 (5.2)	18 (3.8)	27 (4.6)	38 (5.1)	57 (5.7)	43 (5.7)
Michigan	19 (3.7)	33 (5.7)	29 (5.2)	19 (4.6)	60 (5.7)	40 (5.7)
Missouri	11 (4.0)	40 (5.9)	29 (6.4)	20 (4.4)	66 (6.7)	34 (6.7)
North Carolina	29 (5.6)	23 (5.9)	35 (6.6)	13 (4.4)	75 (4.2)	25 (4.2)
Oregon	19 (3.2)	16 (4.3)	36 (6.7)	29 (6.6)	57 (5.0)	43 (5.0)
Pennsylvania	25 (6.9)	19 (4.4)	32 (5.6)	24 (5.7)	54 (5.4)	46 (5.4)
South Carolina	23 (5.7)	32 (4.8)	19 (3.5)	27 (5.7)	85 (5.1)	15 (5.1)
Texas	17 (5.0)	25 (4.3)	38 (6.1)	21 (4.1)	67 (5.6)	33 (5.6)
Districts and Consortia						
Academy School Dist. #20, CO	0 (0.0)	18 (0.3)	48 (0.4)	35 (0.3)	67 (0.4)	33 (0.4)
Chicago Public Schools, IL	9 (3.4)	25 (10.1)	39 (8.6)	27 (7.9)	70 (10.4)	30 (10.4)
Delaware Science Coalition, DE	r 22 (6.5)	27 (5.9)	26 (4.2)	26 (5.2)	r 57 (4.9)	43 (4.9)
First in the World Consort., IL	27 (6.8)	19 (8.4)	26 (9.3)	28 (5.6)	84 (4.7)	16 (4.7)
Fremont/Lincoln/WestSide PS, NE	28 (8.5)	39 (7.3)	7 (0.2)	25 (6.4)	78 (6.8)	22 (6.8)
Guilford County, NC	29 (6.7)	29 (4.8)	31 (3.6)	10 (4.5)	89 (3.5)	11 (3.5)
Jersey City Public Schools, NJ	0 (0.0)	23 (3.0)	37 (3.8)	40 (4.3)	57 (4.4)	43 (4.4)
Miami-Dade County PS, FL	s 14 (6.1)	21 (7.8)	32 (8.1)	34 (7.9)	s 68 (11.5)	32 (11.5)
Michigan Invitational Group, MI	25 (4.7)	12 (4.6)	32 (6.6)	32 (7.5)	49 (8.6)	51 (8.6)
Montgomery County, MD	s 25 (7.5)	11 (1.7)	29 (8.2)	35 (11.2)	s 84 (3.8)	16 (3.8)
Naperville Sch. Dist. #203, IL	22 (3.5)	18 (3.2)	30 (3.8)	30 (3.0)	25 (5.1)	75 (5.1)
Project SMART Consortium, OH	15 (5.1)	16 (5.0)	34 (5.8)	34 (6.3)	50 (5.4)	50 (5.4)
Rochester City Sch. Dist., NY	24 (5.2)	14 (4.2)	36 (3.8)	26 (4.5)	54 (5.4)	46 (5.4)
SW Math/Sci. Collaborative, PA	10 (2.9)	16 (5.2)	32 (6.4)	42 (5.5)	42 (5.2)	58 (5.2)
International Avg. (All Countries)	16 (0.5)	30 (0.6)	33 (0.6)	21 (0.5)	60 (0.6)	40 (0.6)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

	Percentage of Students Whose Teachers Reported Having the Major Area of Study[1]				
	Mathematics	Mathematics Education	Science or Science Education	Education	Other
Countries					
United States	41 (3.4)	37 (3.4)	16 (2.4)	54 (3.4)	r 46 (3.6)
Belgium (Flemish)	89 (2.6)	38 (3.8)	73 (3.5)	42 (2.9)	37 (3.5)
Canada	22 (2.7)	19 (2.2)	24 (2.8)	49 (3.2)	68 (2.9)
Chinese Taipei	82 (3.7)	39 (4.2)	11 (2.1)	32 (3.6)	23 (3.9)
Czech Republic	85 (3.8)	34 (5.6)	53 (6.0)	34 (5.5)	53 (4.9)
England	47 (3.3)	32 (2.9)	s 20 (2.6)	s 44 (3.4)	s 41 (3.5)
Hong Kong, SAR	57 (4.2)	30 (3.9)	38 (4.4)	36 (3.8)	47 (4.5)
Italy	22 (3.3)	0 (0.0)	66 (3.4)	0 (0.0)	16 (3.1)
Japan	79 (3.6)	27 (3.6)	4 (1.7)	15 (3.2)	21 (3.5)
Korea, Rep. of	55 (4.2)	61 (4.0)	4 (1.5)	19 (3.2)	9 (2.2)
Netherlands	68 (4.9)	16 (4.2)	25 (5.0)	12 (4.3)	14 (4.4)
Russian Federation	89 (2.9)	83 (3.1)	39 (4.0)	81 (3.1)	67 (3.9)
Singapore	78 (3.6)	32 (4.0)	38 (4.2)	48 (4.8)	47 (4.3)
States					
Connecticut	31 (5.2)	29 (5.3)	r 6 (3.2)	r 69 (5.2)	s 40 (7.4)
Idaho	28 (5.2)	34 (7.2)	r 17 (5.3)	r 68 (5.9)	r 43 (7.4)
Illinois	61 (4.8)	55 (6.5)	13 (5.1)	71 (5.0)	43 (4.6)
Indiana	55 (7.3)	48 (5.0)	17 (5.1)	63 (5.0)	26 (5.5)
Maryland	40 (5.7)	35 (6.0)	r 8 (2.7)	r 63 (6.6)	r 37 (5.2)
Massachusetts	60 (5.1)	35 (4.9)	9 (2.9)	59 (4.7)	29 (5.5)
Michigan	51 (5.9)	53 (6.9)	32 (6.4)	64 (6.3)	52 (6.1)
Missouri	61 (6.4)	49 (5.2)	14 (5.2)	79 (4.3)	32 (5.9)
North Carolina	50 (5.0)	50 (6.6)	26 (4.1)	61 (5.6)	31 (5.0)
Oregon	39 (4.8)	39 (6.4)	21 (4.6)	66 (6.1)	49 (5.9)
Pennsylvania	58 (6.0)	53 (4.7)	8 (3.3)	61 (5.8)	r 33 (4.4)
South Carolina	53 (6.1)	45 (6.0)	6 (2.7)	61 (6.3)	25 (6.0)
Texas	50 (6.5)	29 (6.0)	r 18 (5.5)	r 47 (8.1)	r 51 (6.2)
Districts and Consortia					
Academy School Dist. #20, CO	55 (0.4)	39 (0.4)	20 (0.4)	66 (0.4)	12 (0.2)
Chicago Public Schools, IL	37 (9.4)	51 (9.8)	13 (2.8)	74 (9.5)	r 59 (9.1)
Delaware Science Coalition, DE	23 (5.2)	36 (6.5)	r 12 (4.6)	r 65 (6.6)	r 59 (7.4)
First in the World Consort., IL	73 (7.2)	75 (7.8)	21 (5.0)	77 (3.4)	38 (7.9)
Fremont/Lincoln/WestSide PS, NE	65 (3.1)	56 (6.0)	5 (0.2)	57 (9.1)	58 (5.5)
Guilford County, NC	59 (4.8)	64 (6.4)	13 (4.3)	47 (5.8)	37 (5.7)
Jersey City Public Schools, NJ	16 (4.9)	18 (2.6)	4 (2.7)	79 (5.0)	r 55 (6.4)
Miami-Dade County PS, FL	31 (7.9)	27 (8.8)	s 18 (8.7)	s 55 (9.3)	s 84 (6.0)
Michigan Invitational Group, MI	64 (7.6)	36 (8.9)	29 (4.0)	55 (10.0)	47 (8.0)
Montgomery County, MD	27 (6.1)	28 (7.3)	s 6 (1.2)	s 76 (7.1)	s 37 (6.2)
Naperville Sch. Dist. #203, IL	73 (5.4)	30 (2.8)	2 (0.5)	50 (5.9)	57 (4.8)
Project SMART Consortium, OH	67 (4.6)	61 (6.4)	11 (4.5)	61 (7.7)	47 (5.3)
Rochester City Sch. Dist., NY	70 (3.6)	58 (5.0)	6 (1.7)	56 (5.5)	38 (4.0)
SW Math/Sci. Collaborative, PA	63 (4.9)	61 (6.5)	12 (5.3)	64 (7.7)	r 31 (7.4)
International Avg. (All Countries)	71 (0.6)	31 (0.6)	35 (0.6)	32 (0.6)	32 (0.6)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

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

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

Index of Teachers' Confidence in Preparation to Teach Mathematics

Index based on teachers' responses to 12 questions about how prepared they feel to teach different mathematics topics (see reference exhibit R3.1) based on a 3-point scale: 1 = not well prepared; 2 = somewhat prepared; 3 = very well prepared. Average is computed across the 12 items for items for which the teacher did not respond do not teach. High level indicates average is greater than or equal to 2.75. Medium level indicates average is greater than or equal to 2.25 and less than 2.75. Low level indicates average is less than 2.25.

	High CPTM		Medium CPTM		Low CPTM	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Jersey City Public Schools, NJ	97 (2.7)	479 (9.0)	3 (2.7)	351 (4.6)	0 (0.0)	~ ~
Naperville Sch. Dist. #203, IL	95 (1.9)	570 (3.0)	5 (1.9)	529 (8.9)	0 (0.0)	~ ~
Michigan Invitational Group, MI	94 (2.1)	530 (5.0)	6 (2.1)	519 (27.2)	0 (0.0)	~ ~
SW Math/Sci. Collaborative, PA	94 (3.4)	519 (8.1)	5 (3.4)	508 (20.0)	1 (0.0)	~ ~
Rochester City Sch. Dist., NY	93 (2.0)	444 (7.3)	7 (2.0)	406 (16.9)	0 (0.0)	~ ~
First in the World Consort., IL	93 (5.5)	564 (6.4)	7 (5.5)	491 (11.8)	0 (0.0)	~ ~
Academy School Dist. #20, CO	92 (0.2)	531 (1.9)	0 (0.0)	~ ~	8 (0.2)	495 (5.0)
Maryland r	92 (3.0)	489 (5.6)	8 (3.0)	444 (28.1)	0 (0.0)	~ ~
Missouri	92 (3.3)	492 (5.8)	6 (2.6)	476 (13.2)	2 (1.6)	~ ~
South Carolina	92 (3.6)	506 (8.4)	8 (3.6)	472 (22.6)	0 (0.0)	~ ~
Pennsylvania	92 (5.0)	512 (7.2)	4 (1.7)	496 (27.7)	5 (4.7)	501 (6.7)
Michigan	91 (3.3)	525 (6.9)	8 (3.3)	479 (17.0)	1 (0.6)	~ ~
Project SMART Consortium, OH	90 (4.1)	526 (8.1)	10 (4.1)	476 (16.7)	0 (0.0)	~ ~
North Carolina	88 (4.1)	497 (7.0)	11 (4.0)	479 (13.7)	1 (0.9)	~ ~
United States	87 (2.4)	505 (4.2)	11 (2.3)	489 (7.0)	2 (1.0)	~ ~
Connecticut r	87 (5.9)	519 (10.5)	11 (5.7)	526 (16.6)	1 (1.4)	~ ~
Illinois	87 (5.0)	516 (6.3)	12 (5.0)	479 (25.8)	1 (0.7)	~ ~
Massachusetts	87 (3.9)	513 (7.2)	10 (3.1)	535 (24.9)	3 (2.3)	486 (8.0)
Texas r	87 (4.5)	525 (9.4)	12 (4.3)	485 (22.4)	1 (1.2)	~ ~
Chicago Public Schools, IL	87 (6.7)	470 (7.4)	13 (6.6)	452 (13.5)	1 (0.8)	~ ~
Indiana	86 (4.8)	513 (7.3)	11 (4.6)	545 (22.0)	2 (1.7)	~ ~
Miami-Dade County PS, FL s	86 (5.2)	425 (11.9)	11 (5.2)	435 (53.0)	3 (2.5)	269 (37.9)
Guilford County, NC	85 (5.3)	517 (10.0)	13 (5.0)	490 (26.3)	2 (0.1)	~ ~
Montgomery County, MD s	85 (6.5)	543 (5.2)	14 (6.6)	501 (9.9)	1 (0.1)	~ ~
Czech Republic	85 (3.6)	521 (5.1)	14 (3.8)	519 (9.5)	1 (1.3)	~ ~
Delaware Science Coalition, DE r	85 (5.6)	480 (11.5)	12 (5.1)	499 (22.2)	3 (2.3)	417 (38.5)
Fremont/Lincoln/WestSide PS, NE	81 (4.9)	492 (10.6)	13 (4.9)	440 (24.3)	5 (0.2)	534 (5.0)
Netherlands	81 (6.2)	542 (7.1)	10 (3.0)	514 (22.4)	9 (5.8)	514 (58.7)
Oregon	78 (4.3)	516 (7.3)	18 (4.7)	506 (15.3)	4 (1.6)	480 (22.4)
Idaho r	75 (4.9)	508 (8.2)	18 (6.1)	461 (12.3)	7 (3.8)	447 (34.9)
Chinese Taipei	71 (3.6)	586 (4.5)	15 (3.1)	587 (10.9)	14 (2.7)	572 (6.8)
Canada	71 (2.7)	537 (3.3)	21 (3.0)	530 (6.6)	8 (1.8)	515 (14.6)
Singapore	66 (4.2)	603 (7.1)	24 (3.7)	619 (12.0)	10 (2.8)	578 (20.8)
Belgium (Flemish)	65 (3.2)	559 (5.8)	32 (3.1)	561 (5.6)	3 (1.4)	558 (27.1)
Hong Kong, SAR	61 (4.3)	579 (5.5)	28 (3.9)	591 (8.2)	11 (2.7)	571 (12.0)
Italy	60 (3.9)	479 (5.5)	27 (3.5)	481 (7.2)	13 (2.3)	479 (12.4)
Korea, Rep. of	48 (3.9)	585 (3.2)	31 (3.8)	590 (4.1)	21 (3.0)	588 (3.5)
Japan	8 (2.1)	584 (6.1)	24 (3.6)	589 (4.2)	68 (4.0)	573 (2.6)
England	– –	– –	– –	– –	– –	– –
Russian Federation	– –	– –	– –	– –	– –	– –
International Avg. (All Countries)	63 (0.6)	489 (1.1)	23 (0.6)	481 (1.7)	14 (0.5)	473 (2.9)

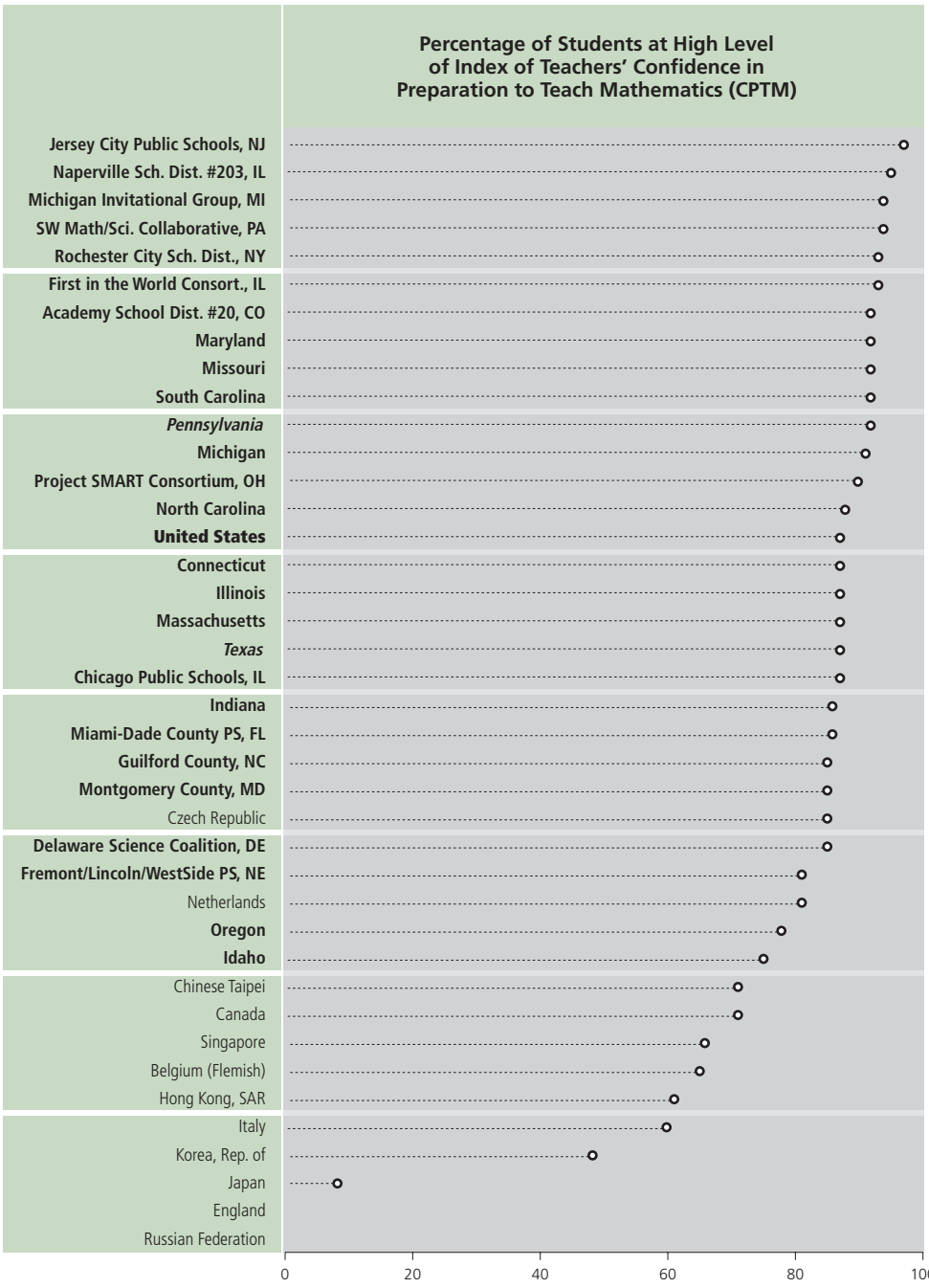
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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), 1998-1999.

How Much School Time Is Devoted to Mathematics Instruction?

Exhibit 6.4 presents information about the amount of mathematics instruction given to eighth-grade students in the TIMSS 1999 Benchmarking jurisdictions and the comparison countries. Since different systems have school years of different lengths (see Exhibit R3.6) and different arrangements of daily and weekly instruction, the information is given in terms of the average number of hours of mathematics instruction over the school year as reported by mathematics teachers. Canada provides 150 hours per year, on average, and the United States 144 hours, compared with the international average of 129 hours. Benchmarking entities with teachers reporting more than 150 hours of mathematics instruction per year were the Jersey City Public Schools, South Carolina, North Carolina, the Delaware Science Coalition, and the Fremont/Lincoln/Westside Public Schools. Interestingly, the teachers in the Naperville School District and the First in the World Consortium reported the least amount of mathematics instructional time (114 hours) per year. Among the reference countries, the percentage of instructional time at the eighth grade that was devoted to mathematics ranged from 17 percent in the Russian Federation to nine percent in Chinese Taipei and the Netherlands. Among the Benchmarking jurisdictions, the percentage ranged from 18 percent in North Carolina to 11 percent in Indiana, Pennsylvania, and First in the World.

As shown in Exhibit 6.5, teachers of about half the students, on average internationally, reported that mathematics classes meet for at least two hours per week but fewer than three and a half. For another one-third of students, classes meet for at least three and a half hours but fewer than five. On average, eighth graders in the United States spend more time in mathematics class per week (typically three and a half to five hours) than do their counterparts internationally. This pattern of more classroom time held for nearly all of the Benchmarking entities, with the exception of the Chicago Public Schools and Naperville (primarily two to three and a half hours), and North Carolina and the Jersey City Public Schools (primarily five hours or more).

The data, however, reveal no clear pattern between the number of in-class instructional hours and mathematics achievement either across or within participating entities. Common sense and research both support the idea that time on task is an important contributor to achievement, yet this time can be spent more or less efficiently. Time alone is not enough; it needs to be spent on high-quality mathematics instruction. Devoting extensive class time to remedial activities can deprive students of this. Also, instructional time can be spent out of school in various tutoring programs; low-performing students may be receiving additional instruction.

Videotapes of mathematics classes in the United States and Japan in TIMSS 1995 revealed that outside interruptions like those for announcements or to conduct administrative tasks can affect the flow of the lesson and detract from instructional time.[2] As shown in Exhibit 6.6, on average internationally about one-fifth of the students (21 percent) were in mathematics classes that were interrupted pretty often or almost always, and 28 percent were in classes that were never interrupted. In Japan and Korea, more than half the students were in mathematics classes that were never interrupted – compared with only 10 percent in the United States. In the United States, nearly one-third of the eighth graders were in mathematics classes that were interrupted pretty often or almost always. If anything, the teachers in most of the Benchmarking jurisdictions reported even more interruptions than did teachers in the U.S. nationally. The jurisdictions with more than 15 percent of students in classrooms that were never interrupted were Illinois, the First in the World Consortium, Montgomery County, and Naperville. Conversely, the jurisdictions with the highest percentages of students in classrooms almost always interrupted (17 to 18 percent) were the public school systems of Chicago, Jersey City, Miami-Dade, and Rochester. Students in mathematics classrooms that were frequently interrupted had substantially lower achievement than their counterparts in classrooms with fewer interruptions.

2 Stigler, J.W., Gonzales, P., Kawanaka, T., Knoll, S., and Serrano, A. (1999), *The TIMSS Videotape Classroom Study: Methods and Findings from an Exploratory Research Project on Eighth-Grade Mathematics Instruction in Germany, Japan, and the United States*, NCES 1999-074, Washington, DC: National Center for Education Statistics.

