

Chapter 6

Teachers of Science

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

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

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

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

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

What Are the Requirements for Being a Science Teacher?

Exhibit 6.1 presents the country-level responses about the requirements for being certified or licensed to teach science at the eighth and fourth grades. Countries were asked about five requirements, including supervised practical experience (practicum), passing an examination, obtaining a university degree, completion of a probationary period, and completion of an induction program. At the eighth grade, 72 percent of the TIMSS countries (34 out of 47) and three benchmarking entities required a university degree (or equivalent) and just as many participants required fulfillment of some type of practicum for certification as a science teacher. In more than half of the countries (30 out of 47) and three of the benchmarking participants, certification required passing an examination. A probationary period was required in 28 countries and one benchmarking entity. Of the TIMSS countries, nine required completion of an induction program as did one of the benchmarking entities. For the United States and Canada, it should be noted that requirements for certification vary across states and provinces.

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

Exhibit 6.2 contains participants' reports about the organization or authority responsible for granting certification for science teachers. Across participants at the eighth grade, universities or colleges were most likely to be responsible for granting certification (70% of the countries and Quebec province). The next most prevalent procedure was for the ministry of education to grant certification. A handful of participants reported using licensing boards and three (New Zealand, Scotland, and Syria) reported granting certification through a teacher

Exhibit 6.1: Current Requirements for Being a Science Teacher



| Countries | Pre-practicum and Supervised Practicum | Passing an Examination | University Degree or Equivalent | Completion of a Probationary Teaching Period | Completion of an Induction Program |
|----------------------------------|--|------------------------|---------------------------------|--|------------------------------------|
| Armenia | ● | ● | ○ | ● | ○ |
| Australia | ● | ○ | ● | ● | ○ |
| Bahrain | ● | ● | ● | ● | ○ |
| Belgium (Flemish) | ● | ● | ● | ○ | ○ |
| Botswana | ● | ● | ○ | ● | ○ |
| Bulgaria | ● | ● | ● | ○ | ○ |
| Chile | ○ | ○ | ● | ○ | ○ |
| Chinese Taipei | ● | ○ | ● | ● | ○ |
| Cyprus | ○ | ○ | ● | ● | ○ |
| Egypt | ○ | ○ | ● | ○ | ○ |
| England | ● | ● | ● | ● | ● |
| Estonia | ● | ○ | ● | ○ | ○ |
| Ghana | ● | ● | ○ | ○ | ○ |
| Hong Kong, SAR | ○ | ○ | ○ | ○ | ○ |
| Hungary | ● | ● | ● | ○ | ○ |
| Indonesia | ● | ● | ● | ○ | ○ |
| Iran, Islamic Rep. of | ● | ○ | ○ | ● | ● |
| Israel | ● | ● | ● | ● | ○ |
| Italy | ○ | ● | ● | ● | ○ |
| Japan | ● | ● | ● | ● | ● |
| Jordan | ○ | ○ | ● | ○ | ○ |
| Korea, Rep. of | ● | ● | ● | ○ | ○ |
| Latvia | ○ | ○ | ● | ○ | ○ |
| Lebanon | ○ | ● | ○ | ○ | ● |
| Lithuania | ● | ● | ○ | ● | ○ |
| Macedonia, Rep. of | ○ | ○ | ● | ● | ○ |
| Malaysia | ● | ● | ○ | ● | ● |
| Moldova, Rep. of | ○ | ○ | ○ | ○ | ○ |
| Morocco | ○ | ● | ○ | ● | ○ |
| Netherlands | ● | ● | ○ | ● | ○ |
| New Zealand | ● | ○ | ● | ● | ○ |
| Norway | ● | ● | ○ | ● | ○ |
| Palestinian Nat'l Auth. | ○ | ○ | ● | ○ | ○ |
| Philippines | ● | ● | ● | ● | ○ |
| Romania | ● | ● | ● | ● | ● |
| Russian Federation | ● | ● | ● | ○ | ○ |
| Saudi Arabia | ● | ● | ● | ● | ● |
| Scotland | ● | ● | ● | ● | ○ |
| Serbia | ● | ● | ● | ● | ● |
| Singapore | ● | ● | ● | ● | ● |
| Slovak Republic | ○ | ○ | ● | ○ | ○ |
| Slovenia | ● | ○ | ● | ● | ● |
| South Africa | ● | ● | ○ | ● | ○ |
| Sweden | ● | ● | ● | ○ | ○ |
| Syrian Arab Republic | ● | ● | ● | ○ | ○ |
| Tunisia | ● | ● | ● | ● | ○ |
| United States | ● | ○ | ● | ● | ○ |
| Benchmarking Participants | | | | | |
| Basque Country, Spain | ○ | ● | ● | ○ | ○ |
| Indiana State, US | ● | ● | ○ | ● | ● |
| Ontario Province, Can. | ● | ● | ● | ○ | ○ |
| Quebec Province, Can. | ○ | ○ | ● | ○ | ○ |

● Country reported Yes for the particular option

○ Country reported No for the particular option

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

Background data provided by National Research Coordinators.

Exhibit 6.1: Current Requirements for Being a Science Teacher

| Countries | Pre-practicum and Supervised Practicum | Passing an Examination | University Degree or Equivalent | Completion of a Probationary Teaching Period | Completion of an Induction Program |
|----------------------------------|--|------------------------|---------------------------------|--|------------------------------------|
| Armenia | ○ | ○ | ● | ○ | ○ |
| Australia | ● | ○ | ● | ● | ○ |
| Belgium (Flemish) | ● | ● | ● | ○ | ○ |
| Chinese Taipei | ● | ○ | ● | ● | ○ |
| Cyprus | ○ | ○ | ● | ○ | ● |
| England | ● | ● | ● | ● | ● |
| Hong Kong, SAR | ○ | ○ | ○ | ○ | ○ |
| Hungary | ● | ● | ● | ○ | ○ |
| Iran, Islamic Rep. of | ● | ○ | ○ | ● | ● |
| Italy | ○ | ● | ○ | ● | ○ |
| Japan | ● | ● | ○ | ● | ● |
| Latvia | ○ | ○ | ● | ○ | ○ |
| Lithuania | ● | ● | ○ | ● | ○ |
| Moldova, Rep. of | ○ | ○ | ○ | ○ | ○ |
| Morocco | ● | ● | ○ | ○ | -- |
| Netherlands | ● | ● | ○ | ● | ○ |
| New Zealand | ● | ○ | ● | ● | ○ |
| Norway | ● | ● | ○ | ● | ○ |
| Philippines | ● | ● | ● | ○ | ○ |
| Russian Federation | ● | ● | ● | ○ | ○ |
| Scotland | ● | ● | ● | ● | ○ |
| Singapore | ● | ● | ○ | ● | ● |
| Slovenia | ● | ○ | ● | ● | ● |
| Tunisia | ● | ● | ● | ● | ○ |
| United States | ○ | ○ | ● | ○ | ○ |
| Yemen | ● | ○ | ○ | ● | ○ |
| Benchmarking Participants | | | | | |
| Indiana State, US | ● | ● | ○ | ● | ● |
| Ontario Province, Can. | ● | ● | ● | ○ | ○ |
| Quebec Province, Can. | ○ | ○ | ● | ○ | ○ |

● Country reported Yes for the particular option

○ Country reported No for the particular option

Background data provided by National Research Coordinators.

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

Exhibit 6.2: Licensing/Certification Authority for Science Teachers



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

Country reported Yes for the particular option

Country reported No for the particular option

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

Background data provided by National Research Coordinators.

Exhibit 6.2: Licensing/Certification Authority for Science Teachers

| Countries | Minister/ Ministry of Education | National/State Licensing Board | Universities/ Colleges | Teacher Organization | |
|----------------------------------|---------------------------------------|-----------------------------------|----------------------------------|----------------------------------|---|
| Armenia | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | ● Country reported Yes for the particular option |
| Australia | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Belgium (Flemish) | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | ○ Country reported No for the particular option |
| Chinese Taipei | <input type="radio"/> | <input checked="" type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| Cyprus | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| England | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Hong Kong, SAR | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Hungary | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| Iran, Islamic Rep. of | <input checked="" type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| Italy | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Japan | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Latvia | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Lithuania | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| Moldova, Rep. of | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Morocco | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Netherlands | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| New Zealand | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | |
| Norway | <input checked="" type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Philippines | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Russian Federation | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| Scotland | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | |
| Singapore | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| Slovenia | <input checked="" type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |
| Tunisia | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| United States | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Yemen | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Benchmarking Participants | | | | | |
| Indiana State, US | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Ontario Province, Can. | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/> | |
| Quebec Province, Can. | <input checked="" type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/> | |

Background data provided by National Research Coordinators.

organization. The responses at the fourth grade were similar, with ministries of education and universities/colleges being the organizations most often responsible for granting certification.

What Are the Background Characteristics of Science teachers?