	Students' Average Yearly Mathematics Instructional Time in Hours	Mathematics Instructional Time as a Percent of Total Instructional Time[1]
Jersey City Public Schools, NJ	s 238 (9.8)	x x
South Carolina	r 189 (10.6)	x x
North Carolina	r 182 (8.9)	s 18 (1.1)
Delaware Science Coalition, DE	s 167 (17.8)	x x
Fremont/Lincoln/WestSide PS, NE	s 152 (15.3)	x x
Canada	r 150 (2.3)	r 15 (0.2)
Hong Kong, SAR	r 149 (5.4)	s 15 (0.5)
Oregon	r 148 (10.5)	s 14 (0.6)
Guilford County, NC	s 146 (6.2)	s 13 (0.4)
United States	s 144 (4.5)	x x
Texas	s 143 (10.3)	x x
Rochester City Sch. Dist., NY	r 143 (9.1)	s 13 (1.0)
Russian Federation	r 142 (3.3)	s 17 (0.6)
Missouri	r 142 (8.2)	s 14 (0.7)
Massachusetts	s 141 (4.9)	x x
Maryland	s 141 (6.9)	s 13 (0.6)
Czech Republic	139 (2.4)	15 (0.2)
Academy School Dist. #20, CO	138 (0.2)	x x
Indiana	r 135 (10.7)	s 11 (0.5)
Michigan	r 135 (5.3)	x x
Idaho	s 135 (9.0)	x x
Italy	130 (3.2)	12 (0.3)
Michigan Invitational Group, MI	r 129 (8.6)	s 13 (0.8)
Illinois	r 128 (8.7)	s 13 (1.0)
Japan	127 (1.8)	12 (0.2)
Chicago Public Schools, IL	s 127 (8.2)	x x
Chinese Taipei	126 (1.9)	9 (0.1)
Singapore	126 (3.8)	15 (0.5)
Project SMART Consortium, OH	r 124 (5.5)	x x
Pennsylvania	r 122 (7.6)	s 11 (0.7)
SW Math/Sci. Collaborative, PA	119 (3.8)	r 12 (0.4)
Korea, Rep. of	118 (3.5)	11 (0.3)
Belgium (Flemish)	116 (3.5)	12 (0.4)
England	s 115 (2.7)	s 12 (0.3)
Naperville Sch. Dist. #203, IL	114 (0.3)	12 (0.0)
First in the World Consort., IL	s 114 (9.8)	s 11 (1.2)
Netherlands	s 94 (1.6)	s 9 (0.1)
Connecticut	x x	x x
Miami-Dade County PS, FL	x x	x x
Montgomery County, MD	x x	x x
International Avg. (All Countries)	129 (0.7)	13 (0.1)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Mathematics instructional time provided by teachers, and total instructional time provided by schools.

1 Computed as the ratio of mathematics instructional time to total instructional time averaged across students.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

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

An "r" indicates school and/or teacher response data available for 70-84% of students. An "s" indicates school and/or teacher response data available for 50-69% of students. An "x" indicates school and/or teacher response data available for <50% of students.

Exhibit 6.5 Number of Hours Mathematics Is Taught Weekly

8th Grade Mathematics

	5 Hours or More		3.5 Hours to < 5		2 Hours to < 3.5		Less Than 2 Hours	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Countries								
United States	16 (2.2)	490 (9.2)	56 (3.4)	501 (4.9)	17 (2.6)	528 (11.6)	11 (2.3)	491 (14.5)
Belgium (Flemish)	4 (1.0)	590 (11.7)	40 (2.8)	595 (4.1)	43 (3.8)	544 (7.7)	13 (3.4)	502 (18.9)
Canada r	17 (2.2)	520 (6.4)	55 (3.2)	544 (3.9)	26 (2.7)	523 (6.1)	3 (0.9)	503 (6.3)
Chinese Taipei	1 (1.1)	~ ~	48 (4.4)	592 (5.8)	51 (4.5)	577 (5.5)	0 (0.0)	~ ~
Czech Republic	4 (2.1)	600 (28.1)	52 (4.4)	517 (5.3)	44 (4.4)	517 (6.4)	0 (0.0)	~ ~
England s	2 (1.2)	~ ~	3 (1.4)	481 (10.2)	95 (2.0)	512 (5.3)	0 (0.2)	~ ~
Hong Kong, SAR	9 (2.3)	579 (15.2)	71 (4.0)	583 (5.6)	17 (3.1)	587 (11.1)	3 (1.5)	553 (16.7)
Italy	9 (2.1)	469 (11.5)	55 (3.8)	483 (5.3)	29 (4.0)	475 (7.4)	6 (1.8)	484 (10.3)
Japan	1 (1.3)	~ ~	2 (1.3)	~ ~	95 (2.0)	577 (2.1)	2 (0.9)	~ ~
Korea, Rep. of	2 (0.9)	~ ~	3 (1.1)	602 (9.6)	93 (1.8)	587 (2.1)	3 (1.1)	587 (11.7)
Netherlands	0 (0.0)	~ ~	0 (0.0)	~ ~	100 (0.5)	537 (7.2)	0 (0.0)	~ ~
Russian Federation	11 (2.5)	553 (13.4)	57 (4.1)	528 (7.7)	32 (3.8)	513 (8.5)	0 (0.0)	~ ~
Singapore	9 (2.3)	592 (24.7)	37 (3.8)	586 (11.2)	48 (4.0)	623 (7.5)	5 (2.0)	608 (20.0)
States								
Connecticut r	5 (2.5)	534 (14.7)	58 (6.1)	515 (11.1)	36 (6.7)	532 (15.2)	1 (0.1)	~ ~
Idaho r	13 (4.4)	488 (18.4)	65 (7.6)	499 (9.2)	13 (4.4)	512 (13.6)	10 (4.8)	454 (15.2)
Illinois	6 (2.2)	500 (9.6)	44 (6.6)	522 (9.3)	38 (6.5)	489 (11.0)	12 (5.1)	540 (8.5)
Indiana	7 (3.5)	565 (33.6)	55 (7.5)	509 (8.6)	26 (7.8)	517 (16.4)	12 (4.0)	517 (8.2)
Maryland r	17 (5.3)	474 (16.2)	60 (6.4)	489 (6.9)	10 (4.1)	504 (16.7)	13 (4.0)	472 (18.3)
Massachusetts r	12 (4.7)	513 (8.9)	69 (6.1)	511 (7.8)	15 (4.7)	522 (14.4)	3 (2.2)	549 (26.4)
Michigan	8 (3.1)	512 (18.6)	64 (5.4)	525 (9.5)	15 (4.0)	521 (13.3)	14 (2.9)	528 (11.4)
Missouri	7 (3.2)	479 (43.4)	65 (6.0)	491 (6.8)	22 (5.1)	493 (11.0)	6 (3.2)	502 (13.1)
North Carolina	48 (5.2)	493 (8.8)	37 (5.6)	498 (13.7)	7 (2.9)	492 (12.3)	8 (2.1)	491 (42.5)
Oregon	9 (3.8)	545 (13.7)	64 (6.6)	519 (6.5)	19 (4.7)	483 (18.4)	8 (2.4)	510 (30.5)
Pennsylvania	11 (5.1)	515 (11.1)	47 (5.0)	518 (9.9)	29 (3.8)	504 (7.3)	13 (5.5)	496 (17.7)
South Carolina	40 (6.2)	512 (7.6)	41 (5.5)	494 (15.0)	13 (4.7)	523 (24.2)	6 (2.5)	469 (36.9)
Texas r	16 (6.2)	530 (19.4)	59 (6.6)	528 (10.6)	12 (3.8)	520 (27.5)	12 (3.3)	488 (20.9)
Districts and Consortia								
Academy School Dist. #20, CO	9 (0.2)	527 (4.6)	75 (0.3)	535 (2.1)	8 (0.2)	529 (5.5)	8 (0.2)	513 (4.7)
Chicago Public Schools, IL	6 (3.6)	460 (32.4)	19 (7.8)	465 (14.0)	69 (7.6)	469 (7.9)	5 (3.0)	430 (23.3)
Delaware Science Coalition, DE r	20 (6.9)	507 (27.1)	56 (7.3)	464 (13.3)	21 (5.1)	510 (11.7)	3 (2.3)	417 (25.8)
First in the World Consort., IL	2 (2.4)	~ ~	60 (1.5)	564 (7.0)	26 (4.3)	539 (6.2)	12 (5.1)	559 (21.5)
Fremont/Lincoln/WestSide PS, NE	8 (5.2)	493 (28.5)	77 (3.8)	494 (10.1)	12 (1.2)	477 (4.5)	3 (0.1)	323 (9.2)
Guilford County, NC	15 (3.8)	500 (16.6)	64 (5.2)	513 (11.3)	6 (3.7)	524 (25.9)	15 (3.7)	502 (22.1)
Jersey City Public Schools, NJ r	69 (6.0)	467 (5.7)	31 (6.0)	495 (22.3)	0 (0.0)	~ ~	0 (0.0)	~ ~
Miami-Dade County PS, FL s	20 (7.6)	371 (26.6)	45 (10.7)	443 (18.3)	16 (8.1)	415 (22.3)	19 (7.0)	442 (33.6)
Michigan Invitational Group, MI	10 (2.6)	519 (4.7)	64 (7.8)	532 (7.6)	7 (1.1)	516 (28.3)	19 (6.9)	552 (10.7)
Montgomery County, MD s	3 (1.1)	598 (17.6)	67 (12.6)	539 (7.1)	20 (11.8)	533 (13.1)	11 (7.3)	503 (11.6)
Naperville Sch. Dist. #203, IL	2 (0.1)	~ ~	0 (0.0)	~ ~	89 (0.4)	571 (3.2)	9 (0.4)	549 (3.6)
Project SMART Consortium, OH	7 (2.1)	536 (40.9)	51 (6.0)	519 (11.2)	31 (5.5)	525 (13.1)	11 (3.2)	505 (10.1)
Rochester City Sch. Dist., NY	6 (3.3)	509 (31.2)	59 (3.9)	427 (7.7)	35 (2.9)	454 (12.9)	0 (0.0)	~ ~
SW Math/Sci. Collaborative, PA	5 (3.2)	511 (29.8)	41 (6.9)	524 (12.1)	44 (7.6)	505 (10.6)	10 (3.3)	551 (27.2)
International Avg. (All Countries)	9 (0.3)	481 (3.5)	34 (0.5)	492 (2.3)	53 (0.5)	490 (1.9)	4 (0.3)	485 (4.7)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

	Never		Once in a While		Pretty Often		Almost Always	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Countries								
United States	10 (0.4)	494 (8.2)	59 (0.9)	522 (3.9)	20 (0.5)	488 (3.9)	11 (0.6)	455 (5.1)
Belgium (Flemish)	24 (1.1)	557 (5.9)	62 (1.1)	566 (2.9)	9 (0.7)	562 (6.8)	5 (0.8)	505 (20.3)
Canada	9 (0.4)	528 (4.2)	64 (1.0)	540 (2.4)	18 (0.7)	517 (3.9)	9 (0.7)	502 (7.8)
Chinese Taipei	22 (1.1)	580 (6.1)	56 (1.0)	594 (4.4)	17 (0.9)	580 (5.4)	6 (0.6)	563 (9.0)
Czech Republic	33 (1.7)	520 (4.0)	59 (1.3)	524 (4.7)	4 (0.5)	517 (11.4)	4 (0.8)	472 (13.7)
England	10 (0.8)	508 (9.5)	66 (1.2)	509 (4.2)	19 (1.1)	474 (6.0)	6 (0.6)	437 (8.9)
Hong Kong, SAR	36 (1.0)	585 (4.4)	54 (0.8)	588 (4.0)	8 (0.6)	552 (8.9)	2 (0.2)	~ ~
Italy	16 (1.0)	480 (5.5)	54 (1.2)	488 (4.0)	18 (1.0)	477 (5.3)	11 (0.8)	450 (7.6)
Japan	53 (1.4)	580 (2.7)	42 (1.3)	581 (2.5)	4 (0.3)	559 (5.9)	1 (0.2)	~ ~
Korea, Rep. of	57 (0.9)	581 (2.0)	38 (0.8)	598 (3.0)	4 (0.2)	579 (7.5)	1 (0.1)	~ ~
Netherlands	39 (1.3)	539 (7.7)	55 (1.3)	544 (8.3)	4 (0.5)	524 (14.0)	2 (0.4)	~ ~
Russian Federation	17 (1.5)	538 (11.1)	64 (1.5)	533 (5.2)	10 (0.9)	506 (7.5)	9 (0.7)	497 (6.9)
Singapore	16 (0.8)	592 (8.9)	64 (1.0)	614 (5.9)	14 (0.6)	585 (7.4)	6 (0.4)	579 (9.5)
States								
Connecticut	10 (1.1)	529 (12.6)	59 (2.3)	529 (8.7)	18 (1.7)	488 (9.1)	12 (1.3)	471 (12.3)
Idaho	11 (0.9)	484 (14.8)	60 (1.7)	510 (6.0)	18 (1.1)	475 (8.9)	11 (1.0)	463 (9.1)
Illinois	16 (1.2)	521 (9.7)	61 (1.5)	519 (7.0)	15 (1.1)	487 (8.2)	9 (0.9)	472 (7.8)
Indiana	10 (1.2)	511 (9.8)	66 (1.6)	527 (7.3)	16 (1.1)	495 (7.5)	7 (0.8)	471 (11.3)
Maryland	12 (0.9)	494 (9.8)	60 (1.6)	513 (5.4)	17 (1.0)	475 (7.2)	11 (1.0)	465 (9.8)
Massachusetts	11 (0.7)	521 (10.0)	62 (1.3)	526 (5.8)	19 (1.2)	495 (6.8)	8 (0.8)	464 (7.7)
Michigan	11 (1.3)	509 (12.2)	61 (2.0)	534 (6.4)	18 (1.6)	501 (8.1)	11 (1.3)	476 (6.7)
Missouri	10 (0.8)	483 (9.3)	58 (1.8)	500 (5.6)	20 (0.9)	489 (6.4)	12 (1.3)	454 (9.4)
North Carolina	7 (0.5)	474 (13.6)	60 (2.0)	513 (7.2)	21 (1.1)	485 (6.6)	12 (1.3)	448 (7.5)
Oregon	11 (0.9)	491 (8.0)	59 (1.6)	532 (5.9)	19 (0.9)	499 (6.5)	11 (0.8)	486 (9.0)
Pennsylvania	13 (1.4)	506 (10.4)	59 (1.7)	522 (6.1)	18 (1.0)	494 (5.2)	10 (1.0)	462 (10.7)
South Carolina	9 (1.1)	482 (11.4)	56 (2.2)	523 (7.7)	23 (2.1)	485 (8.3)	12 (1.0)	461 (9.8)
Texas	12 (0.8)	497 (17.0)	55 (2.1)	536 (9.0)	22 (1.5)	517 (8.1)	11 (1.0)	485 (11.2)
Districts and Consortia								
Academy School Dist. #20, CO	4 (0.6)	504 (12.0)	57 (1.2)	536 (2.6)	26 (1.3)	531 (4.6)	12 (1.1)	506 (6.6)
Chicago Public Schools, IL	7 (1.0)	435 (14.8)	49 (4.3)	478 (6.4)	27 (2.6)	456 (8.3)	17 (2.8)	447 (10.8)
Delaware Science Coalition, DE	11 (0.9)	466 (9.2)	59 (2.6)	500 (9.9)	17 (1.2)	472 (8.2)	13 (1.5)	453 (10.8)
First in the World Consort., IL	17 (1.3)	559 (12.1)	66 (1.5)	568 (5.9)	14 (1.4)	530 (10.3)	4 (0.6)	521 (12.0)
Fremont/Lincoln/WestSide PS, NE	8 (1.1)	484 (16.5)	56 (2.1)	513 (9.3)	20 (2.2)	471 (9.0)	15 (1.4)	430 (11.5)
Guilford County, NC	10 (0.8)	498 (10.9)	65 (1.5)	525 (8.0)	19 (1.2)	499 (9.2)	6 (0.8)	473 (18.8)
Jersey City Public Schools, NJ	5 (0.8)	467 (13.5)	51 (2.0)	489 (7.8)	27 (1.9)	475 (11.3)	18 (1.3)	450 (12.0)
Miami-Dade County PS, FL	11 (1.0)	411 (15.6)	49 (1.7)	449 (10.3)	23 (0.8)	411 (9.8)	17 (1.4)	394 (16.0)
Michigan Invitational Group, MI	11 (1.4)	550 (6.9)	64 (2.6)	543 (6.4)	18 (1.9)	511 (8.1)	8 (1.1)	487 (12.5)
Montgomery County, MD	16 (1.2)	547 (9.3)	60 (1.7)	550 (3.8)	15 (1.6)	509 (8.3)	9 (0.9)	500 (8.7)
Naperville Sch. Dist. #203, IL	22 (1.3)	570 (5.9)	66 (1.5)	575 (3.2)	8 (0.8)	552 (8.1)	4 (0.5)	521 (9.6)
Project SMART Consortium, OH	10 (1.0)	511 (7.7)	60 (1.9)	533 (8.1)	20 (1.5)	507 (9.8)	10 (0.9)	495 (12.1)
Rochester City Sch. Dist., NY r	11 (0.9)	428 (12.6)	52 (2.5)	479 (7.4)	19 (1.8)	444 (9.8)	18 (1.7)	417 (8.5)
SW Math/Sci. Collaborative, PA	15 (2.1)	517 (10.7)	66 (1.7)	524 (6.3)	13 (1.2)	505 (12.4)	6 (1.0)	475 (15.4)
International Avg. (All Countries)	28 (0.2)	487 (1.2)	52 (0.2)	499 (0.8)	13 (0.1)	474 (1.4)	8 (0.1)	442 (1.8)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by students.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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 a 70-84% student response rate.

What Activities Do Students Do in Their Mathematics Lessons?

Because it can affect pedagogical strategies, class size is shown in Exhibit 6.7. Teachers' reports on the size of their eighth-grade mathematics class reveal that across countries the average was 31 students, but there was considerable variation even among the higher-performing countries – from 42 students in Korea to 19 in Belgium (Flemish). Average class size was relatively uniform across all of the Benchmarking entities, ranging from 22 to 30 students. The relationship between class size and achievement is difficult to disentangle, given the variety of policies and practices and the fact that smaller classes can be used for both advanced and remedial learning. It makes sense, however, that teachers may have an easier time managing and conducting more student-centered instructional activities with smaller classes.

Extensive research about class size in relation to achievement indicates that the existence of such a relationship is dependent on the situation.[3] 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. Also, the research is more consistent in suggesting that reductions in class size have the potential to help students in the primary grades. The TIMSS 1999 data support the complexity of this issue. The five highest-performing countries – Singapore, Korea, Chinese Taipei, Hong Kong, and Japan – were 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.

Exhibit 6.8 presents a profile of the activities most commonly encountered in mathematics classes around the world, as reported by mathematics teachers. As can be seen from the international averages, the two predominant activities, accounting for nearly half of class time on average, were teacher lecture (23 percent of class time) and teacher-guided student practice (22 percent). In general for the United States overall and the Benchmarking entities, teachers' reports on the frequency of these activities matched the international profile. According to U.S. mathematics teachers, class time is spent as follows:

3 Mayer, D.P., Mullens, J.E., and Moore, M.T. (2000), *Monitoring School Quality: An Indicators Report*, NCES 2001-030, Washington, DC: National Center for Education Statistics.

15 percent on homework review; 20 percent on lecture style teacher presentation; 35 percent on teacher-guided or independent student practice; 12 percent on re-teaching and clarification; 11 percent on tests and quizzes, six percent on administrative tasks; and four percent on other activities. One noteworthy exception is 26 percent of class time in Naperville spent on homework review, compared with 15 percent for the United States.

As shown in Exhibit 6.9, most students internationally (86 percent on average) agreed with teachers' reports about the prevalence of teacher-guided activities, saying that their teachers frequently showed them how to do mathematics problems. Just as found in the 1995 videotapes, it appears that in the U.S. the teacher states the problem, demonstrates the solution, and then asks the students to practice. Ninety-four percent of U.S. eighth graders reported that their teachers showed them how to do mathematics problems almost always or pretty often during mathematics lessons. More than 90 percent of the students in each of the Benchmarking entities reported this also.

Compared with their counterparts internationally (59 percent), more U.S. students reported that working independently on worksheets or textbooks occurred almost always or pretty often (86 percent). Working on their own on worksheets or textbooks was also quite pervasive throughout the Benchmarking entities, where more than 80 percent of the students in each jurisdiction reported doing this activity that frequently.

As for working on mathematics projects, the Benchmarking states typically were below the international average (36 percent), ranging from 22 to 33 percent. There was considerable variation across the districts and consortia. Less than one-fifth of the students reported frequent project work in the Academy School District, the First in the World Consortium, and Naperville. At the other end of the continuum, 63 percent so reported in Jersey City, followed by 34 to 38 percent in Chicago, the Fremont/Lincoln/Westside Public Schools, Miami-Dade, and Rochester.

Compared with students internationally, eighth graders in each of the Benchmarking jurisdictions and in the United States overall reported an unusually large amount of classroom time devoted to working on homework. Internationally, 55 percent of the students reported frequently discussing their completed homework. The figure for the United States was 79 percent, and it ranged from 70 to 91 percent for the Benchmarking jurisdictions. An even greater difference was evident for frequently beginning homework in class – 42 percent internationally compared with 74 percent for the United States. In the Benchmarking jurisdictions, from 43 to 90 percent of the students reported beginning their homework in class almost always or pretty often.

As might be anticipated, students reported that use of the board was an extremely common presentational mode in mathematics class (see Exhibit 6.10). On average internationally, 92 percent of students reported that teachers used the board at least pretty often, and 60 percent reported that students did so. Using the board seems to be less common in the United States, especially for students (37 percent). In the United States, use of an overhead projector is a popular presentational mode, especially for teachers – 59 percent compared with 19 percent internationally. This mode was used frequently for more than 80 percent of the students in Maryland, North Carolina, Oregon, the Academy School District, the Fremont/Lincoln/Westside Public Schools, Guilford County, Montgomery County, and Naperville.