Exhibit 6.3 presents a considerable amount of information about the background characteristics of science teachers at the eighth and fourth grades, including their gender, age, certification status, and number of years of teaching experience. Typically, larger percentages of students were taught science by female teachers than male teachers, particularly at the fourth grade. At the eighth grade, on average, internationally, 60 percent of the students were taught science by females and 40 percent by males, and similar percentages were found in a number of countries. However, at least 80 percent of students had female teachers in Armenia, Bulgaria, Italy, Latvia, Lithuania, the Philippines, the Russian Federation, and Slovenia. By contrast, only in Ghana and Japan were as many as 80 percent of the students taught science by male teachers. At the fourth grade, on average, internationally, almost four-fifths (79%) of the science teaching force was female. Across the participants, in each country with the exception of Tunisia, at least 50 percent, and often a much higher percentage, of the students were taught by female teachers.

Looking to the last column of Exhibit 6.3, it can be seen that, in general, the science teaching force around the world is quite experienced. Eighth-grade science teachers reported 15 years of teaching experience, on average, internationally, and fourth-grade teachers reported 16 years.

Given their years of teaching experience, it follows that the majority of the eighth-grade and the fourth-grade students were taught science by teachers in their 30s and 40s. If there was a steady replenishing of the teaching force, one might expect approximately equivalent percentages of students taught by teachers in their 20s, 30s, 40s, and 50s. Few countries, however, had a comparatively younger teach-

ing force at either the eighth or fourth grades. At the eighth grade, on average, internationally, only 20 percent of students were taught by teachers younger than age 30. The four countries with the most students (more than 40 percent) taught by younger teachers were Botswana, Ghana, Lebanon, and Saudi Arabia. The pattern was very similar at the fourth grade. On average, internationally, 20 percent of the students were taught by teachers younger than 30 years old, and with the exception of Cyprus (48%) and Singapore (45%), this percentage was usually well under 40 percent.

At the other end of the age distribution, 22 percent of the eighth-grade students and 21 percent of the fourth-grade students internationally were taught by teachers age 50 or older. At the eighth grade, interestingly, the teaching force was relatively older in some countries. For example, at least half of the students in Italy and Macedonia had teachers at least 50 years of age.

Finally, from Exhibit 6.3, it can be seen that teachers at both the eighth and fourth grades, reported having full certification rather than provisional or emergency credentials. Given the potential problem of teacher shortages for a variety of reasons, it is interesting to note that, on average, internationally, 87 percent of the eighth-grade students and 84 percent of the fourth-grade students were taught science by certified teachers. Of course, the situation varied dramatically across the TIMSS countries. For example, in Lebanon, only 45 percent of the eighth-grade students and in Tunisia only 21 percent of the fourth-grade students were taught science by a fully certified teacher.

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



| Countries | Percentage of Students by Teacher Characteristics | | | | | | | Number of Years of Teaching | | | | |
|----------------------------------|---|-----------------|-------------------|-------------|-----------------|-------------------|------------------------|-----------------------------|---|-----------------|---|-----------------|
| | Gender | | Age | | | | Have Full Certificate* | | | | | |
| | Female | Male | 29 Years or Under | 30-39 Years | 40-49 Years | 50 Years or Older | | | | | | |
| Armenia | r | 86 (1.7) | 14 (1.7) | r | 10 (1.4) | 27 (2.0) | 36 (2.3) | 28 (1.7) | r | 95 (1.1) | r | 19 (0.5) |
| Australia | r | 46 (3.6) | 54 (3.6) | r | 23 (3.3) | 23 (2.5) | 33 (3.8) | 21 (3.2) | r | 90 (2.7) | r | 15 (0.8) |
| Bahrain | | 52 (0.4) | 48 (0.4) | | 27 (2.3) | 58 (2.6) | 14 (2.4) | 1 (0.2) | | 94 (1.5) | | 9 (0.5) |
| Belgium (Flemish) | | 71 (2.9) | 29 (2.9) | | 31 (3.1) | 23 (2.4) | 28 (2.4) | 18 (2.6) | | -- | | 15 (0.8) |
| Botswana | | 39 (4.2) | 61 (4.2) | | 56 (4.4) | 35 (4.5) | 6 (2.2) | 3 (1.6) | r | 91 (2.9) | r | 6 (0.5) |
| Bulgaria | r | 81 (2.0) | 19 (2.0) | r | 8 (1.6) | 25 (2.5) | 34 (1.7) | 33 (2.2) | r | 99 (0.4) | r | 19 (0.6) |
| Chile | | 75 (2.8) | 25 (2.8) | | 5 (1.7) | 20 (3.2) | 39 (4.3) | 36 (3.3) | | 87 (2.2) | | 21 (0.6) |
| Chinese Taipei | | 41 (4.1) | 59 (4.1) | | 18 (3.3) | 38 (3.9) | 25 (3.3) | 19 (3.1) | | 93 (2.3) | | 13 (0.8) |
| Cyprus | | 64 (1.1) | 36 (1.1) | | 10 (0.7) | 21 (1.0) | 47 (0.9) | 22 (1.4) | | -- | | 9 (0.3) |
| Egypt | | 62 (4.2) | 38 (4.2) | | 16 (3.4) | 59 (3.7) | 23 (3.0) | 1 (0.9) | | 100 (0.2) | | 13 (0.5) |
| Estonia | | 79 (1.9) | 21 (1.9) | | 11 (1.8) | 16 (1.7) | 35 (2.8) | 38 (2.9) | | 91 (1.4) | | 20 (0.6) |
| Ghana | | 11 (2.4) | 89 (2.4) | | 50 (4.5) | 30 (4.1) | 13 (3.2) | 7 (2.3) | r | 83 (3.5) | | 8 (0.6) |
| Hong Kong, SAR | | 41 (4.6) | 59 (4.6) | | 30 (4.4) | 42 (3.4) | 19 (3.5) | 9 (2.6) | | 83 (3.2) | | 12 (0.9) |
| Hungary | | 74 (1.9) | 26 (1.9) | | 9 (1.5) | 20 (1.7) | 40 (2.6) | 31 (2.3) | | -- | | 21 (0.5) |
| Indonesia | | 56 (3.1) | 44 (3.1) | | 16 (2.2) | 50 (3.2) | 26 (2.8) | 7 (1.6) | | 90 (2.1) | | 12 (0.5) |
| Iran, Islamic Rep. of | | 39 (4.2) | 61 (4.2) | | 17 (2.6) | 42 (4.0) | 36 (3.7) | 5 (1.8) | | 57 (3.8) | | 14 (0.6) |
| Israel | | 79 (2.5) | 21 (2.5) | | 14 (2.8) | 35 (3.2) | 30 (3.0) | 21 (3.2) | | 96 (1.6) | | 16 (0.8) |
| Italy | | 80 (3.0) | 20 (3.0) | | 3 (1.0) | 7 (2.1) | 31 (3.1) | 59 (3.1) | | 95 (1.6) | | 23 (0.6) |
| Japan | | 20 (3.1) | 80 (3.1) | | 14 (2.8) | 30 (3.6) | 38 (3.9) | 18 (3.4) | | 97 (1.6) | | 18 (0.8) |
| Jordan | | 48 (1.9) | 52 (1.9) | | 33 (4.0) | 45 (4.5) | 15 (3.2) | 7 (2.4) | | 70 (3.7) | | 11 (0.7) |
| Korea, Rep. of | r | 66 (3.4) | 34 (3.4) | r | 15 (2.6) | 41 (3.0) | 40 (3.6) | 4 (1.7) | s | 99 (0.2) | r | 13 (0.5) |
| Latvia | | 83 (1.9) | 17 (1.9) | | 9 (1.6) | 24 (2.6) | 33 (2.8) | 34 (2.8) | | -- | | 20 (0.7) |
| Lebanon | | 71 (3.1) | 29 (3.1) | | 45 (2.9) | 27 (2.6) | 20 (2.7) | 8 (1.7) | r | 45 (3.9) | | 11 (0.5) |
| Lithuania | | 82 (1.7) | 18 (1.7) | | 11 (1.4) | 26 (2.3) | 34 (2.2) | 30 (2.4) | | 100 (0.0) | | 20 (0.7) |