Educators, parents, employers, and most of the public support the goal of improving students' capacity for mathematics problem-solving. To examine the emphasis placed on that goal, TIMSS created an index of teachers' emphasis on mathematics reasoning and problem-solving (EMRPS). As shown in Exhibit 6.11, the index is based on teachers' responses about how often they asked students to explain the reasoning behind an idea, represent and analyze relationships using tables, charts, or graphs, work on problems for which there was no immediate solution, and write equations to represent relationships. Students were placed in the high category if, on average, they were asked to do these activities in most of their lessons. The medium level represents students asked to do these activities in some to most lessons, and students in the low category did them only in some lessons or rarely.

Nearly half the Japanese students were at the high index level, compared with the international average of 15 percent. Across countries, most students (61 percent on average) were in the medium category. An emphasis on problem-solving was related to performance, with students at the high and medium levels having higher average achievement than those at the low level, both internationally and for most entities. There was tremendous variation among the Benchmarking participants on this index. From 41 to 46 percent of the students were in the high category in Jersey City, First in the World, and the Michigan Invitational Group, compared with eight to nine percent in Chicago and Oregon.

Exhibit R3.7 in the reference section shows the percentages of students asked in most or every lesson to engage in each of the activities included in the problem-solving index. For comparison purposes, the exhibit also shows the percentages of students asked to practice computational skills in most or every lesson. According to their teachers,

internationally on average nearly three-fourths of the students (73 percent) were asked to practice their computational skills in most or every mathematics lesson. Nearly as many (70 percent) were asked to explain the reasoning behind an idea this frequently. The other three problem-solving activities occurred much less often. Forty-three percent of students, on average across countries, wrote equations representing relationships in most or every lesson, but only about one-fourth (26 percent) represented and analyzed relationships using tables or graphs, and about one-fifth (21 percent) worked on problems for which there was no immediately obvious method of solution. While the Benchmarking entities did not vary greatly from the international profile, there were differences. For example, twice as many students as internationally reported spending time in most or every lesson working on problems for which there was no immediately obvious method of solution in the First in the World Consortium, the Jersey Public Schools, and the Michigan Invitational Group (44 to 51 percent). More than 90 percent of the students in Jersey City and the Michigan Invitational Group were frequently asked to explain the reasoning behind an idea, and 90 percent of the Naperville students were frequently asked to write equations to represent relationships.

Teachers were not asked about the emphasis placed on using things from everyday life in solving mathematics problems, but students were (see Exhibit R3.8). In most of the countries, students reported a moderate emphasis on doing this type of problem in mathematics class. Nearly two-thirds (65 percent), on average internationally, said these activities occur once in a while or pretty often, and an additional 15 percent said they occur almost always. The figures were somewhat higher for the United States and most Benchmarking jurisdictions. More than 60 percent of the students in Maryland, North Carolina, the Academy School District, the Fremont/Lincoln/Westside Public Schools, Jersey City, and the Michigan Invitational Group reported that they use things from everyday life in solving mathematics problems almost always or pretty often.

	Overall Average Class Size	1 - 20 Students		21 - 35 Students		36 or More Students	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Countries							
United States r	26 (0.7)	21 (2.6)	507 (8.4)	73 (3.0)	504 (4.9)	6 (1.4)	488 (26.2)
Belgium (Flemish)	19 (0.4)	58 (3.5)	541 (6.8)	42 (3.5)	582 (4.4)	0 (0.0)	~ ~
Canada	27 (0.3)	11 (2.1)	522 (6.7)	87 (2.3)	534 (2.9)	2 (1.0)	~ ~
Chinese Taipei	39 (0.5)	0 (0.0)	~ ~	14 (2.9)	578 (11.5)	86 (3.0)	586 (4.6)
Czech Republic r	24 (0.4)	18 (4.2)	504 (6.9)	82 (4.2)	524 (6.0)	0 (0.0)	~ ~
England	x x	x x	x x	x x	x x	x x	x x
Hong Kong, SAR	37 (0.5)	7 (1.8)	521 (20.0)	15 (3.0)	530 (10.5)	78 (3.4)	597 (4.3)
Italy	20 (0.3)	55 (3.9)	472 (5.3)	44 (3.9)	489 (6.5)	1 (0.0)	~ ~
Japan	36 (0.2)	1 (0.0)	~ ~	41 (3.4)	572 (2.9)	58 (3.3)	582 (2.3)
Korea, Rep. of	42 (0.5)	0 (0.0)	~ ~	12 (2.2)	584 (6.7)	88 (2.2)	587 (2.1)
Netherlands r	25 (0.5)	13 (4.1)	459 (18.8)	87 (4.1)	546 (8.2)	0 (0.0)	~ ~
Russian Federation	24 (0.5)	19 (3.2)	492 (10.0)	81 (3.2)	534 (5.9)	0 (0.0)	~ ~
Singapore	37 (0.3)	1 (0.4)	~ ~	32 (3.8)	602 (11.6)	68 (3.8)	607 (6.4)
States							
Connecticut s	24 (1.4)	29 (6.1)	501 (16.8)	64 (7.1)	525 (11.6)	6 (5.5)	559 (3.4)
Idaho r	22 (1.7)	43 (7.0)	481 (14.3)	52 (5.8)	503 (8.8)	6 (4.4)	488 (17.8)
Illinois	24 (0.6)	24 (5.3)	511 (10.8)	76 (5.2)	513 (7.9)	1 (0.0)	~ ~
Indiana r	22 (1.3)	40 (6.8)	517 (13.7)	59 (6.7)	512 (9.6)	1 (0.1)	~ ~
Maryland s	28 (1.2)	11 (3.4)	497 (23.2)	84 (4.7)	488 (6.3)	5 (2.6)	419 (23.6)
Massachusetts r	24 (1.1)	32 (5.1)	488 (11.6)	66 (4.8)	528 (7.4)	3 (1.5)	453 (30.5)
Michigan r	27 (1.3)	17 (3.6)	519 (8.0)	80 (3.7)	526 (9.2)	3 (2.0)	536 (29.8)
Missouri	23 (0.8)	36 (5.6)	477 (8.1)	61 (5.7)	497 (6.7)	3 (2.1)	571 (22.7)
North Carolina r	24 (0.7)	22 (5.4)	482 (17.1)	77 (5.4)	497 (7.7)	1 (0.8)	~ ~
Oregon r	24 (0.4)	26 (3.9)	500 (14.8)	74 (3.9)	521 (7.5)	0 (0.0)	~ ~
Pennsylvania	23 (0.6)	31 (4.4)	498 (11.3)	68 (4.4)	513 (6.9)	1 (0.6)	~ ~
South Carolina r	24 (1.0)	35 (5.7)	484 (13.6)	64 (5.5)	513 (12.4)	2 (1.7)	~ ~
Texas r	22 (0.9)	41 (6.1)	518 (16.9)	58 (6.0)	532 (8.4)	1 (0.9)	~ ~
Districts and Consortia							
Academy School Dist. #20, CO	27 (0.0)	9 (0.2)	474 (5.6)	88 (0.2)	541 (1.7)	3 (0.1)	508 (11.8)
Chicago Public Schools, IL	26 (1.2)	16 (7.2)	478 (27.9)	80 (6.6)	464 (6.3)	4 (0.5)	444 (5.1)
Delaware Science Coalition, DE r	29 (0.9)	9 (3.7)	417 (31.9)	78 (4.4)	480 (13.1)	13 (4.2)	559 (19.9)
First in the World Consort., IL	24 (0.6)	28 (4.3)	575 (15.6)	72 (4.3)	552 (4.9)	0 (0.0)	~ ~
Fremont/Lincoln/WestSide PS, NE	24 (0.6)	22 (4.8)	455 (19.9)	78 (4.8)	499 (11.9)	0 (0.0)	~ ~
Guilford County, NC r	24 (0.5)	15 (4.1)	494 (13.5)	85 (4.1)	512 (11.3)	0 (0.0)	~ ~
Jersey City Public Schools, NJ r	28 (3.1)	17 (4.8)	440 (21.3)	71 (4.0)	482 (11.8)	12 (4.6)	524 (31.9)
Miami-Dade County PS, FL s	30 (1.6)	16 (6.6)	369 (40.3)	56 (11.0)	427 (18.3)	28 (10.6)	437 (24.6)
Michigan Invitational Group, MI	26 (0.6)	23 (4.6)	534 (16.1)	75 (4.6)	528 (5.9)	2 (0.1)	~ ~
Montgomery County, MD s	25 (0.7)	16 (3.3)	495 (15.2)	84 (3.4)	539 (4.7)	0 (0.0)	~ ~
Naperville Sch. Dist. #203, IL	28 (0.4)	6 (2.8)	508 (23.3)	94 (2.8)	572 (3.0)	0 (0.0)	~ ~
Project SMART Consortium, OH r	24 (0.7)	23 (6.2)	533 (18.3)	77 (6.2)	523 (8.2)	0 (0.0)	~ ~
Rochester City Sch. Dist., NY	24 (0.6)	22 (4.8)	452 (13.8)	78 (4.8)	439 (7.9)	0 (0.0)	~ ~
SW Math/Sci. Collaborative, PA	24 (1.2)	35 (6.3)	507 (10.1)	62 (6.4)	521 (10.5)	3 (3.0)	455 (6.5)
International Avg. (All Countries)	31 (0.1)	17 (0.4)	468 (2.4)	53 (0.6)	488 (1.4)	30 (0.4)	471 (4.3)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

	Average Percentage of Class Time Spent in a Typical Month of Lessons							
	Administrative Tasks	Homework Review	Lecture-Style Presentation by Teacher	Teacher-Guided Student Practice	Re-teaching and Clarification of Content/ Procedures	Student Independent Practice	Tests and Quizzes	Other
Countries								
United States	r 6 (0.3)	r 15 (0.4)	r 20 (0.7)	r 18 (0.4)	r 12 (0.5)	r 17 (0.9)	r 11 (0.4)	r 4 (0.5)
Belgium (Flemish)	4 (0.3)	7 (0.4)	24 (1.1)	29 (1.0)	10 (0.4)	14 (0.9)	10 (0.3)	2 (0.4)
Canada	r 5 (0.2)	r 14 (0.4)	r 20 (0.9)	r 18 (0.8)	r 10 (0.3)	r 20 (0.7)	r 10 (0.3)	r 3 (0.6)
Chinese Taipei	3 (0.6)	12 (0.5)	39 (1.3)	15 (0.5)	11 (0.6)	9 (0.5)	10 (0.5)	2 (0.4)
Czech Republic	3 (0.3)	5 (0.4)	23 (0.7)	29 (1.2)	10 (0.5)	19 (1.0)	9 (0.6)	3 (0.4)
England	s 3 (0.2)	s 6 (0.5)	s 18 (0.9)	s 27 (1.2)	s 11 (0.4)	s 24 (1.5)	s 8 (0.4)	s 3 (0.7)
Hong Kong, SAR	5 (0.7)	12 (0.7)	32 (1.6)	18 (0.8)	8 (0.4)	14 (0.8)	8 (0.4)	3 (0.4)
Italy	2 (0.2)	14 (0.5)	25 (0.7)	22 (0.7)	13 (0.4)	12 (0.5)	12 (0.5)	1 (0.2)
Japan	2 (0.5)	5 (0.4)	34 (1.6)	26 (1.3)	16 (0.9)	9 (0.7)	7 (0.5)	2 (0.3)
Korea, Rep. of	3 (0.6)	6 (0.3)	33 (1.4)	22 (0.8)	14 (0.8)	14 (0.8)	7 (0.3)	3 (0.4)
Netherlands	5 (0.4)	15 (1.5)	9 (1.2)	5 (1.0)	18 (1.1)	32 (2.0)	11 (0.6)	5 (1.0)
Russian Federation	2 (0.1)	10 (0.4)	25 (0.6)	17 (0.7)	11 (0.4)	17 (0.6)	12 (0.6)	5 (0.4)
Singapore	6 (0.6)	13 (0.7)	28 (1.5)	20 (1.2)	9 (0.3)	12 (0.8)	8 (0.4)	3 (0.3)
States								
Connecticut	r 5 (0.6)	r 15 (0.8)	r 20 (1.7)	r 22 (1.7)	r 12 (1.0)	r 14 (1.4)	r 13 (1.0)	s 3 (0.9)
Idaho	r 5 (0.6)	r 12 (0.6)	r 16 (1.2)	r 17 (1.8)	r 12 (0.7)	r 23 (2.3)	r 11 (0.7)	r 3 (0.5)
Illinois	5 (0.4)	15 (0.6)	21 (1.5)	19 (1.2)	11 (0.5)	15 (0.9)	12 (0.7)	3 (0.4)
Indiana	4 (0.4)	14 (0.9)	22 (1.6)	17 (1.3)	12 (0.7)	15 (1.2)	12 (0.6)	3 (0.7)
Maryland	r 6 (0.7)	r 13 (0.8)	r 20 (1.6)	r 18 (1.2)	r 12 (1.1)	r 15 (1.1)	r 12 (0.7)	r 4 (0.6)
Massachusetts	4 (0.4)	17 (1.0)	19 (1.1)	19 (0.9)	15 (1.0)	13 (0.7)	12 (0.6)	r 4 (1.0)
Michigan	5 (0.6)	16 (0.8)	18 (1.0)	19 (1.6)	11 (1.0)	16 (1.0)	10 (0.6)	5 (1.7)
Missouri	5 (0.5)	12 (0.6)	21 (1.2)	19 (1.2)	12 (0.8)	18 (1.2)	10 (0.6)	3 (0.7)
North Carolina	5 (0.4)	14 (1.0)	20 (1.2)	20 (1.2)	12 (0.5)	16 (1.0)	11 (0.6)	3 (0.4)
Oregon	5 (0.5)	12 (1.0)	19 (1.3)	17 (1.2)	11 (0.6)	21 (1.2)	9 (0.6)	5 (1.7)
Pennsylvania	4 (0.3)	16 (0.9)	24 (1.5)	19 (1.1)	10 (0.5)	13 (1.1)	10 (0.6)	3 (0.4)
South Carolina	5 (0.6)	13 (0.8)	23 (1.7)	19 (1.2)	12 (0.8)	15 (1.0)	11 (0.7)	3 (0.5)
Texas	r 7 (0.7)	r 12 (0.8)	r 17 (1.4)	r 21 (1.2)	r 12 (0.7)	r 17 (1.2)	r 12 (0.7)	r 4 (0.7)
Districts and Consortia								
Academy School Dist. #20, CO	5 (0.0)	18 (0.0)	20 (0.1)	14 (0.0)	12 (0.0)	16 (0.0)	13 (0.1)	r 3 (0.0)
Chicago Public Schools, IL	6 (0.7)	11 (1.1)	20 (2.2)	20 (2.0)	13 (1.0)	16 (1.7)	12 (1.1)	3 (1.0)
Delaware Science Coalition, DE	r 5 (0.5)	r 13 (0.8)	r 21 (1.1)	r 22 (1.8)	r 10 (0.6)	r 13 (1.1)	r 10 (0.5)	r 6 (1.3)
First in the World Consort., IL	3 (0.4)	17 (1.2)	24 (1.6)	16 (1.1)	11 (0.4)	12 (1.2)	11 (0.7)	7 (2.7)
Fremont/Lincoln/WestSide PS, NE	6 (0.7)	19 (1.7)	19 (2.7)	18 (1.9)	10 (0.6)	16 (1.0)	11 (1.1)	2 (0.7)
Guilford County, NC	5 (0.4)	13 (0.5)	18 (1.5)	20 (1.1)	11 (0.7)	16 (1.0)	11 (0.7)	5 (1.2)
Jersey City Public Schools, NJ	5 (0.7)	9 (0.5)	18 (1.2)	17 (0.5)	13 (0.7)	21 (1.2)	10 (0.4)	r 7 (0.7)
Miami-Dade County PS, FL	s 5 (0.8)	s 14 (1.2)	s 19 (1.7)	s 19 (1.4)	s 12 (1.1)	s 13 (1.1)	s 12 (1.1)	s 5 (0.7)
Michigan Invitational Group, MI	3 (0.3)	18 (2.3)	16 (1.8)	18 (2.4)	11 (1.2)	17 (1.0)	13 (0.7)	6 (2.1)
Montgomery County, MD	s 5 (0.4)	s 14 (1.0)	s 18 (0.6)	s 20 (1.5)	s 14 (0.8)	s 14 (0.8)	s 12 (0.8)	s 4 (0.8)
Naperville Sch. Dist. #203, IL	5 (0.5)	26 (0.7)	22 (0.8)	14 (0.7)	9 (0.3)	12 (0.9)	12 (0.5)	1 (0.3)
Project SMART Consortium, OH	5 (0.5)	15 (1.2)	21 (1.1)	19 (1.0)	11 (0.6)	16 (1.2)	11 (0.5)	2 (0.4)
Rochester City Sch. Dist., NY	5 (0.4)	14 (0.8)	22 (0.8)	17 (0.8)	13 (0.9)	15 (0.5)	10 (0.6)	3 (0.5)
SW Math/Sci. Collaborative, PA	5 (0.8)	15 (1.3)	24 (2.3)	17 (1.3)	11 (0.6)	14 (1.2)	12 (0.8)	2 (0.5)
International Avg. (All Countries)	5 (0.1)	12 (0.1)	23 (0.2)	22 (0.2)	13 (0.1)	15 (0.2)	11 (0.1)	4 (0.1)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

	Percentage of Students Reporting Almost Always or Pretty Often				
	We Discuss Our Completed Homework	Teacher Shows Us How to Do Mathematics Problems	We Work on Worksheets or Textbooks on Our Own	We Work on Mathematics Projects	We Begin Our Homework
Countries					
United States	79 (1.2)	94 (0.6)	86 (0.7)	29 (1.3)	74 (1.6)
Belgium (Flemish)	43 (1.4)	69 (0.9)	64 (1.0)	16 (1.1)	20 (1.4)
Canada	62 (1.4)	92 (0.5)	92 (0.5)	28 (1.1)	82 (1.2)
Chinese Taipei	55 (1.0)	91 (0.5)	59 (1.2)	55 (1.2)	34 (1.0)
Czech Republic	42 (1.8)	86 (1.1)	51 (2.4)	8 (0.6)	16 (1.6)
England	62 (1.5)	93 (0.7)	88 (1.5)	35 (1.4)	27 (1.6)
Hong Kong, SAR	35 (1.1)	91 (0.6)	69 (1.2)	67 (1.4)	40 (1.1)
Italy	64 (1.4)	80 (1.2)	34 (1.2)	22 (1.3)	39 (2.3)
Japan	19 (1.2)	88 (0.7)	38 (1.5)	6 (0.7)	20 (1.3)
Korea, Rep. of	10 (0.5)	85 (0.8)	29 (0.7)	46 (1.2)	17 (0.7)
Netherlands	68 (3.7)	70 (2.7)	92 (1.1)	3 (0.7)	89 (1.5)
Russian Federation	53 (1.4)	78 (1.2)	62 (1.3)	19 (0.9)	10 (0.8)
Singapore	61 (1.0)	97 (0.4)	75 (0.9)	15 (1.1)	60 (1.9)
States					
Connecticut	87 (1.3)	94 (1.3)	88 (1.0)	33 (3.0)	67 (2.2)
Idaho	70 (2.4)	94 (1.1)	88 (1.2)	31 (1.9)	89 (1.3)
Illinois	78 (2.2)	97 (0.5)	87 (1.0)	31 (2.2)	82 (2.5)
Indiana	80 (1.7)	95 (1.1)	88 (0.8)	30 (2.5)	84 (2.6)
Maryland	81 (1.9)	93 (1.0)	87 (1.1)	28 (2.1)	57 (3.1)
Massachusetts	82 (2.2)	94 (0.9)	85 (1.1)	22 (1.6)	63 (3.4)
Michigan	84 (1.9)	95 (0.7)	89 (0.8)	28 (2.3)	83 (2.4)
Missouri	74 (2.5)	92 (1.1)	90 (1.2)	30 (2.2)	85 (2.1)
North Carolina	89 (1.4)	98 (0.5)	90 (0.8)	31 (1.9)	79 (2.1)
Oregon	74 (2.4)	93 (1.1)	90 (1.2)	34 (2.2)	90 (1.8)
Pennsylvania	85 (1.8)	95 (0.9)	83 (1.2)	24 (2.0)	71 (3.2)
South Carolina	84 (2.0)	95 (0.9)	87 (1.6)	30 (2.2)	79 (2.2)
Texas	75 (2.9)	94 (1.3)	84 (1.4)	25 (2.1)	78 (2.4)
Districts and Consortia					
Academy School Dist. #20, CO	82 (0.9)	92 (0.9)	90 (0.9)	19 (0.9)	72 (1.1)
Chicago Public Schools, IL	74 (4.3)	96 (1.1)	81 (1.4)	34 (3.3)	53 (4.6)
Delaware Science Coalition, DE	85 (1.6)	95 (0.9)	88 (1.3)	25 (1.8)	74 (2.0)
First in the World Consort., IL	91 (1.5)	94 (1.5)	92 (1.6)	18 (2.8)	63 (3.6)
Fremont/Lincoln/WestSide PS, NE	83 (1.5)	91 (1.0)	91 (1.2)	38 (3.7)	83 (2.9)
Guilford County, NC	88 (1.4)	96 (1.0)	93 (0.8)	24 (2.2)	80 (2.5)
Jersey City Public Schools, NJ	76 (2.0)	97 (0.6)	85 (2.2)	63 (2.3)	43 (2.7)
Miami-Dade County PS, FL	71 (4.7)	92 (2.2)	83 (2.4)	34 (2.8)	58 (3.3)
Michigan Invitational Group, MI	86 (1.3)	92 (1.2)	86 (1.7)	22 (1.3)	84 (3.0)
Montgomery County, MD	83 (1.4)	93 (1.2)	92 (0.9)	24 (2.4)	69 (1.5)
Naperville Sch. Dist. #203, IL	91 (0.9)	96 (0.7)	92 (0.9)	15 (1.8)	87 (1.6)
Project SMART Consortium, OH	84 (1.9)	93 (1.5)	88 (1.2)	25 (1.8)	84 (2.5)
Rochester City Sch. Dist., NY	r 82 (1.8)	r 95 (0.8)	r 86 (1.2)	r 35 (2.9)	r 68 (3.0)
SW Math/Sci. Collaborative, PA	85 (2.1)	95 (1.0)	83 (1.9)	22 (2.2)	79 (3.3)
International Avg. (All Countries)	55 (0.2)	86 (0.2)	59 (0.2)	36 (0.2)	42 (0.2)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by students.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

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

An "r" indicates a 70-84% student response rate.

	Percentage of Students Reporting Almost Always or Pretty Often				
	Teacher Uses the Board	Teacher Uses an Overhead Projector	Teacher Uses a Computer to Demonstrate Ideas in Mathematics	Students Use the Board	Students Use an Overhead Projector
Countries					
United States	80 (1.9)	59 (3.3)	9 (0.7)	37 (1.9)	16 (1.0)
Belgium (Flemish)	96 (0.7)	11 (1.7)	2 (0.5)	42 (1.8)	2 (0.8)
Canada	91 (0.9)	42 (2.7)	5 (0.5)	25 (1.2)	7 (0.8)
Chinese Taipei	96 (0.4)	4 (0.4)	2 (0.2)	48 (1.6)	2 (0.3)
Czech Republic	97 (0.4)	9 (1.6)	2 (0.4)	91 (1.7)	4 (0.5)
England	94 (1.5)	19 (2.6)	6 (0.8)	13 (1.0)	3 (0.6)
Hong Kong, SAR	96 (0.4)	9 (0.8)	3 (0.4)	46 (1.7)	3 (0.4)
Italy	94 (0.5)	8 (0.9)	5 (0.6)	84 (1.1)	7 (0.6)
Japan	99 (0.2)	4 (0.8)	1 (0.4)	50 (2.5)	1 (0.3)
Korea, Rep. of	93 (0.5)	10 (0.8)	7 (0.9)	38 (1.7)	3 (0.3)
Netherlands	90 (1.6)	7 (1.4)	2 (0.3)	9 (1.2)	2 (0.3)
Russian Federation	96 (0.4)	7 (1.0)	1 (0.2)	92 (0.6)	4 (0.5)
Singapore	96 (1.3)	75 (2.1)	11 (1.2)	52 (2.0)	21 (1.1)
States					
Connecticut	85 (3.4)	57 (4.5)	8 (1.4)	43 (3.4)	18 (2.7)
Idaho	81 (2.9)	59 (4.1)	9 (1.5)	30 (2.7)	12 (1.2)
Illinois	75 (5.2)	64 (5.5)	8 (1.3)	37 (4.8)	16 (1.9)
Indiana	78 (3.8)	61 (5.4)	8 (1.1)	42 (3.7)	16 (1.7)
Maryland	74 (3.2)	86 (2.5)	10 (1.0)	44 (3.8)	32 (1.9)
Massachusetts	87 (2.4)	47 (5.1)	7 (1.3)	46 (3.4)	17 (2.3)
Michigan	77 (3.6)	64 (4.6)	7 (1.1)	30 (2.2)	18 (2.1)
Missouri	81 (3.2)	55 (5.0)	8 (0.9)	39 (3.0)	15 (2.0)
North Carolina	76 (2.5)	84 (2.7)	10 (1.2)	51 (3.0)	33 (2.6)
Oregon	63 (3.3)	83 (3.0)	9 (0.9)	22 (1.8)	28 (2.5)
Pennsylvania	92 (1.8)	44 (3.5)	5 (0.6)	65 (2.9)	16 (2.6)
South Carolina	63 (3.8)	80 (4.3)	10 (1.4)	32 (3.0)	16 (1.7)
Texas	71 (3.2)	72 (3.7)	9 (1.5)	32 (3.4)	22 (1.9)
Districts and Consortia					
Academy School Dist. #20, CO	70 (1.0)	85 (0.8)	6 (0.7)	30 (1.0)	23 (1.1)
Chicago Public Schools, IL	79 (6.2)	41 (9.2)	10 (1.9)	50 (4.5)	18 (4.5)
Delaware Science Coalition, DE	80 (2.8)	72 (4.2)	10 (1.1)	38 (2.8)	27 (2.7)
First in the World Consort., IL	79 (5.8)	70 (2.6)	5 (1.3)	43 (6.2)	28 (3.6)
Fremont/Lincoln/WestSide PS, NE	61 (3.7)	92 (1.0)	15 (1.4)	23 (2.7)	29 (2.8)
Guilford County, NC	67 (3.3)	89 (2.5)	6 (0.9)	35 (2.5)	25 (2.2)
Jersey City Public Schools, NJ	93 (1.9)	65 (2.8)	17 (1.9)	50 (3.2)	22 (2.5)
Miami-Dade County PS, FL	80 (4.9)	63 (6.8)	16 (1.9)	46 (6.4)	19 (2.3)
Michigan Invitational Group, MI	84 (3.4)	74 (2.8)	7 (0.9)	35 (2.2)	26 (3.3)
Montgomery County, MD	60 (3.3)	92 (1.7)	9 (0.9)	32 (2.7)	32 (2.8)
Naperville Sch. Dist. #203, IL	73 (2.3)	90 (0.6)	5 (0.7)	43 (1.9)	25 (1.6)
Project SMART Consortium, OH	80 (2.7)	66 (4.1)	11 (1.5)	45 (3.2)	25 (2.9)
Rochester City Sch. Dist., NY	r 64 (2.8)	r 74 (4.0)	r 16 (2.1)	r 35 (3.0)	r 36 (3.0)
SW Math/Sci. Collaborative, PA	95 (1.7)	40 (5.1)	5 (0.7)	57 (4.2)	10 (2.0)
International Avg. (All Countries)	92 (0.1)	19 (0.3)	5 (0.1)	60 (0.2)	9 (0.1)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by students.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

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

An "r" indicates a 70-84% student response rate.

Exhibit 6.11

Index of Teachers' Emphasis on Mathematics Reasoning and Problem-Solving

Index based on teachers' responses to four questions about how often they ask students to: 1) explain the reasoning behind an idea; 2) represent and analyze relationships using tables, charts, or graphs; 3) work on problems for which there is no immediately obvious method of solution; 4) write equations to represent relationships (see reference exhibit R3.7). Average is computed across the four items based on a 4-point scale: 1 = never or almost never; 2 = some lessons; 3 = most lessons; 4 = every lesson. High level indicates average is greater than or equal to 3. Medium level indicates average is greater than or equal to 2.25 and less than 3. Low level indicates average is less than 2.25.

		High EMRPS		Medium EMRPS		Low EMRPS	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Japan		49 (4.1)	584 (2.6)	45 (4.1)	574 (2.5)	7 (2.1)	562 (6.2)
Jersey City Public Schools, NJ	r	46 (6.4)	481 (11.1)	50 (6.0)	482 (15.3)	4 (2.5)	372 (7.2)
First in the World Consort., IL		42 (8.8)	536 (8.1)	54 (8.8)	581 (10.4)	4 (3.0)	492 (12.6)
Michigan Invitational Group, MI		41 (9.6)	521 (5.0)	52 (10.2)	549 (9.4)	7 (3.5)	484 (17.2)
Italy		30 (3.1)	484 (6.9)	58 (3.6)	479 (5.7)	12 (2.6)	472 (8.7)
Naperville Sch. Dist. #203, IL		29 (4.9)	569 (9.9)	67 (4.8)	571 (5.1)	4 (2.6)	524 (15.0)
Academy School Dist. #20, CO		26 (0.3)	552 (3.4)	53 (0.4)	533 (2.2)	21 (0.4)	504 (3.2)
Connecticut	r	26 (5.2)	554 (23.7)	57 (6.8)	509 (10.4)	17 (5.9)	508 (17.0)
Miami-Dade County PS, FL	s	25 (8.3)	443 (29.9)	55 (8.9)	410 (13.8)	21 (6.6)	425 (31.4)
Maryland	r	25 (5.6)	491 (14.9)	55 (6.3)	491 (8.4)	20 (4.2)	460 (14.7)
Czech Republic		21 (4.2)	539 (8.4)	73 (4.6)	516 (5.6)	6 (2.6)	502 (10.3)
Guilford County, NC		21 (5.4)	521 (24.3)	66 (5.9)	503 (9.8)	13 (3.5)	527 (13.4)
Michigan		21 (4.7)	558 (16.9)	60 (5.2)	516 (7.6)	19 (4.8)	510 (11.8)
Korea, Rep. of		21 (3.0)	588 (4.0)	66 (3.3)	586 (2.6)	13 (2.4)	594 (4.6)
Texas		20 (5.5)	552 (18.2)	61 (5.2)	512 (12.8)	19 (3.9)	511 (18.9)
Delaware Science Coalition, DE	r	20 (4.2)	490 (14.5)	59 (7.4)	492 (14.5)	21 (6.7)	445 (14.6)
United States		18 (2.5)	519 (12.4)	57 (2.9)	502 (4.1)	24 (2.7)	489 (6.4)
Montgomery County, MD	s	18 (6.7)	582 (11.6)	61 (6.6)	533 (7.1)	21 (5.2)	493 (7.1)
Indiana		17 (4.6)	512 (12.8)	64 (5.2)	524 (9.1)	19 (5.4)	491 (11.8)
SW Math/Sci. Collaborative, PA		17 (4.9)	517 (19.0)	62 (6.0)	527 (10.6)	21 (5.7)	492 (8.4)
Massachusetts		15 (4.2)	543 (15.7)	70 (6.5)	506 (7.1)	15 (4.9)	506 (14.8)
South Carolina		15 (3.3)	545 (26.8)	62 (5.5)	505 (8.6)	24 (4.2)	474 (17.4)
Idaho	r	14 (5.1)	511 (14.9)	52 (5.0)	500 (9.1)	34 (5.6)	479 (15.3)
Chinese Taipei		13 (2.4)	571 (7.5)	58 (4.2)	594 (6.0)	29 (3.8)	573 (6.9)
Project SMART Consortium, OH		13 (2.0)	540 (13.6)	60 (5.8)	516 (10.2)	27 (5.6)	522 (16.6)
Illinois		13 (3.6)	522 (19.6)	56 (5.8)	513 (9.2)	31 (6.8)	505 (9.8)
Canada		13 (2.0)	550 (8.1)	62 (3.4)	537 (3.5)	26 (3.0)	518 (4.9)
Fremont/Lincoln/WestSide PS, NE	r	13 (1.1)	491 (21.9)	66 (1.7)	498 (12.8)	22 (1.1)	459 (21.4)
Netherlands		12 (3.5)	561 (12.7)	60 (6.1)	528 (10.3)	28 (5.2)	547 (9.5)
Russian Federation		11 (2.5)	557 (12.8)	74 (3.9)	523 (6.6)	15 (3.6)	518 (10.5)
Pennsylvania		10 (3.3)	512 (21.2)	67 (5.4)	518 (9.0)	22 (5.8)	489 (9.2)
Missouri		10 (3.9)	503 (26.1)	55 (5.9)	495 (6.8)	35 (5.4)	483 (10.3)
Rochester City Sch. Dist., NY		10 (2.9)	443 (19.4)	73 (3.7)	444 (8.3)	17 (2.1)	429 (12.3)
North Carolina		10 (2.7)	522 (19.0)	69 (4.6)	493 (8.7)	21 (4.3)	476 (13.8)
Chicago Public Schools, IL		9 (5.7)	447 (9.3)	67 (8.5)	476 (6.5)	23 (9.1)	448 (13.0)
Oregon		8 (2.7)	561 (16.1)	64 (5.0)	518 (6.0)	28 (4.9)	494 (12.8)
Singapore		7 (2.1)	617 (25.9)	47 (4.0)	607 (8.8)	47 (4.4)	599 (8.2)
Hong Kong, SAR		6 (2.2)	597 (13.7)	56 (3.6)	591 (5.7)	38 (3.7)	570 (8.1)
England		3 (1.4)	533 (24.8)	66 (3.5)	519 (7.2)	31 (3.4)	490 (7.6)
Belgium (Flemish)		1 (0.4)	~ ~	39 (3.1)	592 (4.9)	61 (3.1)	540 (5.4)
International Avg. (All Countries)		15 (0.5)	493 (3.5)	61 (0.7)	490 (1.0)	24 (0.6)	479 (1.5)

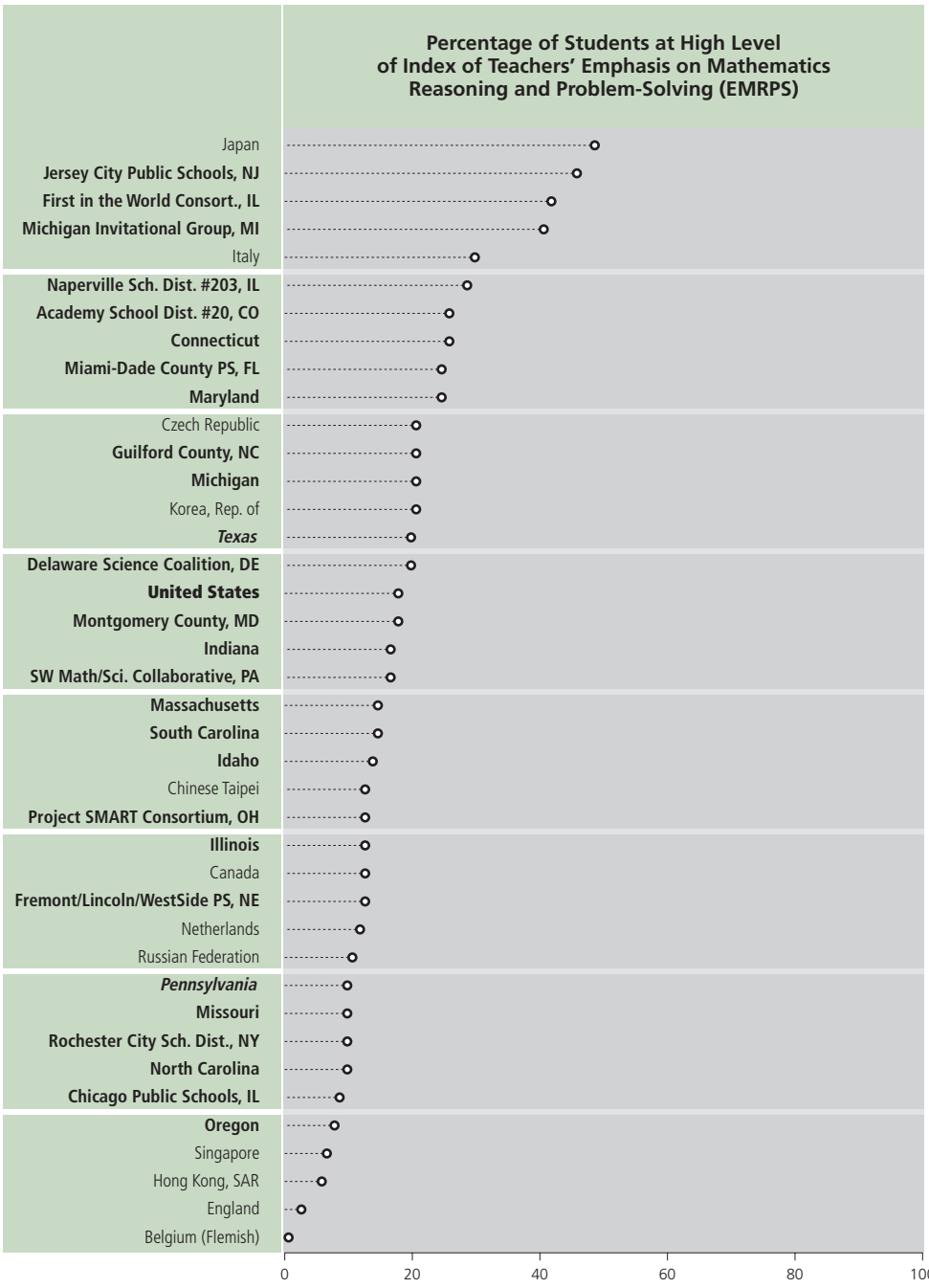
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.



SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

How Are Calculators and Computers Used?

Exhibit 6.12 shows data on students' access to calculators for use in mathematics class and on policies on their use for those with access. When all 38 TIMSS 1999 countries were considered, teachers in 14 countries reported that nearly all students (more than 90 percent) had access to calculators in class. In addition to the United States, the countries with this high degree of access were Australia, Belgium (Flemish), Canada, the Czech Republic, England, Finland, Hong Kong, Israel, Lithuania, the Netherlands, New Zealand, Singapore, and the Slovak Republic. For students in classes with access to calculators, most teachers reported some type of restricted use (for about two-thirds of the students on average internationally). Corresponding to the results for the United States, most students in the Benchmarking entities (83 to 100 percent) had access to calculators. The policies regarding use varied dramatically, however. Whereas use was restricted for only about one-third or less of the students in some jurisdictions – the First in the World Consortium, the Jersey City Public Schools, the Michigan Invitational Group, and Montgomery County – more than 80 percent of the students were subject to some restrictions in South Carolina, the Chicago Public Schools, and the Rochester City School District.

TIMSS combined students' and teachers' reports on the frequency of calculator use to create an index of emphasis on calculators in mathematics class (ECMC), presented in Exhibit 6.13. Students were placed in the high category if they reported using calculators in class almost always or pretty often and their teachers reported calculator use of at least once or twice a week. At the other end of the spectrum, students were placed in the low category if they reported using calculators only once in a while or never and their teachers reported asking students to use calculators never or hardly ever. There was enormous variation in the results across countries. For example, the Netherlands and Singapore had more than four-fifths of their students (95 and 85 percent, respectively) in the high category. In contrast, a number of countries had half or more of their students in the low category, including Chinese Taipei, Korea, and Japan. Since several high-performing countries have restricted calculator use and large percentages of students are in the low-use category, the relationship between calculator use and performance is difficult to interpret. Although on average internationally the relationship is unclear, in most of the countries where emphasis on calculator use was high, there was a positive association between calculator use and mathematics achievement.

Exhibit R3.9 in the reference section shows the detailed results for students' reports on the frequency of their calculator use. In the Netherlands, 67 percent of students reported almost always using calculators in their mathematics lessons. Countries with the next highest level of use included the United States (42 percent) and Canada (44 percent). The Benchmarking jurisdictions with the greatest percentages of students reporting almost always using calculators were the Academy School District (68 percent), Jersey City (68 percent), and Naperville (71 percent). Benchmarking entities with the lowest percentages of students (25 percent or less) reporting this level of calculator use were South Carolina, Texas, Chicago, Miami-Dade, and Rochester.

The percentages of students asked to use calculators for various activities at least once or twice a week are shown in Exhibit R3.10. According to teachers internationally, they asked the most students to use calculators at least weekly for checking answers, performing routine computations, and solving complex problems (43 to 44 percent each). About one-fourth of the students across countries were asked to explore number concepts and one-fifth to use calculators on their tests. Across the Benchmarking entities, students used calculators for each of the activities asked about by TIMSS, although in varying degrees.

Students' reports on the frequency of their computer use in mathematics class are presented in Exhibit 6.14. Across countries, the vast majority of students (80 percent on average internationally) reported never using computers in mathematics class. Even though more students in the Benchmarking entities than internationally used computers in mathematics class, the percentages using computers almost always or pretty often were still relatively low, ranging from 24 percent in the Jersey City Public Schools to seven percent in Idaho, Guilford County, and the Michigan Invitational Group.

Because the Internet provides a wealth of opportunities for students to collect and analyze information, TIMSS began asking about students' access to the Internet and whether they used the World Wide Web to access information for mathematics projects. The data in Exhibit 6.15 indicate great variation in Internet access across countries and across the Benchmarking participants. Still, the international averages show about one-quarter of the students with access to the Internet at school. The international average for using the Internet to access information for mathematics class on even a monthly basis was 10 percent (less than half those reporting access). For the Benchmarking jurisdictions, Internet access at school ranged from 31 to 32 percent in Rochester and Chicago to 98 percent in First in the World and Naperville. Still, the only jurisdictions reporting 20 percent or more of the students accessing information for mathematics class on even a monthly basis were Connecticut, the Delaware Science Coalition, Jersey City, and Miami-Dade.