| Macedonia, Rep. of | | 58 (2.3) | 42 (2.3) | | 4 (0.8) | 17 (1.8) | 29 (2.0) | 50 (2.2) | | x x | | 22 (0.6) |
| Malaysia | | 76 (3.5) | 24 (3.5) | | 26 (3.5) | 39 (4.2) | 31 (3.9) | 4 (1.7) | | 77 (3.8) | | 11 (0.7) |
| Moldova, Rep. of | | 71 (2.1) | 29 (2.1) | | 18 (2.0) | 15 (1.7) | 25 (2.6) | 42 (2.4) | r | 92 (1.6) | r | 22 (0.7) |
| Morocco | | 34 (4.9) | 66 (4.9) | | 17 (3.8) | 29 (4.1) | 46 (5.4) | 7 (2.7) | | 88 (3.0) | | 15 (1.1) |
| Netherlands | | 27 (2.0) | 73 (2.0) | | 18 (2.5) | 20 (2.4) | 31 (3.1) | 31 (3.0) | | -- | r | 16 (0.7) |
| New Zealand | | 50 (5.8) | 50 (5.8) | | 15 (3.4) | 34 (5.0) | 31 (5.1) | 21 (3.3) | | 76 (4.4) | | 12 (0.8) |
| Norway | | 40 (4.0) | 60 (4.0) | | 18 (3.3) | 25 (3.4) | 22 (3.3) | 36 (4.4) | | 96 (2.0) | | 16 (1.0) |
| Palestinian Nat'l Auth. | | 52 (3.0) | 48 (3.0) | | 35 (3.9) | 36 (4.1) | 21 (3.7) | 8 (2.2) | r | 83 (3.6) | | 9 (0.7) |
| Philippines | | 88 (3.1) | 12 (3.1) | | 24 (4.1) | 32 (4.2) | 24 (3.5) | 20 (3.7) | | 93 (2.2) | | 13 (0.8) |
| Romania | | 77 (2.1) | 23 (2.1) | | 20 (2.0) | 20 (2.1) | 22 (1.7) | 38 (2.0) | | 89 (1.8) | | 19 (0.6) |
| Russian Federation | | 88 (1.3) | 12 (1.3) | | 16 (2.1) | 23 (1.5) | 29 (1.8) | 32 (2.2) | | 92 (1.5) | | 19 (0.6) |
| Saudi Arabia | | 43 (2.5) | 57 (2.5) | | 45 (5.7) | 37 (5.0) | 16 (3.7) | 2 (1.2) | | 95 (1.9) | | 9 (0.7) |
| Scotland | s | 45 (3.3) | 55 (3.3) | s | 13 (2.1) | 13 (2.1) | 34 (3.1) | 40 (3.3) | | -- | s | 18 (0.7) |
| Serbia | | 69 (2.0) | 31 (2.0) | | 8 (1.1) | 22 (1.8) | 26 (2.0) | 45 (2.1) | | 90 (1.3) | | 20 (0.5) |
| Singapore | | 64 (2.6) | 36 (2.6) | | 34 (2.6) | 27 (2.6) | 19 (1.8) | 21 (2.3) | | 96 (1.0) | | 12 (0.6) |
| Slovak Republic | | 78 (1.9) | 22 (1.9) | | 16 (2.0) | 20 (2.1) | 25 (2.1) | 39 (2.7) | | 87 (1.9) | | 20 (0.7) |
| Slovenia | | 84 (2.0) | 16 (2.0) | | 8 (1.5) | 31 (2.7) | 42 (2.5) | 19 (2.1) | | 87 (2.1) | | 18 (0.6) |
| South Africa | | 49 (4.1) | 51 (4.1) | | 24 (3.2) | 51 (3.4) | 20 (2.8) | 4 (1.2) | r | 53 (4.4) | | 10 (0.5) |
| Sweden | | 45 (3.6) | 55 (3.6) | | 15 (2.5) | 29 (2.8) | 22 (2.7) | 34 (2.7) | r | 86 (2.5) | | 13 (0.7) |
| Tunisia | | 70 (3.3) | 30 (3.3) | | 24 (3.2) | 45 (4.3) | 19 (3.5) | 12 (2.6) | | 96 (1.7) | r | 11 (0.8) |
| United States | | 54 (3.1) | 46 (3.1) | | 15 (2.3) | 23 (2.4) | 31 (3.1) | 30 (2.9) | r | 88 (2.2) | | 14 (0.7) |
| ‡ England | s | 55 (4.5) | 45 (4.5) | s | 23 (3.3) | 27 (4.0) | 28 (3.9) | 23 (3.7) | | -- | s | 13 (1.1) |
| International Avg. | | 60 (0.5) | 40 (0.5) | | 20 (0.4) | 30 (0.5) | 28 (0.5) | 22 (0.4) | | 87 (0.4) | | 15 (0.1) |
| Benchmarking Participants | | | | | | | | | | | | |
| Basque Country, Spain | | 70 (4.8) | 30 (4.8) | | 9 (2.9) | 29 (4.1) | 49 (4.4) | 13 (2.9) | | -- | | 17 (1.0) |
| Indiana State, US | | 45 (6.1) | 55 (6.1) | | 17 (5.1) | 15 (4.4) | 32 (5.5) | 36 (5.9) | | 99 (0.0) | | -- |
| Ontario Province, Can. | | 50 (4.9) | 50 (4.9) | | 26 (4.1) | 31 (4.6) | 23 (4.0) | 19 (3.8) | | 97 (1.5) | | 12 (0.9) |
| Quebec Province, Can. | | 53 (5.0) | 47 (5.0) | | 28 (4.2) | 33 (4.0) | 23 (4.4) | 16 (2.9) | r | 88 (3.4) | | 12 (0.7) |