Exhibit 6.12 Calculator Use in Mathematics Class*

8th Grade Mathematics

	Percentage of Students Having Access to Calculators in Class	Policy on Use of Calculators During Mathematics Lessons for Students Having Access					
		Unrestricted Use		Restricted Use		Calculators Not Permitted	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Countries							
United States	96 (1.2)	34 (3.3)	524 (6.7)	66 (3.3)	493 (4.5)	0 (0.2)	~ ~
Belgium (Flemish)	94 (2.6)	13 (2.3)	580 (8.7)	87 (2.4)	560 (5.6)	1 (0.4)	~ ~
Canada	96 (1.1)	40 (3.3)	537 (4.5)	60 (3.3)	531 (4.5)	0 (0.0)	~ ~
Chinese Taipei	51 (4.6)	13 (3.9)	576 (13.0)	85 (4.3)	577 (5.7)	3 (2.0)	599 (76.8)
Czech Republic	94 (2.4)	7 (2.7)	517 (13.4)	91 (3.1)	522 (4.7)	2 (1.5)	~ ~
England	s 100 (0.3)	s 14 (2.2)	547 (16.0)	86 (2.2)	504 (5.2)	0 (0.0)	~ ~
Hong Kong, SAR	99 (0.5)	67 (4.3)	579 (5.2)	32 (4.2)	590 (6.6)	1 (0.0)	~ ~
Italy	87 (2.0)	10 (2.6)	467 (12.0)	84 (3.1)	482 (4.6)	6 (1.6)	465 (16.9)
Japan	34 (4.3)	13 (3.9)	579 (5.4)	85 (4.4)	579 (5.1)	2 (0.2)	~ ~
Korea, Rep. of	28 (3.4)	5 (3.3)	601 (9.0)	77 (6.3)	589 (4.6)	18 (5.7)	586 (9.0)
Netherlands	100 (0.0)	85 (4.1)	540 (7.8)	15 (4.1)	522 (18.5)	0 (0.0)	~ ~
Russian Federation	– –	12 (2.5)	547 (16.2)	78 (3.4)	520 (6.2)	10 (2.3)	546 (8.7)
Singapore	100 (0.0)	31 (4.7)	622 (11.0)	69 (4.7)	597 (6.2)	0 (0.0)	~ ~
States							
Connecticut	r 96 (2.2)	r 37 (7.4)	548 (13.2)	63 (7.4)	512 (9.7)	0 (0.0)	~ ~
Idaho	r 90 (5.1)	r 23 (6.5)	510 (13.4)	75 (6.6)	490 (10.4)	2 (0.2)	~ ~
Illinois	94 (3.9)	34 (5.4)	529 (8.8)	65 (5.4)	510 (7.2)	0 (0.0)	~ ~
Indiana	94 (2.6)	22 (5.2)	519 (10.7)	75 (5.6)	519 (9.2)	3 (2.0)	492 (7.4)
Maryland	r 100 (0.1)	r 42 (6.2)	509 (7.9)	58 (6.2)	468 (7.4)	0 (0.0)	~ ~
Massachusetts	97 (2.0)	36 (6.2)	537 (9.2)	64 (6.2)	498 (6.5)	0 (0.0)	~ ~
Michigan	99 (0.7)	55 (6.3)	530 (7.3)	45 (6.3)	517 (11.2)	0 (0.0)	~ ~
Missouri	95 (3.2)	45 (6.6)	492 (8.4)	55 (6.6)	494 (6.9)	0 (0.0)	~ ~
North Carolina	99 (0.8)	29 (6.2)	485 (14.1)	70 (6.3)	496 (7.1)	1 (0.8)	~ ~
Oregon	100 (0.3)	52 (6.2)	526 (8.9)	48 (6.2)	502 (6.7)	0 (0.0)	~ ~
Pennsylvania	89 (5.9)	32 (4.6)	554 (9.9)	66 (4.8)	495 (8.0)	2 (0.2)	~ ~
South Carolina	89 (4.8)	12 (3.5)	539 (29.9)	83 (4.9)	504 (8.1)	5 (2.9)	457 (26.6)
Texas	93 (2.8)	19 (4.0)	562 (16.1)	77 (5.1)	514 (11.2)	5 (2.7)	475 (52.8)
Districts and Consortia							
Academy School Dist. #20, CO	99 (0.2)	57 (0.4)	560 (2.0)	43 (0.4)	497 (2.8)	0 (0.0)	~ ~
Chicago Public Schools, IL	94 (3.9)	6 (3.6)	473 (29.3)	91 (4.7)	468 (6.9)	3 (0.3)	473 (3.3)
Delaware Science Coalition, DE	r 95 (3.5)	r 39 (6.0)	458 (18.1)	59 (6.3)	497 (12.4)	2 (0.1)	~ ~
First in the World Consort., IL	100 (0.0)	65 (4.7)	569 (6.6)	35 (4.7)	538 (8.9)	0 (0.0)	~ ~
Fremont/Lincoln/WestSide PS, NE	100 (0.0)	26 (9.5)	470 (12.6)	74 (9.5)	493 (11.9)	0 (0.0)	~ ~
Guilford County, NC	97 (0.6)	22 (3.9)	547 (12.4)	78 (3.9)	497 (10.7)	0 (0.0)	~ ~
Jersey City Public Schools, NJ	100 (0.0)	93 (5.0)	469 (7.0)	7 (5.0)	601 (5.3)	0 (0.0)	~ ~
Miami-Dade County PS, FL	s 88 (7.8)	s 25 (7.4)	446 (33.3)	75 (7.4)	404 (16.3)	0 (0.0)	~ ~
Michigan Invitational Group, MI	98 (1.7)	68 (6.5)	535 (6.7)	32 (6.5)	533 (7.5)	0 (0.0)	~ ~
Montgomery County, MD	s 100 (0.0)	s 69 (5.8)	547 (8.2)	31 (5.8)	505 (10.9)	0 (0.0)	~ ~
Naperville Sch. Dist. #203, IL	100 (0.0)	60 (3.1)	572 (5.2)	40 (3.1)	563 (6.7)	0 (0.0)	~ ~
Project SMART Consortium, OH	88 (4.8)	25 (5.6)	567 (21.0)	70 (6.3)	517 (8.6)	5 (3.3)	478 (10.1)
Rochester City Sch. Dist., NY	83 (3.1)	12 (5.1)	521 (24.6)	83 (6.1)	431 (5.6)	5 (3.8)	533 (8.2)
SW Math/Sci. Collaborative, PA	100 (0.0)	45 (7.1)	541 (9.8)	55 (7.1)	498 (10.7)	0 (0.0)	~ ~
International Avg. (All Countries)	73 (0.5)	21 (0.5)	490 (2.2)	67 (0.7)	488 (1.2)	12 (0.6)	464 (3.5)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

* The use of calculators on TIMSS was not allowed in 1995 or in 1999.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

Index of Emphasis on Calculators in Mathematics Class

Index based on students' reports of the frequency of using calculators in mathematics lessons and teachers' reports of students' use of calculators in mathematics class for five activities: checking answers; tests and exams; routine computation; solving complex problems; and exploring number concepts (see reference exhibits R3.9-R3.10). High level indicates the student reported using calculators in mathematics lessons always or pretty often, and the teacher reported students use calculators at least once or twice a week for any of the tasks. Low level indicates the student reported using calculators once in a while or never, and the teacher reported students use calculators never or hardly ever for all of the tasks. Medium level includes all other possible combinations of responses.

		High ECMC		Medium ECMC		Low ECMC	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Netherlands		95 (1.1)	538 (7.2)	5 (1.1)	512 (23.5)	0 (0.0)	~ ~
Jersey City Public Schools, NJ	r	93 (0.8)	485 (9.8)	7 (0.8)	432 (12.3)	0 (0.0)	~ ~
Naperville Sch. Dist. #203, IL		92 (0.8)	570 (2.8)	8 (0.8)	549 (14.2)	0 (0.0)	~ ~
Montgomery County, MD	s	90 (3.6)	540 (7.5)	10 (3.6)	484 (17.8)	0 (0.0)	~ ~
Academy School Dist. #20, CO		90 (0.8)	540 (1.8)	8 (0.8)	461 (5.7)	1 (0.3)	~ ~
Michigan Invitational Group, MI		90 (3.2)	536 (5.0)	9 (2.8)	506 (8.8)	2 (0.1)	~ ~
Oregon		87 (2.3)	521 (5.2)	13 (2.2)	485 (9.1)	0 (0.0)	~ ~
First in the World Consort., IL		86 (2.4)	560 (5.8)	14 (2.4)	547 (17.7)	0 (0.0)	~ ~
Singapore		85 (1.6)	611 (6.3)	15 (1.6)	567 (7.1)	0 (0.0)	~ ~
Fremont/Lincoln/WestSide PS, NE		83 (4.2)	492 (12.0)	17 (4.2)	463 (9.8)	0 (0.0)	~ ~
England	s	80 (2.3)	524 (5.7)	19 (2.2)	462 (6.5)	1 (0.7)	~ ~
North Carolina		79 (3.6)	500 (5.7)	20 (3.6)	480 (11.8)	1 (0.6)	~ ~
Canada	r	79 (1.9)	537 (3.0)	18 (1.7)	523 (4.7)	3 (0.9)	548 (6.8)
Michigan		78 (3.3)	530 (6.8)	21 (3.1)	507 (7.6)	1 (0.9)	~ ~
Missouri		78 (4.1)	497 (5.4)	17 (4.5)	476 (14.9)	5 (3.1)	461 (77.6)
Connecticut	r	76 (5.1)	528 (9.1)	19 (3.7)	505 (14.6)	5 (2.0)	497 (43.9)
Hong Kong, SAR		75 (1.9)	586 (4.4)	25 (1.8)	577 (6.3)	0 (0.2)	~ ~
Guilford County, NC		73 (5.5)	506 (9.6)	25 (5.4)	512 (15.5)	2 (0.4)	~ ~
Illinois		72 (4.7)	526 (6.2)	22 (3.4)	487 (7.8)	7 (3.8)	436 (7.8)
SW Math/Sci. Collaborative, PA		70 (5.4)	528 (7.6)	29 (5.1)	499 (11.1)	1 (0.7)	~ ~
Maryland	r	66 (5.3)	503 (4.7)	33 (5.3)	459 (9.3)	1 (0.5)	~ ~
United States	r	65 (3.2)	515 (4.5)	31 (2.9)	489 (6.4)	5 (1.2)	476 (10.8)
Massachusetts		64 (5.3)	518 (7.5)	33 (4.9)	505 (8.2)	3 (1.8)	497 (84.9)
Pennsylvania		63 (6.1)	521 (8.3)	25 (3.6)	497 (8.5)	12 (5.7)	492 (8.5)
Idaho	r	61 (6.2)	499 (9.6)	30 (3.4)	488 (13.8)	9 (4.6)	495 (12.5)
Delaware Science Coalition, DE	r	58 (4.1)	486 (11.9)	39 (3.8)	484 (14.3)	4 (2.6)	527 (29.9)
Indiana		56 (4.8)	523 (8.4)	39 (4.2)	513 (9.1)	5 (2.4)	492 (20.5)
Italy		52 (2.4)	486 (4.6)	37 (2.3)	474 (5.7)	11 (1.8)	483 (12.0)
Project SMART Consortium, OH		50 (2.9)	545 (11.6)	39 (4.3)	502 (8.3)	10 (3.5)	483 (8.9)
Miami-Dade County PS, FL	s	46 (7.6)	419 (16.1)	43 (5.3)	420 (12.5)	11 (7.3)	475 (56.9)
South Carolina		45 (5.2)	525 (10.4)	43 (4.6)	491 (12.4)	12 (3.4)	477 (21.9)
Belgium (Flemish)		39 (2.7)	571 (6.3)	54 (2.7)	562 (6.9)	7 (2.6)	532 (27.9)
Texas	r	37 (4.4)	550 (10.7)	52 (4.7)	504 (13.0)	12 (4.5)	519 (17.2)
Czech Republic		35 (3.2)	528 (7.1)	60 (3.5)	517 (4.7)	5 (2.0)	507 (26.2)
Chicago Public Schools, IL		32 (4.6)	471 (8.4)	53 (6.3)	471 (8.6)	15 (8.3)	446 (10.8)
Russian Federation		29 (2.3)	522 (9.3)	60 (2.1)	528 (6.3)	12 (2.4)	539 (13.3)
Rochester City Sch. Dist., NY	r	24 (4.9)	458 (19.4)	60 (4.4)	449 (6.3)	16 (3.6)	448 (16.9)
Chinese Taipei		2 (0.4)	~ ~	48 (4.0)	576 (4.8)	50 (4.2)	598 (5.4)
Korea, Rep. of		0 (0.3)	~ ~	29 (3.3)	587 (4.0)	71 (3.3)	587 (2.4)
Japan		0 (0.1)	~ ~	21 (3.2)	573 (6.4)	79 (3.2)	579 (2.2)
International Avg. (All Countries)		32 (0.3)	481 (1.8)	42 (0.5)	484 (1.2)	26 (0.5)	481 (3.3)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

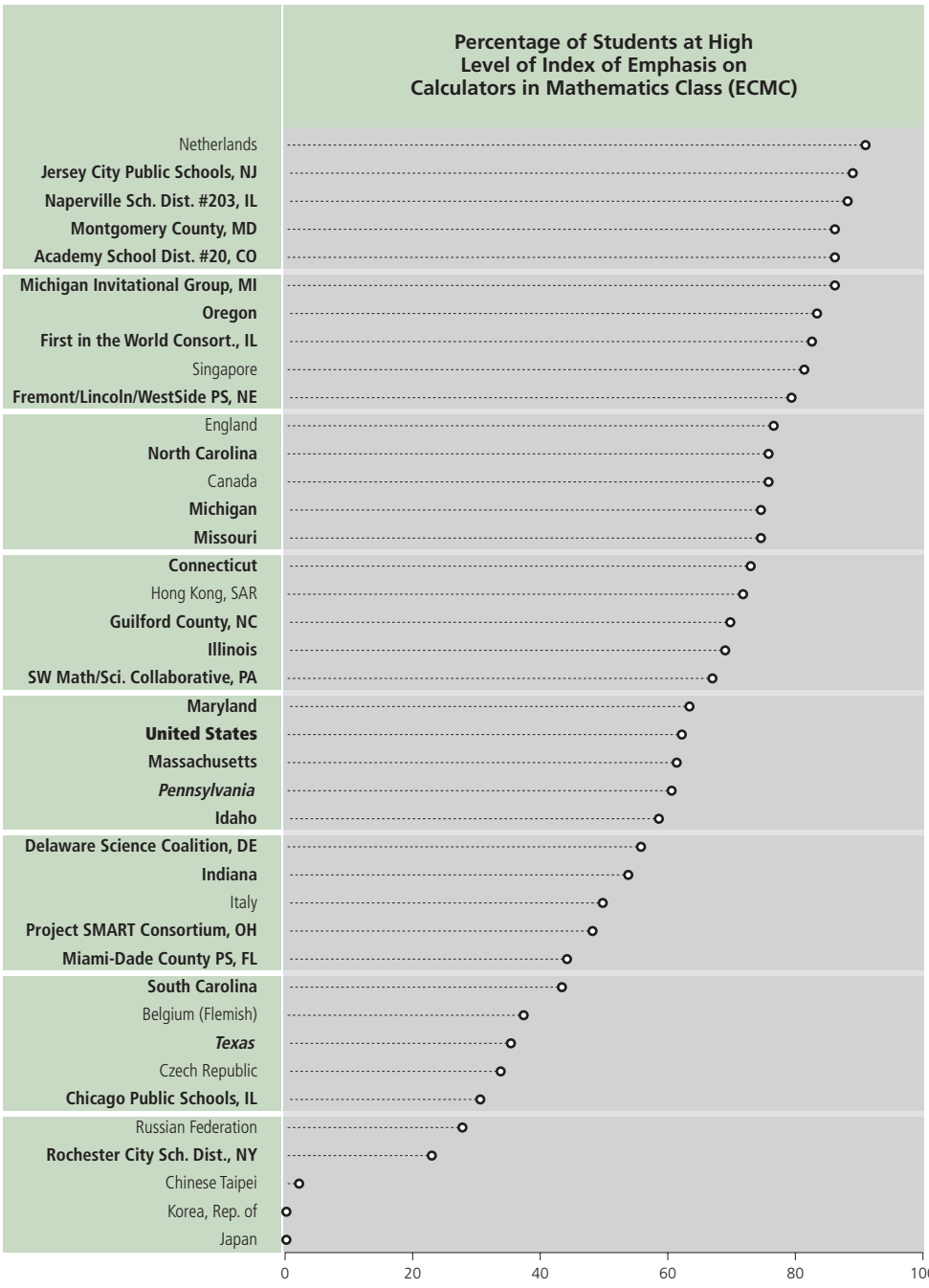
* The use of calculators on TIMSS was not allowed in 1995 or in 1999.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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 and/or student response data available for 70-84% of students. An "s" indicates teacher and/or student response data available for 50-69% of students.



SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Exhibit 6.14 Frequency of Computer Use in Mathematics Class

8th Grade Mathematics

	Almost Always or Pretty Often		Once in a While		Never	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Countries						
United States	12 (1.1)	463 (7.3)	27 (2.0)	520 (5.2)	61 (2.7)	506 (4.0)
Belgium (Flemish)	1 (0.4)	~ ~	5 (1.2)	536 (17.4)	93 (1.3)	562 (3.1)
Canada	8 (0.7)	507 (7.1)	25 (1.5)	534 (3.8)	67 (1.6)	534 (2.5)
Chinese Taipei	13 (0.6)	548 (7.5)	21 (0.6)	564 (5.2)	66 (0.9)	601 (3.8)
Czech Republic	2 (0.7)	~ ~	14 (2.4)	526 (8.4)	84 (2.6)	520 (3.8)
England	11 (1.7)	466 (10.4)	43 (2.2)	512 (5.1)	46 (2.7)	492 (5.2)
Hong Kong, SAR	8 (0.5)	561 (9.5)	18 (0.8)	577 (6.2)	75 (1.1)	587 (4.1)
Italy	11 (1.3)	464 (7.4)	17 (1.6)	489 (5.5)	72 (2.3)	482 (4.0)
Japan	2 (0.5)	~ ~	21 (2.3)	576 (3.7)	76 (2.7)	581 (2.0)
Korea, Rep. of	3 (0.3)	567 (7.9)	13 (0.7)	596 (3.9)	83 (0.8)	587 (2.2)
Netherlands	1 (0.2)	~ ~	19 (3.2)	543 (9.6)	80 (3.2)	541 (8.2)
Russian Federation	1 (0.2)	~ ~	3 (0.4)	513 (11.1)	97 (0.4)	530 (5.7)
Singapore	11 (0.8)	590 (11.0)	43 (2.5)	625 (6.8)	46 (2.7)	589 (6.1)
States						
Connecticut	12 (1.9)	483 (9.6)	31 (2.9)	529 (9.7)	57 (3.8)	513 (9.9)
Idaho	7 (0.9)	434 (15.0)	17 (1.5)	507 (8.5)	76 (2.1)	498 (7.1)
Illinois	12 (1.8)	474 (7.7)	36 (2.8)	521 (8.6)	52 (4.0)	510 (7.9)
Indiana	10 (1.8)	479 (16.5)	25 (3.6)	517 (9.9)	65 (5.1)	522 (7.0)
Maryland	13 (1.7)	447 (11.1)	36 (2.0)	504 (7.5)	51 (2.5)	507 (6.8)
Massachusetts	13 (2.7)	488 (9.5)	24 (2.7)	530 (7.5)	64 (4.3)	513 (5.7)
Michigan	9 (1.3)	467 (9.6)	28 (3.4)	540 (10.6)	63 (3.6)	518 (6.8)
Missouri	9 (1.7)	453 (7.7)	20 (2.6)	489 (7.5)	71 (3.4)	496 (6.1)
North Carolina	13 (2.2)	456 (10.0)	34 (2.4)	500 (8.0)	53 (3.6)	503 (7.6)
Oregon	12 (1.3)	482 (11.1)	26 (1.9)	534 (6.4)	62 (2.5)	515 (5.8)
Pennsylvania	8 (1.0)	465 (11.3)	22 (2.4)	524 (7.7)	70 (3.0)	509 (6.5)
South Carolina	11 (1.5)	444 (8.4)	25 (2.4)	514 (10.5)	64 (3.5)	509 (7.6)
Texas	14 (3.0)	489 (16.3)	33 (3.1)	533 (10.3)	52 (4.8)	522 (10.2)
Districts and Consortia						
Academy School Dist. #20, CO	9 (0.9)	506 (10.1)	32 (1.2)	547 (3.4)	59 (1.4)	523 (2.9)
Chicago Public Schools, IL	15 (3.4)	437 (12.8)	28 (4.1)	469 (8.4)	58 (7.1)	467 (6.8)
Delaware Science Coalition, DE	9 (1.0)	415 (9.0)	16 (1.7)	495 (16.3)	75 (1.9)	492 (9.0)
First in the World Consort., IL	8 (1.4)	518 (23.4)	44 (3.8)	571 (6.0)	48 (4.3)	556 (8.5)
Fremont/Lincoln/WestSide PS, NE	13 (1.2)	463 (13.0)	37 (3.5)	513 (13.9)	51 (4.1)	478 (6.8)
Guilford County, NC	7 (0.9)	478 (11.7)	43 (1.7)	526 (8.1)	50 (2.1)	510 (10.0)
Jersey City Public Schools, NJ	24 (2.5)	462 (15.5)	41 (1.7)	483 (7.7)	35 (2.8)	480 (11.9)
Miami-Dade County PS, FL	14 (2.1)	361 (16.3)	16 (2.0)	428 (17.3)	70 (3.3)	439 (7.6)
Michigan Invitational Group, MI	7 (0.9)	502 (20.5)	24 (1.9)	543 (6.2)	69 (2.2)	533 (5.9)
Montgomery County, MD	10 (0.9)	488 (9.9)	37 (2.2)	546 (6.2)	53 (2.4)	542 (5.3)
Naperville Sch. Dist. #203, IL	8 (0.7)	549 (9.9)	44 (2.5)	579 (5.2)	48 (2.9)	565 (4.6)
Project SMART Consortium, OH	17 (2.6)	494 (9.7)	36 (3.2)	536 (10.2)	47 (3.9)	521 (8.6)
Rochester City Sch. Dist., NY r	14 (1.6)	444 (6.2)	14 (1.9)	450 (14.2)	72 (2.8)	457 (7.3)
SW Math/Sci. Collaborative, PA	8 (1.6)	486 (17.9)	28 (4.3)	530 (11.1)	64 (4.9)	516 (7.6)
International Avg. (All Countries)	5 (0.1)	455 (2.8)	14 (0.2)	488 (1.5)	80 (0.3)	498 (0.7)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by students.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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 a 70-84% student response rate.