Background data provided by teachers.

*Does not include provisional or emergency certificate.

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

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

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

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

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

| Countries | Percentage of Students by Teacher Characteristics | | | | | | | Have Full Certificate* | Number of Years of Teaching | | | |
|----------------------------------|---|-----------------|-------------------|-------------|-----------------|-------------------|-----------------|------------------------|-----------------------------|-----------------|---|-----------------|
| | Gender | | Age | | | | | | | | | |
| | Female | Male | 29 Years or Under | 30-39 Years | 40-49 Years | 50 Years or Older | | | | | | |
| Armenia | s | 90 (3.0) | 10 (3.0) | s | 15 (4.6) | 33 (5.5) | 30 (5.2) | 21 (4.5) | s | 93 (3.0) | s | 15 (1.2) |
| Australia | | 75 (4.2) | 25 (4.2) | | 21 (3.5) | 14 (2.4) | 46 (4.4) | 19 (3.0) | r | 91 (2.4) | | 17 (0.9) |
| Belgium (Flemish) | | 77 (2.7) | 23 (2.7) | | 22 (2.8) | 39 (3.5) | 26 (3.0) | 13 (2.2) | | 100 (0.0) | | 16 (0.7) |
| Chinese Taipei | | 59 (4.0) | 41 (4.0) | | 21 (3.5) | 35 (4.0) | 28 (4.1) | 15 (3.2) | | 81 (3.6) | | 14 (1.0) |
| Cyprus | | 76 (3.8) | 24 (3.8) | | 48 (4.2) | 42 (4.1) | 4 (1.6) | 6 (2.0) | | -- | | 9 (0.6) |
| England | r | 73 (4.2) | 27 (4.2) | r | 30 (4.7) | 24 (4.4) | 25 (3.8) | 21 (3.5) | | -- | r | 12 (1.0) |
| Hong Kong, SAR | | 73 (4.0) | 27 (4.0) | | 38 (4.8) | 26 (3.9) | 11 (2.7) | 25 (4.7) | | 87 (2.9) | | 14 (1.0) |
| Hungary | | 94 (1.8) | 6 (1.8) | | 8 (2.1) | 33 (3.7) | 40 (3.7) | 19 (3.2) | | -- | | 19 (0.8) |
| Iran, Islamic Rep. of | | 51 (4.8) | 49 (4.8) | | 14 (3.4) | 39 (4.2) | 39 (4.4) | 8 (2.6) | | 33 (4.2) | | 16 (0.7) |
| Italy | | 96 (1.2) | 4 (1.2) | | 3 (1.4) | 18 (2.4) | 39 (3.6) | 39 (3.3) | | 97 (1.3) | | 21 (0.6) |
| Japan | | 57 (3.9) | 43 (3.9) | | 10 (2.6) | 19 (3.3) | 44 (4.3) | 27 (3.6) | | 99 (1.0) | | 20 (0.8) |
| Latvia | | 99 (0.6) | 1 (0.6) | | 6 (2.0) | 40 (4.1) | 31 (3.8) | 22 (3.7) | | -- | | 19 (0.9) |
| Lithuania | | 99 (0.6) | 1 (0.6) | | 12 (2.2) | 37 (3.1) | 32 (3.1) | 19 (2.6) | | 100 (0.0) | | 19 (0.7) |
| Moldova, Rep. of | | 98 (1.2) | 2 (1.2) | | 15 (2.8) | 30 (4.0) | 35 (4.2) | 20 (3.5) | | 64 (4.6) | | 21 (0.9) |
| Morocco | s | 52 (4.6) | 48 (4.6) | s | 23 (4.4) | 21 (4.3) | 46 (5.1) | 10 (2.0) | s | 91 (2.8) | s | 15 (0.9) |
| Netherlands | | 64 (4.6) | 36 (4.6) | | 30 (4.4) | 18 (3.7) | 24 (4.3) | 28 (3.9) | | -- | | 16 (1.1) |
| New Zealand | | 81 (2.5) | 19 (2.5) | | 26 (2.9) | 26 (2.9) | 29 (2.9) | 19 (2.5) | r | 85 (2.5) | r | 12 (0.6) |
| Norway | | 81 (2.4) | 19 (2.4) | | 13 (2.7) | 24 (3.3) | 31 (4.1) | 31 (3.4) | | 97 (1.3) | | 16 (0.9) |
| Philippines | | 87 (2.9) | 13 (2.9) | | 14 (3.1) | 39 (5.1) | 24 (4.2) | 22 (4.0) | | 89 (2.9) | | 13 (0.9) |
| Russian Federation | | 99 (0.8) | 1 (0.8) | | 11 (2.6) | 36 (3.4) | 28 (3.5) | 25 (3.7) | | 98 (0.9) | | 21 (0.7) |
| Scotland | r | 93 (2.2) | 7 (2.2) | r | 22 (3.8) | 27 (3.6) | 22 (3.9) | 29 (4.3) | | -- | r | 16 (0.9) |
| Singapore | | 84 (2.9) | 16 (2.9) | | 45 (3.9) | 35 (3.9) | 5 (1.6) | 15 (2.7) | | 95 (1.7) | | 10 (0.8) |
| Slovenia | | 97 (1.6) | 3 (1.6) | | 11 (3.0) | 32 (4.3) | 36 (4.6) | 21 (3.7) | r | 89 (3.1) | | 19 (0.8) |
| Tunisia | | 46 (4.3) | 54 (4.3) | | 11 (2.5) | 46 (4.6) | 24 (3.6) | 19 (3.3) | r | 21 (3.5) | r | 18 (0.8) |
| United States | | 86 (2.1) | 14 (2.1) | | 21 (1.9) | 28 (2.1) | 22 (2.2) | 29 (2.5) | | 91 (1.6) | | 13 (0.6) |
| International Avg. | | 79 (0.6) | 21 (0.6) | | 20 (0.7) | 31 (0.8) | 29 (0.8) | 21 (0.7) | | 84 (0.6) | | 16 (0.2) |
| Benchmarking Participants | | | | | | | | | | | | |
| Indiana State, US | | 88 (3.6) | 12 (3.6) | | 17 (3.8) | 24 (4.9) | 24 (5.5) | 36 (5.4) | | 100 (0.0) | | -- |
| Ontario Province, Can. | | 75 (3.8) | 25 (3.8) | | 23 (4.1) | 23 (3.9) | 26 (4.5) | 28 (4.5) | | 92 (3.1) | | 13 (0.9) |
| Quebec Province, Can. | | 93 (2.0) | 7 (2.0) | | 17 (3.6) | 30 (4.2) | 21 (3.6) | 32 (4.4) | | 83 (3.6) | | 17 (1.0) |