Exhibit 6.15 Access to the Internet and Use of the Internet for Mathematics Projects

8th Grade Mathematics

	Percentage of Students				
	Have Access to the Internet			Use the Internet for Mathematics Projects at Least Once a Month	
	At Home	At School	Elsewhere	Use E-mail to Work with Students in Other Schools	Use the World Wide Web to Access Information
Countries					
United States	59 (1.7)	76 (3.2)	81 (0.9)	13 (0.5)	17 (0.8)
Belgium (Flemish)	27 (0.9)	44 (2.7)	64 (1.1)	5 (0.5)	9 (0.9)
Canada	57 (1.3)	87 (1.5)	84 (0.8)	8 (0.4)	12 (0.5)
Chinese Taipei	32 (1.1)	61 (3.2)	41 (0.8)	10 (0.4)	12 (0.5)
Czech Republic	7 (0.7)	16 (2.6)	39 (1.6)	3 (0.4)	5 (0.4)
England	36 (1.1)	65 (3.1)	53 (1.3)	8 (0.7)	18 (0.9)
Hong Kong, SAR	34 (1.1)	26 (2.2)	34 (0.8)	10 (0.6)	11 (0.6)
Italy	13 (0.7)	20 (2.2)	27 (1.1)	7 (0.6)	8 (0.7)
Japan	r 13 (0.9)	6 (1.6)	s 2 (0.3)	8 (0.8)	7 (0.8)
Korea, Rep. of	23 (0.7)	6 (1.2)	36 (1.0)	4 (0.3)	6 (0.3)
Netherlands	41 (1.8)	53 (5.4)	74 (1.8)	6 (0.7)	6 (0.9)
Russian Federation	3 (0.3)	1 (0.4)	17 (0.9)	3 (0.3)	4 (0.4)
Singapore	47 (1.9)	48 (3.2)	39 (0.9)	9 (0.7)	15 (0.8)
States					
Connecticut	71 (2.5)	85 (2.3)	85 (0.8)	14 (1.2)	20 (1.5)
Idaho	53 (2.7)	84 (4.1)	78 (1.4)	11 (0.9)	12 (1.0)
Illinois	56 (2.3)	79 (3.6)	79 (1.5)	12 (0.8)	16 (1.2)
Indiana	59 (2.0)	70 (5.8)	85 (1.5)	10 (1.0)	13 (1.1)
Maryland	66 (1.8)	77 (3.2)	83 (0.8)	13 (0.8)	18 (1.0)
Massachusetts	68 (2.1)	78 (3.6)	83 (1.3)	14 (1.0)	18 (1.1)
Michigan	61 (2.4)	80 (3.7)	83 (1.2)	10 (0.9)	12 (1.1)
Missouri	49 (1.5)	77 (5.3)	82 (1.0)	11 (0.8)	15 (0.7)
North Carolina	51 (2.0)	80 (2.7)	82 (0.9)	13 (0.9)	19 (1.3)
Oregon	61 (2.1)	85 (4.4)	82 (1.7)	11 (0.6)	14 (1.1)
Pennsylvania	64 (2.7)	69 (4.0)	82 (0.9)	11 (0.8)	16 (1.5)
South Carolina	52 (2.2)	92 (1.5)	81 (1.3)	12 (0.9)	19 (1.3)
Texas	54 (3.5)	82 (3.5)	79 (2.2)	14 (1.1)	19 (1.2)
Districts and Consortia					
Academy School Dist. #20, CO	84 (1.1)	93 (0.7)	78 (1.2)	12 (0.9)	17 (1.1)
Chicago Public Schools, IL	35 (2.4)	32 (6.8)	72 (1.9)	10 (1.2)	16 (1.6)
Delaware Science Coalition, DE	66 (2.3)	88 (1.5)	84 (1.0)	17 (1.3)	20 (1.7)
First in the World Consort., IL	82 (1.0)	98 (0.6)	86 (1.7)	13 (1.1)	19 (1.3)
Fremont/Lincoln/WestSide PS, NE	61 (1.9)	91 (1.4)	85 (1.6)	11 (1.3)	16 (1.8)
Guilford County, NC	64 (1.9)	89 (1.0)	89 (1.1)	12 (1.2)	19 (1.5)
Jersey City Public Schools, NJ	38 (2.2)	92 (1.2)	71 (2.1)	19 (1.4)	33 (2.3)
Miami-Dade County PS, FL	47 (3.1)	59 (6.7)	73 (2.4)	20 (2.5)	22 (1.8)
Michigan Invitational Group, MI	62 (2.1)	90 (1.3)	83 (1.4)	7 (0.8)	14 (1.4)
Montgomery County, MD	77 (1.8)	92 (1.0)	74 (2.2)	13 (1.2)	18 (1.2)
Naperville Sch. Dist. #203, IL	86 (1.0)	98 (0.4)	87 (0.8)	10 (0.8)	14 (1.3)
Project SMART Consortium, OH	63 (1.8)	83 (1.1)	91 (0.7)	12 (1.2)	15 (0.9)
Rochester City Sch. Dist., NY	31 (2.3)	31 (1.6)	74 (2.0)	13 (1.7)	15 (1.0)
SW Math/Sci. Collaborative, PA	58 (2.7)	80 (4.7)	83 (1.6)	10 (0.8)	14 (1.3)
International Avg. (All Countries)	19 (0.2)	27 (0.4)	43 (0.2)	8 (0.1)	10 (0.1)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by students.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

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

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% student response rate.

What Are the Roles of Homework and Assessment?

The amount of time students spend on homework assignments is an important consideration in examining their opportunity to learn mathematics. Exhibit 6.16 presents the index of teachers' emphasis on mathematics homework (EMH). Students in the high category had teachers who reported giving relatively long homework assignments (more than 30 minutes) on a relatively frequent basis (at least once or twice a week). Those in the low category had teachers who gave short assignments (less than 30 minutes) relatively infrequently (less than once a week or never). The medium level includes all other combinations of responses. Details from teachers' reports about the length and frequency of their homework assignments are found in the reference section in Exhibit R3.11.

The results show substantial variation across countries and Benchmarking entities in the emphasis placed on homework. Together with Italy, Singapore, and the Russian Federation among the comparison countries, the Academy School District had more than half its students in the high category. For the remaining Benchmarking participants, the majority of students were in the medium category. Very few students were in the low category. One notable exception is Japan (34 percent in the low category), where students were more likely to spend extra time in tutoring and special schools than doing homework.[4] There was little relationship between the amount of homework assigned and students' performance. Again, lower-performing students may need more homework assignments for remedial reasons.

Since problem-solving activities will potentially be more beneficial if they can be extended to out-of-class-situations and stretched over a longer time, TIMSS asked teachers how often they assigned homework based on projects and investigations. The data in Exhibit R3.12 in the reference section show that most students (82 percent on average internationally) had teachers that never or rarely gave such homework. Even though teachers in some of the Benchmarking entities reported giving project-based homework more frequently than did teachers internationally, such assignments did not appear to be made very often. The Benchmarking entities where approximately one-third or more of the students were given projects to do as homework at least sometimes were Connecticut, Massachusetts, Oregon, South Carolina, the Jersey City Public Schools, the Miami-Dade County Public Schools, Montgomery County, and the Project SMART Consortium.

4 Robitaille, D.F., (1997), *National Contexts for Mathematics and Science Education: An Encyclopedia of the Education Systems Participating in TIMSS*, Vancouver, BC: Pacific Educational Press.

One theme in recommendations for educational reform is to make assessment a continuous process that relies on a variety of methods and sources of data, rather than on a few high-stakes tests. Exhibit 6.17 shows teachers' reports about the weight given to various types of assessment. Teachers in the United States as a whole and in most of the Benchmarking jurisdictions reported placing less weight on informal assessment approaches than did teachers internationally. On average internationally, the most emphasis was placed on students' responses in class, which were given quite a lot or a great deal of weight for 77 percent of the students. The next heaviest weight internationally was given to teacher-made tests requiring explanations (67 percent of students on average) and to observations of students (64 percent). While the use of teacher-made tests requiring explanations was similar to the international average in many Benchmarking jurisdictions, students' responses in class and observations of students were given less weight in the United States as a whole and in most Benchmarking entities (generally for about half the students or less). Exceptions included Jersey City and Miami-Dade, as well as Chicago to some extent.

Internationally, the least weight reportedly was given to external standardized tests, teacher-made objective tests, and projects or practical exercises. On average across countries, about two-fifths of the students (from 37 to 42 percent) had mathematics teachers who reported giving quite a lot or a great deal of weight to such assessments. Across the Benchmarking entities, generally even less weight than internationally was given to external standardized tests. The jurisdictions more similar to the international average were Michigan, North Carolina, Texas, the Academy School District, and Jersey City.

As shown in Exhibit R3.13 in the reference section, eighth-grade students reported substantial variation in the frequency of testing in mathematics class. On average internationally, students were split about in half, with 57 percent reporting having a quiz or test in class almost always or pretty often and 43 percent reporting such testing only once in a while or never. At least three-fourths of the students reported frequent testing in Belgium (Flemish), Canada, the Russian Federation, and the United States. Across the Benchmarking jurisdictions about 80 to 90 percent of the students reported frequent testing. In contrast, about half or more reported infrequent testing in the Czech Republic, Hong Kong, Italy, Japan, and Korea. Within participating entities, there was a tendency for the most frequent testing to be associated with lower-achieving students. One could argue that these students can least afford time diverted from their instructional program. However, teachers may provide shorter lessons and follow-up quizzes for lower-achieving students to monitor their grasp of the subject matter more closely.

Index of Teachers' Emphasis on Mathematics Homework

Index based on teachers' responses to two questions about how often they usually assign mathematics homework and how many minutes of mathematics homework they usually assign students (see reference exhibit R3.11). High level indicates the assignment of more than 30 minutes of homework at least once or twice a week. Low level indicates the assignment of less than 30 minutes of homework less than once a week or never assigning homework. Medium level includes all other possible combinations of responses.

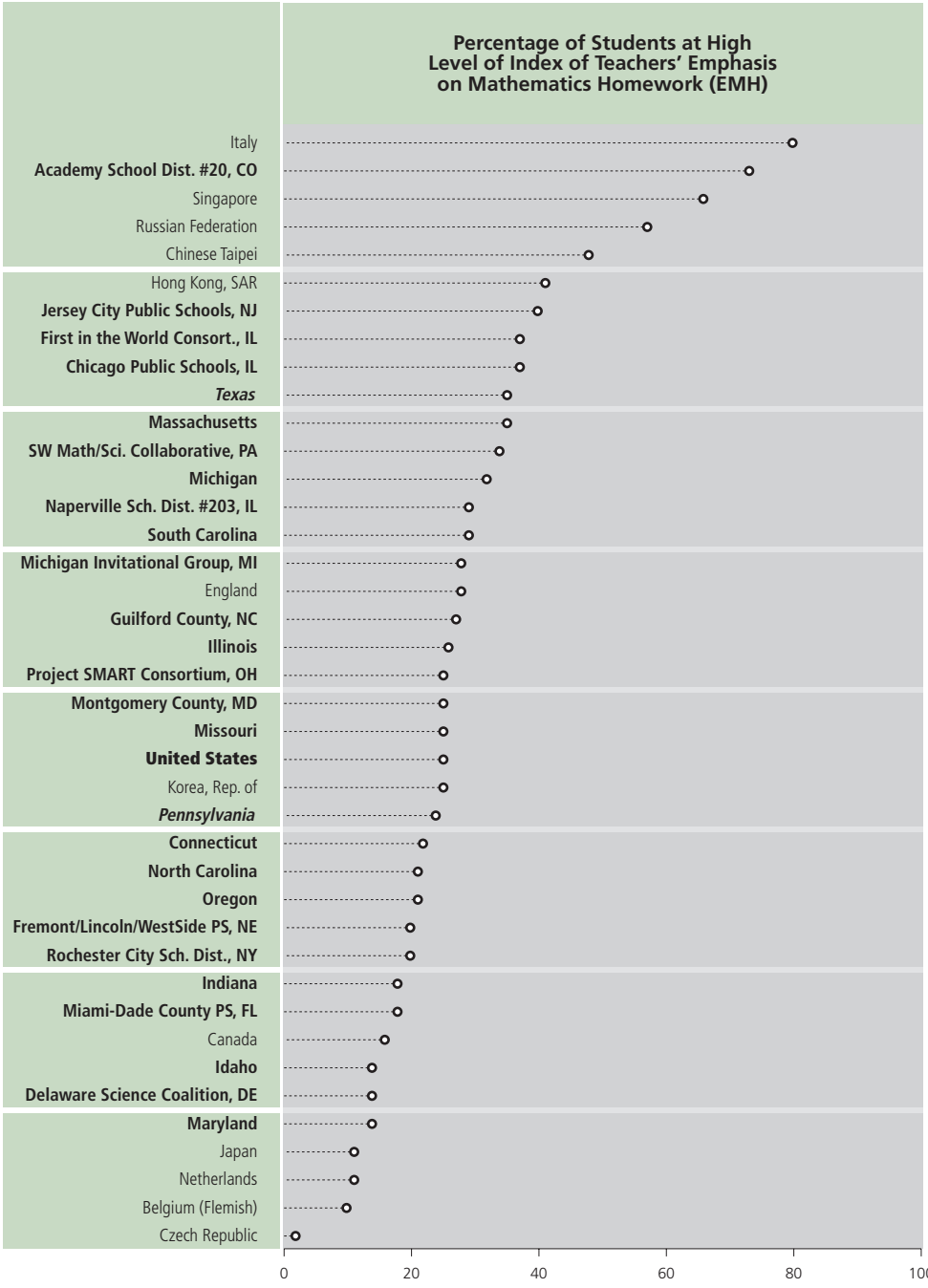
	High EMH		Medium EMH		Low EMH	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Italy	80 (3.0)	479 (4.9)	20 (2.9)	479 (7.9)	0 (0.0)	~ ~
Academy School Dist. #20, CO	73 (0.4)	546 (1.6)	25 (0.4)	483 (4.0)	2 (0.1)	~ ~
Singapore	66 (4.6)	613 (6.9)	34 (4.6)	587 (10.6)	0 (0.0)	~ ~
Russian Federation	57 (4.6)	527 (6.7)	43 (4.6)	525 (7.8)	0 (0.0)	~ ~
Chinese Taipei	48 (3.6)	593 (6.4)	50 (3.7)	580 (5.5)	2 (1.1)	~ ~
Hong Kong, SAR	41 (4.3)	580 (5.9)	57 (4.4)	585 (5.8)	2 (1.2)	~ ~
Jersey City Public Schools, NJ	40 (5.7)	492 (16.0)	60 (5.7)	464 (8.3)	0 (0.0)	~ ~
First in the World Consort., IL	37 (5.1)	595 (12.0)	63 (5.1)	533 (7.2)	0 (0.0)	~ ~
Chicago Public Schools, IL	37 (9.1)	472 (12.9)	63 (9.1)	457 (7.5)	0 (0.0)	~ ~
Texas	35 (6.2)	546 (16.3)	63 (6.7)	500 (9.0)	2 (1.5)	~ ~
Massachusetts	35 (6.5)	525 (9.9)	65 (6.5)	506 (6.9)	0 (0.0)	~ ~
SW Math/Sci. Collaborative, PA	34 (5.3)	552 (13.5)	65 (5.3)	501 (8.8)	1 (0.9)	~ ~
Michigan	32 (4.3)	549 (15.0)	68 (4.3)	502 (7.0)	0 (0.0)	~ ~
Naperville Sch. Dist. #203, IL	29 (2.3)	588 (3.5)	68 (2.3)	559 (4.1)	2 (0.1)	~ ~
South Carolina	29 (6.2)	527 (14.1)	71 (6.2)	491 (8.8)	0 (0.0)	~ ~
Michigan Invitational Group, MI	28 (6.9)	570 (14.9)	72 (6.9)	517 (5.3)	0 (0.0)	~ ~
England	28 (2.9)	529 (8.2)	71 (3.0)	485 (4.7)	1 (0.5)	~ ~
Guilford County, NC	27 (6.0)	539 (13.1)	71 (6.5)	504 (11.0)	2 (0.1)	~ ~
Illinois	26 (5.4)	530 (11.6)	74 (5.4)	502 (7.6)	0 (0.0)	~ ~
Project SMART Consortium, OH	25 (5.7)	567 (16.1)	75 (5.7)	505 (6.8)	0 (0.0)	~ ~
Montgomery County, MD	25 (4.1)	569 (10.5)	74 (4.1)	526 (3.4)	0 (0.1)	~ ~
Missouri	25 (5.7)	498 (15.8)	74 (5.6)	487 (5.7)	1 (1.1)	~ ~
United States	25 (2.1)	528 (9.6)	75 (2.0)	495 (3.8)	1 (0.6)	~ ~
Korea, Rep. of	25 (3.4)	587 (4.2)	62 (3.6)	586 (2.9)	14 (2.6)	593 (4.4)
Pennsylvania	24 (5.2)	535 (12.6)	76 (5.2)	499 (6.3)	0 (0.0)	~ ~
Connecticut	22 (5.1)	545 (20.3)	78 (5.1)	503 (9.3)	0 (0.0)	~ ~
North Carolina	21 (5.1)	534 (13.1)	75 (5.0)	486 (6.8)	4 (2.2)	463 (27.7)
Oregon	21 (4.5)	558 (12.0)	76 (4.8)	506 (6.0)	3 (2.0)	453 (68.7)
Fremont/Lincoln/WestSide PS, NE	20 (2.9)	541 (29.6)	80 (2.9)	475 (7.1)	0 (0.0)	~ ~
Rochester City Sch. Dist., NY	20 (5.1)	502 (11.5)	80 (5.1)	430 (6.4)	0 (0.0)	~ ~
Indiana	18 (4.8)	560 (11.2)	82 (4.8)	504 (7.4)	0 (0.0)	~ ~
Miami-Dade County PS, FL	18 (4.6)	411 (15.3)	82 (4.6)	424 (10.5)	0 (0.0)	~ ~
Canada	16 (2.3)	527 (6.2)	83 (2.4)	532 (2.8)	1 (0.6)	~ ~
Idaho	14 (3.2)	516 (20.7)	83 (3.4)	492 (7.1)	3 (1.0)	476 (38.3)
Delaware Science Coalition, DE	14 (4.4)	528 (18.5)	86 (4.4)	472 (9.4)	0 (0.0)	~ ~
Maryland	14 (2.5)	524 (16.6)	85 (2.8)	491 (6.5)	2 (1.5)	~ ~
Japan	11 (2.5)	578 (3.9)	55 (4.3)	580 (2.8)	34 (4.3)	574 (5.3)
Netherlands	11 (2.6)	555 (14.6)	88 (2.6)	538 (8.0)	1 (0.5)	~ ~
Belgium (Flemish)	10 (2.0)	582 (8.6)	73 (3.6)	557 (5.5)	17 (3.2)	548 (15.0)
Czech Republic	2 (1.2)	~ ~	85 (3.8)	520 (4.8)	13 (3.6)	513 (9.9)
International Avg. (All Countries)	35 (0.6)	491 (1.8)	62 (0.6)	485 (1.0)	4 (0.2)	484 (4.0)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

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

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



SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Exhibit 6.17 Types of Assessment Teachers Give Quite a Lot or A Great Deal of Weight

8th Grade Mathematics

	Percentage of Students by Type 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
Countries							
United States	28 (3.0)	55 (3.3)	28 (3.5)	56 (4.3)	33 (3.5)	40 (3.2)	41 (3.6)
Belgium (Flemish)	12 (3.0)	94 (1.4)	11 (2.4)	23 (3.0)	12 (2.1)	17 (3.4)	52 (4.4)
Canada	21 (3.1)	61 (3.0)	r 26 (2.8)	r 51 (3.8)	r 38 (2.7)	r 34 (3.2)	42 (3.4)
Chinese Taipei	36 (4.0)	43 (4.0)	76 (3.4)	81 (3.2)	17 (3.4)	68 (3.1)	72 (3.6)
Czech Republic	53 (5.4)	97 (1.8)	9 (2.6)	26 (5.0)	23 (5.2)	80 (4.2)	98 (1.5)
England	s 51 (4.1)	s 35 (3.6)	s 7 (1.4)	s 81 (2.2)	s 41 (3.4)	s 78 (2.9)	s 78 (2.7)
Hong Kong, SAR	17 (3.2)	52 (4.2)	47 (3.6)	44 (4.0)	10 (2.6)	38 (4.3)	44 (4.3)
Italy	22 (3.2)	92 (2.2)	63 (3.8)	67 (3.6)	75 (3.1)	96 (1.4)	99 (0.6)
Japan	15 (2.9)	55 (4.4)	25 (3.9)	47 (4.0)	41 (4.0)	67 (4.1)	65 (4.3)
Korea, Rep. of	37 (3.8)	48 (3.7)	45 (3.7)	32 (3.6)	43 (3.3)	50 (4.1)	61 (4.1)
Netherlands	29 (5.5)	96 (1.8)	20 (5.8)	18 (4.7)	8 (2.6)	28 (4.7)	27 (5.4)
Russian Federation	– –	98 (1.0)	54 (4.4)	68 (3.7)	59 (3.8)	91 (2.2)	86 (2.5)
Singapore	36 (4.2)	22 (3.9)	5 (2.0)	61 (4.5)	37 (4.2)	46 (4.6)	52 (4.2)
States							
Connecticut	s 11 (3.7)	s 56 (7.3)	s 21 (6.8)	s 45 (5.6)	s 61 (8.5)	s 49 (8.6)	s 53 (7.3)
Idaho	r 25 (5.1)	r 37 (6.1)	r 21 (5.7)	r 79 (5.7)	r 27 (6.3)	r 29 (6.9)	r 33 (7.5)
Illinois	24 (4.4)	47 (5.9)	32 (5.7)	60 (5.9)	28 (5.5)	23 (4.6)	27 (5.4)
Indiana	28 (6.6)	61 (4.9)	27 (5.8)	60 (5.6)	23 (4.3)	33 (5.8)	29 (6.2)
Maryland	r 26 (6.0)	r 61 (5.5)	r 19 (4.9)	r 47 (6.0)	r 28 (3.5)	r 41 (6.4)	r 42 (6.4)
Massachusetts	19 (4.6)	64 (4.7)	20 (4.1)	56 (6.2)	41 (5.2)	53 (6.1)	57 (5.8)
Michigan	36 (7.3)	48 (5.8)	27 (6.2)	54 (6.0)	33 (5.4)	25 (5.1)	32 (5.2)
Missouri	21 (4.5)	60 (5.7)	24 (4.7)	73 (5.2)	45 (5.7)	42 (5.9)	36 (5.2)
North Carolina	39 (6.1)	44 (5.0)	48 (5.3)	58 (6.4)	34 (5.0)	46 (5.8)	48 (4.4)
Oregon	14 (3.9)	60 (6.4)	27 (6.4)	76 (6.0)	33 (6.2)	44 (6.3)	40 (6.1)
Pennsylvania	18 (4.3)	58 (5.3)	20 (5.4)	47 (6.5)	24 (5.1)	39 (6.7)	42 (6.6)
South Carolina	13 (2.6)	66 (7.3)	44 (5.6)	36 (5.4)	35 (6.8)	48 (5.9)	42 (5.4)
Texas	42 (6.0)	r 49 (6.1)	55 (6.9)	53 (6.9)	r 33 (5.9)	52 (6.6)	52 (6.1)
Districts and Consortia							
Academy School Dist. #20, CO	43 (0.4)	33 (0.3)	6 (0.2)	72 (0.3)	38 (0.4)	39 (0.4)	43 (0.4)
Chicago Public Schools, IL	26 (8.6)	51 (10.2)	60 (10.6)	59 (10.0)	41 (12.8)	56 (12.6)	71 (10.7)
Delaware Science Coalition, DE	r 23 (5.7)	r 64 (6.7)	r 13 (4.9)	r 41 (6.9)	r 37 (5.0)	r 41 (7.1)	r 43 (6.1)
First in the World Consort., IL	r 10 (3.5)	r 77 (4.9)	r 35 (7.4)	r 17 (4.4)	r 38 (5.3)	r 26 (8.2)	r 31 (4.8)
Fremont/Lincoln/WestSide PS, NE	8 (5.5)	42 (9.7)	37 (8.6)	49 (9.2)	20 (5.3)	29 (1.7)	r 19 (3.3)
Guilford County, NC	22 (4.1)	57 (5.2)	47 (5.9)	57 (6.7)	39 (7.1)	46 (5.9)	39 (6.5)
Jersey City Public Schools, NJ	63 (6.5)	96 (3.8)	58 (6.0)	40 (5.0)	82 (4.5)	82 (3.7)	82 (3.7)
Miami-Dade County PS, FL	s 21 (6.1)	s 66 (8.2)	s 35 (8.9)	s 67 (9.5)	s 51 (7.6)	s 67 (9.7)	s 77 (8.3)
Michigan Invitational Group, MI	11 (2.6)	74 (4.7)	9 (6.3)	59 (7.9)	41 (6.6)	41 (8.9)	35 (7.6)
Montgomery County, MD	s 24 (7.0)	s 77 (3.1)	s 16 (5.6)	s 40 (6.0)	s 28 (6.6)	s 26 (7.5)	s 21 (5.8)
Naperville Sch. Dist. #203, IL	16 (2.8)	54 (4.5)	16 (4.5)	48 (3.7)	33 (3.9)	39 (6.0)	29 (5.7)
Project SMART Consortium, OH	21 (5.4)	62 (6.5)	28 (6.5)	47 (6.2)	41 (6.6)	45 (7.6)	45 (7.2)
Rochester City Sch. Dist., NY	1 (0.0)	60 (4.2)	36 (6.6)	50 (5.8)	29 (5.7)	30 (5.2)	34 (6.2)
SW Math/Sci. Collaborative, PA	22 (5.7)	59 (6.8)	17 (5.0)	44 (7.6)	23 (5.8)	42 (4.6)	49 (5.7)
International Avg. (All Countries)	37 (0.6)	67 (0.6)	39 (0.6)	60 (0.6)	42 (0.6)	64 (0.6)	77 (0.5)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

In What Types of Professional Development Activities Do U.S. Mathematics Teachers Participate?