Background data provided by teachers.

*Does not include provisional or emergency certificate.

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

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

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

What Preparation Do Teachers Have for Teaching Science?

Exhibits 6.4 through 6.9 present teachers' reports about their preparation to teach science, including educational experiences before actually teaching and opportunities for developing their expertise after entering the profession (often referred to as pre-service and in-service training).

Exhibit 6.4 presents teachers' highest level of education. Even though the percentages were somewhat higher at the eighth grade than the fourth grade, approximately two-thirds of the eighth- and fourth-grade students were taught science by teachers having at least a university degree or equivalent. At the eighth grade, 57 percent of the students were taught by teachers with a university degree and another 22 percent by teachers who had coursework beyond the initial university degree. At the fourth grade, 52 percent of the students were taught by teachers with a university degree and another 13 percent by teachers with coursework beyond that degree.

Despite a relatively well-educated teaching force, on average, the situation varied dramatically among countries. At the eighth grade, for example, at least half the students were taught by teachers with work beyond the initial university degree in Armenia, Australia, Bulgaria, Lithuania, New Zealand, the Russian Federation, Tunisia, the United States, and the Basque Country, Spain. In contrast, 44 percent of the eighth-grade students in Morocco and 25 percent in Malaysia were taught by teachers only having completed secondary school.

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

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

Teachers' reports about their major area or areas of study during their postsecondary education also can be found in Exhibit 6.5. At the eighth grade, on average, internationally, most students (82%) had teachers who studied a science subject – biology, physics, chemistry, or earth science. Science education was also a popular option, with 37 percent of students, on average, taught by teachers with science education as a major. Less common majors for science teachers were general education (taken by teachers of 25 percent of students) and mathematics (taken by teachers of 20 percent of students). Teachers often reported that their study was focused in more than one area. For example, it was not uncommon for teachers in some countries to report pedagogy as a major area of study and a science subject as another major area. As might be considered, the situation was different at the fourth grade. Here teachers typically studied primary or elementary education (approximately 80 percent, on average, of fourth-grade students had such teachers). On average, for the primary education majors, about one-fourth (23%) of students were taught by teachers who specialized in science, 7 percent in mathematics, and half (50%) not having any particular specialization. In Latvia and the Russian Federation, more than half the fourth-grade students were being taught by science specialists.

To provide more information about the branches of science that science teachers studied during their postsecondary education, Exhibit 6.6 presents the percentage of eighth-grade students whose teachers reported majoring in biology, physics, chemistry, or earth science. Teachers could major in more than one of these subjects, and the percentages in the exhibit reflect this. Biology was the most popular science major, followed by chemistry, physics, and earth science. On