As a TIMSS 1999 national option, the United States asked mathematics teachers to describe their professional development during the 1998-99 school year, defined as June 1998 to May 1999. Since no other countries asked these questions, cross-country comparisons are not possible. Comparisons, however, can be made to the United States as a whole and among the Benchmarking jurisdictions. Teachers were asked both how often they observed and were observed by other teachers (see Exhibit 6.18). In the U.S. overall, these observations of and by teachers were reported by the mathematics teachers of 25 and 35 percent of the students, respectively. Among the Benchmarking states, the results for classroom observation as a professional development approach resembled the national results. Among districts and consortia, observations were used most extensively in the First in the World Consortium and Montgomery County with more than half the students having teachers who reported both observing and being observed by other teachers.

The professional development activities teachers were asked about include the following school- and district-based activities: immersion or internship activities; receiving mentoring, coaching, lead teaching, or observation; teacher resource centers; committees or task forces; and teacher study groups. As shown in Exhibit 6.19, participation on committees or task forces was the most frequently used of these activities. It was reported nationally by the mathematics teachers of more than half the eighth graders (55 percent), and was similarly popular among the Benchmarking participants.

Mathematics teachers were asked about their participation in several types of workshops, conferences, and networks, including within-district workshops and institutes; out-of-district workshops and institutes; teacher collaborative or networks; out-of-district conferences; and other forms of organized professional development (see Exhibit 6.20). They were also asked about individual activities, including taking courses for college credit; individual research projects; individual learning; and other individual professional development activities (see Exhibit 6.21). Of all of the professional development activities, within-district workshops or institutes (79 percent of the students) and individual learning (84 percent) were generally the most frequent activities in which mathematics teachers of U.S. eighth-grade students participated during the 1998-99 school year. Even though there was considerable variation, these activities were also widely reported by teachers in the Benchmarking jurisdictions.

Teachers' reports about the topics heavily emphasized in their professional development are presented in Exhibit 6.22. Nationally, mathematics teachers of 63 percent of eighth graders reported that curriculum was emphasized quite a lot or a great deal. The next greatest emphasis was on general pedagogy, mathematics pedagogy, and instructional technology (45 to 47 percent of the students). Teachers reported the least emphasis on content knowledge (28 percent) and leadership development (15 percent). Again, although there was variation across the Benchmarking participants, the national pattern held in many jurisdictions.

The most interesting result about professional development may be the limited emphasis on content knowledge in relation to the other topics. Further detail about the types of content emphasized is provided in Exhibit 6.23. Nationally, teachers reported that the five content areas (fractions and number sense; measurement; data representation, analysis, and probability; geometry; and algebra) were emphasized relatively equally (from 45 to 56 percent). In general, the pattern of relatively equal emphasis was also found in the Benchmarking states. There was more variation within some districts and consortia. For example, the Academy School District focused relatively less emphasis on professional development in geometry (17 percent) than in the other four areas (28 to 42 percent). Montgomery County placed relatively less emphasis on measurement (18 percent) and more emphasis on data representation, analysis, and probability (72 percent). The First in the World Consortium placed relatively more emphasis on geometry (77 percent) and relatively less on data representation, analysis, and probability (37 percent).

Teachers in the United States reported a relatively heavy focus on curriculum in their professional development activities. Their reports about familiarity with various curriculum documents are presented in Exhibit 6.24. Nationally, teachers of most students (91 percent) reported that they were fairly or very familiar with the curriculum guides for their school and their school district, and this held across most of the Benchmarking jurisdictions. U.S. mathematics teachers of 82 percent of the eighth-grade students reported being very familiar with the NCTM *Professional Standards for Teaching Mathematics*. For the Benchmarking states, this ranged from 71 percent in Idaho to 98 percent in South Carolina. For districts and consortia, it ranged from 62 percent in the Chicago Public Schools to 97 percent in the Fremont/Lincoln/Westside Public Schools.

Fewer teachers than might be anticipated reported being at least fairly familiar with their state curriculum guides. Nationally, 74 percent of the eighth graders had mathematics teachers who so reported. Among states the figure ranged from 57 percent in Pennsylvania to 98 percent in South Carolina, and among districts and consortia from 54 percent in the Southwest Pennsylvania Math and Science Collaborative to 100 percent in the Academy School District.

	Observation of Other Teachers[1]		Observation by Other Teachers[2]	
	Percent of Students	Number of Class Periods Observed Averaged Across Students[3]	Percent of Students	Number of Class Periods Observed Averaged Across Students[3]
States				
Connecticut	r 29 (6.9)	5 (1.1)	r 51 (8.0)	5 (1.7)
Idaho	r 12 (4.8)	2 (0.2)	r 34 (8.5)	7 (2.6)
Illinois	9 (3.5)	3 (0.4)	23 (5.5)	10 (3.1)
Indiana	10 (3.4)	11 (4.8)	33 (6.2)	7 (1.9)
Maryland	r 29 (5.1)	6 (1.9)	r 45 (6.1)	4 (0.5)
Massachusetts	24 (5.1)	4 (0.8)	34 (5.4)	8 (2.8)
Michigan	14 (4.0)	6 (1.2)	26 (5.4)	10 (3.3)
Missouri	19 (5.2)	4 (1.9)	25 (6.0)	4 (1.5)
North Carolina	31 (6.4)	5 (1.0)	47 (7.7)	4 (0.7)
Oregon	23 (4.0)	5 (1.7)	23 (5.1)	5 (2.6)
Pennsylvania	25 (4.6)	4 (0.5)	42 (5.7)	5 (1.3)
South Carolina	28 (5.6)	3 (0.4)	47 (5.7)	4 (0.6)
Texas	r 39 (5.3)	6 (0.9)	r 51 (6.1)	4 (0.9)
Districts and Consortia				
Academy School Dist. #20, CO	18 (0.3)	2 (0.0)	40 (0.4)	10 (0.1)
Chicago Public Schools, IL	2 (2.2)	~ ~	31 (12.0)	10 (3.0)
Delaware Science Coalition, DE	r 16 (5.5)	5 (1.3)	r 23 (4.7)	9 (3.5)
First in the World Consort., IL	66 (4.5)	11 (0.9)	59 (3.4)	12 (2.4)
Fremont/Lincoln/WestSide PS, NE	27 (8.4)	17 (4.9)	51 (10.5)	20 (3.4)
Guilford County, NC	52 (6.3)	4 (0.5)	41 (5.9)	8 (2.3)
Jersey City Public Schools, NJ	5 (1.5)	3 (0.4)	22 (2.3)	5 (0.4)
Miami-Dade County PS, FL	s 33 (6.3)	3 (0.8)	s 35 (7.5)	2 (0.4)
Michigan Invitational Group, MI	18 (7.3)	3 (0.5)	17 (5.9)	3 (0.7)
Montgomery County, MD	s 51 (5.7)	8 (1.0)	s 85 (5.0)	4 (0.6)
Naperville Sch. Dist. #203, IL	21 (3.5)	5 (1.0)	34 (4.4)	4 (0.7)
Project SMART Consortium, OH	37 (6.0)	9 (2.5)	47 (6.7)	9 (2.1)
Rochester City Sch. Dist., NY	s 14 (1.8)	2 (0.5)	s 47 (6.9)	11 (1.7)
SW Math/Sci. Collaborative, PA	25 (4.8)	4 (1.0)	37 (7.2)	7 (2.1)
United States	25 (3.0)	4 (0.8)	35 (3.3)	5 (1.0)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

1 Based on complete class periods teachers observed other teachers in their school teach mathematics from the beginning of the 1998-99 school year until the time of testing.

2 Based on complete class periods teachers were observed while teaching mathematics by other teachers in their school from the beginning of the 1998-99 school year until the time of testing.

3 Teachers who did not participate in the professional development activity were not included in the average.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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 average number of class periods.

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

	Immersion or Internship Activities		Receipt of Mentoring or Observation		Teacher Resource Center		Committees or Task Forces		Teacher Study Groups	
	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]
States										
Connecticut	r 3 (0.3)	2 (0.0)	r 32 (7.5)	11 (3.3)	r 9 (5.0)	3 (0.8)	r 55 (6.6)	9 (1.5)	r 26 (4.8)	8 (1.3)
Idaho	r 3 (2.6)	17 (3.3)	r 24 (5.3)	8 (3.3)	r 8 (5.0)	10 (9.6)	r 51 (6.9)	15 (2.1)	r 26 (6.4)	4 (1.0)
Illinois	4 (1.8)	5 (1.4)	20 (4.4)	11 (3.5)	14 (4.1)	12 (3.9)	55 (6.5)	16 (2.9)	23 (6.0)	9 (1.7)
Indiana	5 (3.3)	45 (20.6)	14 (5.4)	10 (7.1)	3 (1.7)	3 (1.1)	61 (5.9)	9 (1.2)	21 (5.8)	7 (2.4)
Maryland	r 6 (3.3)	18 (17.6)	r 33 (6.4)	4 (0.7)	r 21 (4.7)	7 (2.8)	r 35 (6.9)	14 (3.0)	r 22 (6.1)	12 (3.9)
Massachusetts	7 (2.2)	14 (8.4)	32 (5.9)	5 (0.7)	16 (4.7)	4 (0.8)	61 (5.9)	12 (1.4)	46 (7.8)	10 (1.9)
Michigan	0 (0.0)	~ ~	21 (4.7)	4 (0.7)	11 (3.7)	6 (3.7)	54 (7.0)	12 (2.0)	18 (4.9)	12 (1.7)
Missouri	6 (2.6)	23 (9.8)	27 (5.7)	4 (0.7)	6 (3.3)	4 (0.6)	60 (6.3)	10 (1.9)	20 (4.5)	5 (1.3)
North Carolina	2 (1.8)	~ ~	41 (5.4)	11 (2.7)	14 (3.9)	7 (1.2)	56 (5.3)	7 (0.9)	29 (5.8)	12 (3.6)
Oregon	5 (2.3)	7 (3.5)	35 (5.2)	7 (2.5)	11 (3.7)	10 (3.8)	68 (3.3)	15 (3.0)	29 (5.4)	11 (2.3)
Pennsylvania	14 (3.1)	10 (2.3)	30 (5.6)	8 (2.4)	15 (3.6)	9 (2.7)	58 (6.2)	10 (1.3)	20 (4.3)	6 (0.9)
South Carolina	4 (2.4)	14 (8.7)	23 (5.5)	12 (3.9)	25 (5.1)	9 (2.6)	46 (6.6)	14 (2.6)	21 (5.4)	10 (1.6)
Texas	r 18 (6.6)	12 (4.5)	r 39 (6.7)	13 (4.9)	r 24 (4.3)	5 (0.8)	r 61 (6.8)	13 (2.0)	r 42 (6.7)	16 (4.5)
Districts and Consortia										
Academy School Dist. #20, CO	18 (0.3)	9 (0.1)	49 (0.4)	7 (0.1)	15 (0.3)	3 (0.0)	48 (0.4)	16 (0.1)	40 (0.4)	7 (0.1)
Chicago Public Schools, IL	9 (5.3)	3 (0.9)	25 (8.8)	21 (9.9)	29 (9.8)	12 (2.0)	34 (9.5)	11 (2.3)	22 (7.8)	15 (6.0)
Delaware Science Coalition, DE	r 0 (0.0)	~ ~	r 28 (6.7)	11 (2.8)	r 36 (5.5)	4 (0.7)	r 71 (5.6)	10 (1.2)	r 24 (5.4)	9 (2.6)
First in the World Consort., IL	5 (0.3)	5 (0.0)	r 51 (5.5)	24 (2.9)	23 (6.3)	5 (1.0)	82 (7.9)	10 (1.6)	30 (9.7)	15 (3.4)
Fremont/Lincoln/WestSide PS, NE	0 (0.0)	~ ~	33 (8.5)	22 (7.6)	12 (4.0)	4 (0.5)	49 (7.0)	6 (1.6)	22 (4.1)	5 (0.6)
Guilford County, NC	6 (0.9)	10 (0.0)	47 (5.6)	18 (2.3)	43 (5.4)	9 (1.2)	58 (6.8)	15 (2.6)	31 (5.0)	15 (3.3)
Jersey City Public Schools, NJ	3 (0.2)	15 (0.0)	r 35 (3.5)	10 (0.7)	14 (2.8)	4 (0.3)	r 45 (4.9)	11 (0.8)	30 (4.5)	25 (5.3)
Miami-Dade County PS, FL	s 9 (5.3)	17 (6.3)	s 24 (4.9)	8 (5.2)	s 42 (10.2)	8 (2.7)	s 56 (10.3)	15 (3.5)	s 54 (10.3)	19 (5.0)
Michigan Invitational Group, MI	0 (0.0)	~ ~	25 (8.6)	6 (1.4)	5 (0.2)	2 (0.0)	59 (7.0)	10 (0.9)	32 (4.7)	11 (0.8)
Montgomery County, MD	s 8 (3.5)	11 (2.6)	s 50 (6.3)	3 (0.8)	s 22 (7.2)	5 (0.9)	s 57 (6.7)	19 (2.2)	s 12 (2.4)	25 (17.7)
Naperville Sch. Dist. #203, IL	0 (0.0)	~ ~	26 (5.6)	6 (1.1)	17 (2.8)	4 (0.1)	64 (4.5)	46 (2.7)	25 (2.8)	30 (9.4)
Project SMART Consortium, OH	6 (2.8)	33 (14.7)	25 (6.8)	5 (0.7)	23 (6.5)	4 (0.7)	64 (6.5)	13 (1.4)	19 (4.7)	6 (0.8)
Rochester City Sch. Dist., NY	s 0 (0.0)	~ ~	s 34 (6.8)	8 (1.6)	s 47 (8.2)	6 (0.8)	s 39 (7.8)	10 (2.3)	s 31 (7.1)	8 (0.8)
SW Math/Sci. Collaborative, PA	5 (3.3)	4 (0.7)	18 (5.2)	12 (7.5)	11 (4.8)	6 (1.2)	42 (6.9)	11 (1.7)	16 (4.5)	7 (0.8)
United States	6 (2.1)	14 (3.6)	27 (3.2)	5 (0.6)	12 (2.4)	5 (1.5)	55 (3.2)	12 (1.5)	30 (3.4)	11 (2.5)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

* Based on participation in professional development activities from June 1998 until the time of testing.

1 Teachers who did not participate in the professional development activity were not included in the average.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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 average hours.

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

	Within-District Workshops/ Institutes		Out-of-District Workshops/ Institutes		Teacher Collaborative or Networks		Out-of-District Conferences		Other Organized Professional Development	
	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]	Percent of Students	Teacher Hours Averaged Across Students[1]
States										
Connecticut	r 82 (5.8)	14 (1.7)	r 33 (7.2)	15 (2.0)	r 30 (6.9)	12 (3.3)	r 41 (7.5)	12 (2.2)	r 11 (5.1)	6 (1.7)
Idaho	r 64 (5.7)	12 (1.4)	r 34 (4.9)	25 (5.0)	r 14 (4.2)	7 (1.0)	r 37 (7.5)	15 (2.4)	r 12 (3.7)	6 (1.8)
Illinois	81 (5.0)	10 (1.3)	53 (6.1)	9 (1.6)	12 (3.1)	7 (1.4)	38 (6.5)	11 (2.1)	22 (6.3)	10 (3.1)
Indiana	76 (7.5)	11 (1.3)	33 (6.8)	9 (1.4)	18 (4.2)	6 (0.9)	30 (7.1)	8 (0.9)	15 (3.9)	18 (9.1)
Maryland	r 79 (4.8)	18 (1.7)	r 30 (5.6)	13 (2.8)	r 30 (5.6)	12 (3.0)	r 23 (5.5)	12 (3.2)	r 23 (4.8)	9 (1.2)
Massachusetts	82 (4.7)	14 (2.0)	45 (5.4)	11 (2.1)	23 (5.8)	7 (1.3)	35 (6.1)	8 (1.5)	r 39 (6.1)	11 (3.3)
Michigan	70 (6.3)	15 (1.6)	32 (6.1)	13 (2.3)	13 (3.4)	6 (1.3)	30 (5.3)	10 (1.9)	13 (4.4)	7 (1.7)
Missouri	76 (6.1)	12 (2.0)	41 (6.6)	13 (3.5)	19 (4.7)	5 (1.1)	49 (6.7)	16 (2.7)	17 (3.6)	9 (2.4)
North Carolina	87 (3.5)	14 (1.5)	27 (4.2)	17 (6.3)	27 (5.7)	12 (3.8)	37 (5.2)	10 (1.6)	r 19 (4.6)	15 (5.7)
Oregon	83 (4.2)	13 (1.5)	42 (5.9)	10 (1.2)	23 (5.6)	7 (0.9)	39 (5.5)	16 (1.7)	19 (4.3)	15 (3.6)
Pennsylvania	75 (4.8)	13 (1.9)	47 (6.2)	8 (1.2)	20 (4.5)	10 (1.6)	29 (5.5)	11 (2.8)	19 (4.7)	11 (3.3)
South Carolina	75 (4.0)	19 (2.4)	27 (6.4)	15 (2.9)	16 (4.6)	5 (1.2)	35 (4.7)	19 (4.7)	26 (5.0)	13 (3.5)
Texas	r 94 (3.0)	26 (4.1)	r 62 (5.8)	20 (2.9)	r 27 (7.3)	14 (5.3)	r 39 (6.6)	21 (3.9)	r 32 (5.3)	22 (4.7)
Districts and Consortia										
Academy School Dist. #20, CO	67 (0.4)	10 (0.1)	37 (0.4)	13 (0.1)	r 0 (0.0)	~ ~	24 (0.3)	7 (0.0)	6 (0.2)	8 (0.0)
Chicago Public Schools, IL	67 (11.4)	11 (2.5)	22 (7.9)	8 (2.8)	30 (11.8)	8 (2.2)	23 (8.7)	11 (2.4)	16 (8.2)	7 (2.0)
Delaware Science Coalition, DE	r 79 (4.6)	15 (1.4)	r 39 (6.5)	11 (3.1)	r 29 (6.0)	8 (1.5)	r 33 (5.7)	11 (4.0)	r 16 (4.9)	11 (4.3)
First in the World Consort., IL	68 (4.7)	12 (2.1)	64 (6.0)	12 (1.7)	69 (6.0)	13 (3.9)	54 (8.7)	14 (1.9)	r 24 (6.2)	10 (1.5)
Fremont/Lincoln/WestSide PS, NE	97 (0.2)	13 (2.1)	29 (5.3)	15 (3.1)	15 (1.8)	2 (0.0)	35 (8.6)	15 (2.2)	r 34 (6.1)	12 (1.3)
Guilford County, NC	78 (4.8)	23 (3.1)	16 (3.4)	23 (10.3)	26 (6.3)	6 (1.4)	29 (5.1)	10 (1.5)	r 15 (4.7)	9 (1.3)
Jersey City Public Schools, NJ	85 (2.7)	11 (0.3)	41 (4.4)	16 (0.8)	16 (2.2)	22 (2.7)	26 (4.1)	11 (1.0)	45 (3.3)	7 (0.1)
Miami-Dade County PS, FL	s 88 (6.2)	24 (3.2)	s 16 (8.5)	5 (0.8)	s 35 (12.3)	8 (1.8)	s 11 (7.6)	3 (0.8)	s 33 (8.5)	12 (4.8)
Michigan Invitational Group, MI	74 (4.9)	12 (2.4)	39 (8.0)	18 (4.5)	33 (5.0)	8 (2.3)	27 (8.7)	10 (2.3)	10 (6.0)	6 (0.6)
Montgomery County, MD	s 86 (5.1)	27 (1.7)	s 34 (6.7)	13 (3.9)	s 29 (5.8)	20 (9.9)	s 28 (6.9)	8 (0.7)	s 25 (6.2)	7 (2.2)
Naperville Sch. Dist. #203, IL	72 (5.7)	24 (1.1)	45 (3.9)	6 (0.2)	18 (3.6)	11 (1.0)	38 (4.5)	7 (0.2)	20 (2.6)	7 (0.1)
Project SMART Consortium, OH	83 (6.0)	15 (1.3)	53 (5.8)	7 (0.8)	29 (5.5)	8 (1.7)	30 (6.3)	11 (2.6)	16 (6.5)	8 (3.4)
Rochester City Sch. Dist., NY	s 97 (3.5)	11 (1.9)	s 44 (8.2)	19 (3.3)	s 43 (5.8)	12 (1.8)	s 2 (0.2)	~ ~	s 27 (6.5)	10 (1.2)
SW Math/Sci. Collaborative, PA	74 (7.4)	16 (2.0)	42 (7.6)	10 (1.4)	24 (6.4)	12 (2.8)	20 (4.8)	10 (3.6)	6 (3.5)	5 (0.9)
United States	79 (3.1)	15 (1.3)	37 (3.2)	16 (1.9)	21 (2.7)	10 (1.6)	34 (2.7)	13 (1.6)	r 18 (2.5)	11 (1.7)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

* Based on participation in professional development activities from June 1998 until the time of testing.

1 Teachers who did not participate in the professional development activity were not included in the average.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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 average hours.

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

	Courses for College Credit[1]		Individual Research Projects		Individual Learning		Other Individual Professional Development	
	Percent of Students	Teacher Hours Averaged Across Students[2]	Percent of Students	Teacher Hours Averaged Across Students[2]	Percent of Students	Teacher Hours Averaged Across Students[2]	Percent of Students	Teacher Hours Averaged Across Students[2]
States								
Connecticut	r 15 (4.4)	27 (7.2)	r 35 (6.3)	23 (4.5)	r 84 (5.6)	25 (2.7)	s 31 (6.4)	18 (5.3)
Idaho	r 54 (8.2)	27 (2.9)	r 22 (4.1)	23 (5.4)	r 68 (5.6)	27 (3.9)	r 29 (7.1)	31 (8.8)
Illinois	36 (7.0)	24 (5.7)	33 (7.3)	23 (6.4)	88 (4.0)	23 (3.9)	19 (5.3)	21 (9.2)
Indiana	21 (4.5)	40 (9.1)	21 (4.7)	13 (2.8)	84 (5.5)	19 (1.7)	20 (4.8)	19 (5.5)
Maryland	r 31 (4.5)	40 (6.9)	r 25 (5.2)	26 (5.9)	r 79 (6.1)	23 (2.2)	r 26 (6.0)	24 (4.6)
Massachusetts	27 (5.5)	43 (4.2)	36 (6.3)	19 (3.6)	84 (4.0)	26 (3.4)	r 37 (7.4)	21 (5.0)
Michigan	17 (4.7)	22 (5.9)	37 (6.1)	15 (4.2)	85 (4.2)	18 (2.9)	r 39 (6.3)	16 (4.7)
Missouri	23 (4.3)	19 (6.5)	20 (4.6)	43 (11.6)	83 (4.7)	20 (2.4)	15 (4.7)	17 (4.4)
North Carolina	17 (4.8)	30 (7.6)	39 (5.6)	18 (3.7)	80 (3.5)	16 (2.1)	r 20 (4.8)	19 (4.5)
Oregon	28 (4.2)	28 (5.6)	36 (4.6)	18 (4.2)	86 (3.6)	24 (2.6)	34 (5.5)	28 (8.1)
Pennsylvania	31 (5.5)	34 (6.2)	36 (6.6)	12 (2.5)	93 (3.0)	23 (3.2)	r 23 (4.6)	13 (1.9)
South Carolina	47 (6.3)	33 (5.8)	36 (6.3)	17 (5.4)	86 (3.8)	25 (3.6)	24 (4.4)	17 (5.7)
Texas	r 16 (4.1)	36 (9.7)	r 34 (6.4)	22 (2.8)	r 81 (2.9)	28 (3.5)	r 41 (7.0)	19 (3.6)
Districts and Consortia								
Academy School Dist. #20, CO	40 (0.4)	18 (0.7)	r 44 (0.4)	17 (0.1)	92 (0.2)	25 (0.3)	r 11 (0.3)	2 (0.0)
Chicago Public Schools, IL	28 (10.7)	16 (7.1)	25 (8.8)	27 (7.7)	75 (8.9)	22 (5.3)	r 17 (9.2)	10 (2.9)
Delaware Science Coalition, DE	r 28 (6.1)	46 (9.4)	r 41 (6.0)	19 (3.5)	r 81 (4.0)	31 (5.1)	r 36 (6.2)	23 (3.6)
First in the World Consort., IL	11 (3.5)	12 (3.8)	42 (6.0)	28 (9.5)	100 (0.0)	26 (5.0)	s 18 (4.6)	8 (1.4)
Fremont/Lincoln/WestSide PS, NE	31 (7.2)	52 (6.3)	40 (9.1)	14 (4.4)	91 (1.2)	25 (3.0)	r 35 (3.4)	21 (2.6)
Guilford County, NC	14 (4.6)	29 (5.3)	30 (4.6)	22 (7.6)	74 (3.5)	23 (2.3)	23 (3.0)	12 (1.0)
Jersey City Public Schools, NJ	r 13 (3.7)	33 (5.3)	39 (3.7)	20 (2.0)	85 (2.4)	35 (1.8)	r 31 (5.6)	13 (2.1)
Miami-Dade County PS, FL	s 39 (8.4)	18 (7.6)	s 56 (8.5)	15 (5.1)	s 78 (5.3)	20 (4.3)	x x	x x
Michigan Invitational Group, MI	23 (1.3)	20 (1.2)	19 (5.1)	5 (0.6)	76 (2.9)	22 (2.6)	7 (2.6)	33 (8.8)
Montgomery County, MD	s 39 (5.8)	39 (6.7)	s 46 (6.7)	29 (3.6)	s 90 (3.4)	25 (2.5)	s 34 (6.5)	19 (6.1)
Naperville Sch. Dist. #203, IL	22 (2.5)	56 (10.3)	39 (2.6)	24 (1.5)	85 (4.2)	23 (1.3)	21 (2.6)	9 (0.1)
Project SMART Consortium, OH	38 (5.5)	24 (7.0)	34 (6.6)	25 (4.8)	81 (5.4)	26 (1.4)	25 (5.5)	14 (3.6)
Rochester City Sch. Dist., NY	s 19 (3.6)	90 (0.0)	s 45 (8.2)	10 (1.5)	s 92 (0.9)	23 (4.8)	s 44 (6.7)	10 (1.5)
SW Math/Sci. Collaborative, PA	10 (4.6)	50 (7.2)	27 (6.4)	23 (8.4)	83 (5.4)	24 (2.7)	23 (6.6)	21 (5.4)
United States	27 (2.9)	35 (4.8)	r 33 (3.7)	21 (2.2)	84 (2.3)	26 (2.3)	r 25 (3.7)	18 (2.1)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

* Based on participation in professional development activities from June 1998 until the time of testing.

1 The response range had a maximum of 90 hours spent in courses for college credit.

2 Teachers who did not participate in the professional development activity were not included in the average.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

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

Exhibit 6.22 Professional Development Topics Emphasized Quite a Lot or A Great Deal

8th Grade Mathematics

	Percentage of Students Whose Teachers Reported That the Topic is Emphasized Quite a Lot or A Great Deal in Their Professional Development[1]						
	Content Knowledge	Curriculum	General Instruction/ Pedagogy	Subject-Specific Instruction/ Pedagogy	Assessment	Instructional Technology	Leadership Development
States							
Connecticut	r 22 (6.4)	r 57 (7.2)	r 43 (6.1)	r 37 (7.7)	r 35 (6.4)	r 48 (7.0)	r 11 (4.2)
Idaho	r 28 (6.1)	r 37 (5.3)	r 41 (6.3)	r 32 (6.0)	r 26 (4.9)	r 42 (6.7)	r 11 (2.8)
Illinois	20 (5.3)	62 (5.8)	50 (5.8)	33 (5.6)	45 (7.2)	60 (6.8)	14 (5.5)
Indiana	9 (4.1)	56 (6.9)	35 (5.8)	29 (5.6)	23 (5.7)	27 (6.1)	13 (5.2)
Maryland	r 28 (4.2)	r 55 (6.1)	r 55 (4.9)	r 45 (5.9)	r 42 (5.4)	r 63 (4.9)	r 12 (3.3)
Massachusetts	32 (5.0)	66 (5.8)	52 (5.2)	50 (7.3)	35 (5.4)	43 (5.4)	20 (5.0)
Michigan	24 (5.5)	57 (5.5)	60 (5.0)	41 (6.2)	33 (5.8)	35 (6.5)	15 (4.3)
Missouri	14 (3.1)	58 (6.9)	50 (5.5)	44 (6.4)	48 (5.8)	34 (6.4)	8 (2.8)
North Carolina	19 (3.8)	64 (7.3)	57 (4.6)	45 (4.8)	34 (5.0)	62 (5.4)	19 (5.2)
Oregon	23 (5.2)	64 (4.7)	42 (6.1)	30 (6.0)	57 (5.3)	16 (5.7)	17 (4.4)
Pennsylvania	26 (5.8)	63 (6.3)	44 (6.0)	39 (5.4)	34 (4.7)	42 (5.2)	24 (4.1)
South Carolina	24 (5.0)	78 (4.9)	43 (6.7)	55 (6.9)	31 (5.7)	44 (7.0)	21 (5.8)
Texas	r 26 (6.1)	r 77 (6.1)	r 66 (5.8)	r 57 (6.9)	r 41 (6.9)	r 64 (6.0)	r 25 (5.9)
Districts and Consortia							
Academy School Dist. #20, CO	26 (0.3)	52 (0.4)	30 (0.3)	46 (0.4)	30 (0.3)	54 (0.4)	9 (0.2)
Chicago Public Schools, IL	r 30 (8.7)	r 63 (8.9)	r 73 (12.0)	r 44 (10.4)	r 49 (9.3)	r 44 (9.1)	r 24 (9.4)
Delaware Science Coalition, DE	r 23 (5.3)	r 79 (6.2)	r 32 (7.4)	r 54 (8.3)	r 28 (6.1)	r 46 (7.0)	r 14 (5.5)
First in the World Consort., IL	42 (8.8)	87 (5.3)	70 (4.6)	51 (4.9)	34 (7.5)	53 (7.7)	7 (1.0)
Fremont/Lincoln/WestSide PS, NE	39 (5.4)	72 (7.3)	38 (3.3)	45 (8.5)	45 (7.4)	28 (4.2)	22 (3.5)
Guilford County, NC	31 (6.5)	76 (5.3)	79 (4.7)	49 (5.6)	46 (6.6)	46 (5.8)	24 (4.3)
Jersey City Public Schools, NJ	49 (3.7)	57 (5.0)	70 (5.7)	59 (5.1)	53 (2.4)	51 (4.3)	15 (1.7)
Miami-Dade County PS, FL	s 56 (9.2)	s 65 (9.9)	s 58 (9.7)	s 64 (7.3)	s 49 (8.2)	s 68 (7.5)	s 32 (7.6)
Michigan Invitational Group, MI	19 (7.9)	57 (3.4)	30 (5.8)	41 (7.4)	26 (9.0)	28 (6.5)	19 (7.8)
Montgomery County, MD	s 24 (4.9)	s 77 (4.7)	s 52 (6.1)	s 47 (6.7)	s 56 (8.5)	s 85 (5.2)	s 23 (4.9)
Naperville Sch. Dist. #203, IL	0 (0.0)	49 (4.4)	34 (3.6)	23 (2.6)	35 (4.3)	57 (3.8)	19 (2.5)
Project SMART Consortium, OH	19 (5.0)	52 (4.7)	53 (5.9)	49 (7.3)	43 (5.9)	46 (6.5)	20 (4.9)
Rochester City Sch. Dist., NY	s 35 (8.0)	s 69 (5.4)	s 53 (7.9)	s 62 (6.6)	s 62 (8.2)	s 18 (6.9)	s 29 (6.0)
SW Math/Sci. Collaborative, PA	21 (5.2)	59 (6.8)	39 (7.4)	31 (6.1)	30 (7.0)	39 (7.2)	11 (4.4)
United States	r 28 (3.3)	63 (3.3)	45 (3.1)	47 (3.9)	r 33 (3.1)	45 (3.7)	r 15 (2.5)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

1 Based on participation in professional development activities from June 1998 until the time of testing. Does not include students whose teachers reported that they do not teach the topic.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

	Percentage of Students Whose Teachers Reported That the Content Area is Focused On in Their Professional Development[1]									
	Fractions and Number Sense		Measurement		Data Representation, Analysis, and Probability		Geometry		Algebra	
States										
Connecticut	r	32 (7.6)	r	29 (7.2)	r	42 (6.5)	r	32 (7.4)	r	44 (7.1)
Idaho	r	40 (6.9)	r	34 (6.5)	r	33 (5.4)	r	24 (5.8)	r	37 (5.5)
Illinois		46 (5.7)		39 (6.5)		49 (6.8)		39 (5.6)		46 (5.4)
Indiana		40 (6.2)		32 (6.2)		37 (6.8)		26 (6.0)		41 (6.0)
Maryland	r	46 (6.5)	r	41 (7.3)	r	65 (5.7)	r	40 (6.0)	r	58 (6.8)
Massachusetts		52 (5.6)		52 (6.4)		52 (5.0)		43 (5.7)		53 (5.5)
Michigan		39 (5.6)		29 (5.3)		44 (7.0)		38 (6.8)		48 (6.6)
Missouri		47 (6.4)		51 (6.3)		54 (6.1)		47 (5.2)		52 (4.7)
North Carolina		53 (6.6)		53 (6.7)		53 (5.9)		53 (7.1)		56 (5.9)
Oregon		42 (7.0)		41 (5.8)		46 (5.1)		38 (5.6)		45 (5.5)
Pennsylvania	r	37 (5.6)	r	35 (5.6)	r	41 (6.6)	r	24 (4.4)	r	37 (6.2)
South Carolina		52 (6.8)		45 (5.5)		56 (7.2)		42 (6.0)		58 (6.4)
Texas	r	59 (7.0)	r	47 (7.0)	r	56 (6.8)	r	45 (7.1)	r	64 (7.0)
Districts and Consortia										
Academy School Dist. #20, CO		42 (0.4)		28 (0.4)		30 (0.4)		17 (0.4)		37 (0.4)
Chicago Public Schools, IL	r	41 (11.0)	r	37 (9.5)	r	41 (12.2)	r	34 (9.0)	r	40 (11.0)
Delaware Science Coalition, DE	r	61 (6.5)	r	63 (7.1)	r	59 (6.1)	r	52 (6.3)	r	64 (6.7)
First in the World Consort., IL		46 (6.4)		52 (9.0)		37 (6.5)		77 (6.7)		66 (9.7)
Fremont/Lincoln/WestSide PS, NE		52 (8.6)		33 (5.4)		55 (8.0)		39 (1.4)		52 (8.6)
Guilford County, NC		45 (6.3)		36 (6.4)		34 (6.3)		40 (6.2)		51 (5.7)
Jersey City Public Schools, NJ		53 (5.2)		58 (5.2)		46 (3.9)		50 (4.3)		54 (5.7)
Miami-Dade County PS, FL	s	57 (8.5)	s	66 (7.6)	s	68 (7.7)	s	60 (8.4)	s	59 (7.1)
Michigan Invitational Group, MI		39 (4.8)		34 (4.7)		45 (4.6)		35 (8.0)		48 (4.1)
Montgomery County, MD	s	34 (6.3)	s	18 (3.6)	s	72 (9.1)	s	48 (7.3)	s	64 (9.1)
Naperville Sch. Dist. #203, IL		26 (2.8)		17 (2.8)		47 (5.2)		22 (0.7)		40 (4.5)
Project SMART Consortium, OH		36 (5.9)		41 (4.6)		47 (5.7)		34 (4.4)		46 (6.6)
Rochester City Sch. Dist., NY	s	76 (5.5)	s	86 (6.9)	s	84 (6.3)	s	76 (6.2)	s	81 (6.8)
SW Math/Sci. Collaborative, PA		30 (4.8)		34 (5.7)		38 (7.0)		36 (5.6)		36 (7.9)
United States		54 (3.3)		45 (3.3)	r	50 (3.0)	r	45 (2.4)	r	56 (3.1)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

1 Content areas are focused on in professional development if 80% or more of the TIMSS topics in the content area are reported by teachers to have been focused on in their professional development from June 1998 until the time of testing.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

( ) 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.

	Percentage of Students Whose Teachers Reported Being Fairly Familiar or Very Familiar with the Curriculum Document					
	National Council of Teachers of Mathematics (NCTM) *Professional Standards for Teaching Mathematics*	State Education Department Curriculum Guide	School District Curriculum Guide	School Curriculum Guide	National Assessment of Educational Progress (NAEP) Assessment Frameworks/ Specifications	State Education Department Assessment Specifications
States						
Connecticut	r 96 (2.3)	r 73 (5.5)	r 95 (2.6)	r 98 (1.2)	r 38 (6.7)	r 64 (7.1)
Idaho	r 71 (4.0)	r 60 (5.7)	r 84 (5.4)	r 87 (4.4)	r 8 (3.9)	r 39 (7.6)
Illinois	84 (3.8)	58 (7.5)	95 (2.7)	82 (3.2)	14 (3.0)	r 56 (8.7)
Indiana	92 (3.9)	92 (3.3)	98 (1.7)	97 (2.2)	12 (3.8)	59 (6.4)
Maryland	r 94 (3.0)	r 63 (7.0)	r 96 (3.0)	s 89 (2.5)	r 35 (4.6)	s 62 (5.6)
Massachusetts	85 (4.4)	86 (4.2)	94 (2.2)	94 (2.9)	40 (5.5)	74 (5.9)
Michigan	90 (3.6)	72 (5.3)	94 (2.9)	90 (4.1)	12 (3.9)	57 (6.8)
Missouri	90 (3.1)	73 (5.1)	97 (2.5)	96 (3.2)	46 (6.0)	76 (5.9)
North Carolina	87 (3.5)	98 (1.3)	97 (1.8)	91 (2.6)	28 (4.2)	46 (5.7)
Oregon	78 (3.8)	93 (2.2)	92 (3.9)	92 (3.1)	16 (4.3)	82 (5.0)
Pennsylvania	88 (5.5)	57 (4.0)	87 (5.9)	78 (3.8)	29 (4.2)	r 56 (4.3)
South Carolina	98 (1.3)	98 (2.3)	100 (0.0)	97 (0.4)	62 (5.7)	76 (4.6)
Texas	r 79 (5.8)	r 62 (7.2)	r 97 (2.0)	r 94 (3.3)	r 29 (6.9)	r 69 (6.4)
Districts and Consortia						
Academy School Dist. #20, CO	88 (0.4)	100 (0.0)	100 (0.0)	100 (0.0)	17 (0.3)	64 (0.4)
Chicago Public Schools, IL	62 (10.1)	70 (9.3)	90 (5.9)	r 100 (0.0)	22 (8.2)	33 (5.9)
Delaware Science Coalition, DE	r 92 (4.6)	r 88 (4.3)	r 91 (3.0)	r 91 (3.7)	r 40 (6.9)	r 65 (6.5)
First in the World Consort., IL	95 (5.1)	80 (6.7)	96 (2.7)	98 (1.8)	36 (10.6)	59 (10.3)
Fremont/Lincoln/WestSide PS, NE	97 (0.1)	76 (4.5)	97 (3.0)	100 (0.0)	30 (5.9)	41 (7.4)
Guilford County, NC	84 (3.3)	99 (1.4)	96 (3.1)	97 (3.3)	32 (3.6)	66 (4.9)
Jersey City Public Schools, NJ	97 (0.4)	97 (3.0)	100 (0.0)	100 (0.0)	63 (4.4)	82 (5.1)
Miami-Dade County PS, FL	s 86 (4.9)	s 90 (5.0)	s 85 (7.6)	s 95 (4.0)	s 39 (10.5)	s 59 (10.5)
Michigan Invitational Group, MI	91 (2.5)	61 (5.5)	95 (0.2)	92 (0.5)	25 (3.0)	62 (7.6)
Montgomery County, MD	s 91 (3.5)	s 76 (4.6)	s 98 (2.1)	x x	s 39 (7.2)	s 67 (6.8)
Naperville Sch. Dist. #203, IL	90 (3.7)	62 (3.7)	92 (0.9)	95 (1.1)	32 (4.1)	62 (4.0)
Project SMART Consortium, OH	94 (2.0)	68 (5.4)	95 (0.3)	97 (2.8)	10 (4.3)	40 (4.6)
Rochester City Sch. Dist., NY	82 (1.6)	68 (4.5)	100 (0.0)	89 (4.9)	19 (4.7)	61 (5.0)
SW Math/Sci. Collaborative, PA	90 (4.9)	54 (7.7)	85 (5.5)	86 (5.6)	16 (4.6)	66 (7.7)
United States	82 (2.6)	74 (3.8)	91 (2.2)	91 (2.1)	27 (3.0)	51 (3.8)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Background data provided by teachers.

States in *italics* did not fully satisfy guidelines for sample participation rates (see Appendix A for details).

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