Exhibit 6.4: Highest Educational Level of Science Teachers*



| Countries | Percentage of Students by Their Teachers' Educational Level | | | | |
|----------------------------------|---|-----------------------------------|--|------------------------------------|--|
| | Beyond Initial University Degree** | Finished University or Equivalent | Finished Post Secondary Education but Not University | Finished Upper Secondary Schooling | Did Not Complete Upper Secondary Schooling |
| Armenia | r 82 (2.1) | 16 (2.0) | 1 (0.4) | 1 (0.3) | 0 (0.0) |
| Australia | r 56 (3.5) | 38 (3.7) | 5 (1.5) | 0 (0.1) | 0 (0.0) |
| Bahrain | 10 (1.8) | 88 (2.2) | 2 (1.1) | 0 (0.0) | 1 (0.0) |
| Belgium (Flemish) | 0 (0.0) | 0 (0.0) | 100 (0.0) | 0 (0.0) | 0 (0.0) |
| Botswana | 4 (2.0) | 34 (4.7) | 61 (4.8) | 1 (0.6) | 0 (0.0) |
| Bulgaria | r 67 (3.0) | 24 (2.5) | 9 (1.5) | 0 (0.0) | 0 (0.0) |
| Chile | 2 (1.1) | 91 (2.6) | 7 (2.3) | 0 (0.0) | 0 (0.0) |
| Chinese Taipei | 27 (3.6) | 70 (3.7) | 2 (1.5) | 0 (0.0) | 0 (0.0) |
| Cyprus | 21 (1.0) | 79 (1.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Egypt | 8 (2.3) | 92 (2.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Estonia | 23 (2.2) | 61 (2.6) | 12 (1.6) | 3 (1.1) | 0 (0.0) |
| Ghana | 0 (0.0) | 9 (3.1) | 79 (4.4) | 12 (3.3) | 0 (0.0) |
| Hong Kong, SAR | 17 (3.3) | 66 (4.2) | 17 (3.2) | 0 (0.0) | 0 (0.0) |
| Hungary | 28 (2.1) | 72 (2.1) | 0 (0.2) | 0 (0.0) | 0 (0.0) |
| Indonesia | 0 (0.0) | 57 (3.0) | 40 (2.9) | 3 (1.3) | 0 (0.0) |
| Iran, Islamic Rep. of | 1 (0.5) | 42 (4.0) | 57 (4.0) | 0 (0.0) | 0 (0.0) |
| Israel | 27 (3.2) | 71 (3.4) | 3 (1.0) | 0 (0.0) | 0 (0.0) |
| Italy | 7 (1.9) | 93 (1.9) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Japan | 9 (2.6) | 90 (2.7) | 1 (0.9) | 0 (0.0) | 0 (0.0) |
| Jordan | 13 (2.9) | 78 (3.7) | 8 (2.7) | 0 (0.0) | 1 (0.0) |
| Korea, Rep. of | r 25 (2.9) | 75 (2.9) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Latvia | 1 (0.5) | 95 (1.1) | 0 (0.2) | 4 (0.9) | 0 (0.0) |
| Lebanon | -- | -- | -- | -- | -- |
| Lithuania | 62 (2.2) | 35 (2.1) | 2 (0.7) | 1 (0.3) | 0 (0.0) |
| Macedonia, Rep. of | 0 (0.0) | 21 (2.0) | 78 (2.0) | 0 (0.2) | 0 (0.0) |
| Malaysia | 3 (1.5) | 47 (4.0) | 25 (3.8) | 25 (3.6) | 0 (0.0) |
| Moldova, Rep. of | 1 (0.6) | 91 (1.5) | 1 (0.6) | 6 (1.2) | 1 (0.4) |
| Morocco | 2 (1.4) | 32 (4.5) | 16 (3.8) | 44 (5.8) | 5 (1.9) |
| Netherlands | 30 (3.1) | -- | 66 (3.0) | 5 (1.5) | 0 (0.0) |
| New Zealand | 51 (4.8) | 43 (5.2) | 6 (3.0) | 0 (0.0) | 0 (0.0) |
| Norway | 12 (2.6) | 72 (4.0) | 14 (2.9) | 1 (0.8) | 1 (1.0) |
| Palestinian Nat'l Auth. | 10 (2.6) | 73 (3.9) | 16 (3.2) | 1 (0.8) | 0 (0.0) |
| Philippines | 8 (2.6) | 92 (2.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Romania | 4 (1.0) | 81 (2.1) | 13 (1.7) | 2 (0.9) | 0 (0.0) |
| Russian Federation | 89 (1.0) | 8 (1.1) | 3 (0.5) | 1 (0.3) | 0 (0.0) |
| Saudi Arabia | 3 (2.6) | 85 (3.6) | 10 (2.2) | 2 (1.2) | 0 (0.0) |
| Scotland | s 24 (2.6) | 76 (2.6) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Serbia | 1 (0.4) | 43 (2.2) | 54 (2.2) | 2 (0.6) | 0 (0.1) |
| Singapore | 8 (1.5) | 80 (2.2) | 8 (1.3) | 4 (1.0) | 0 (0.0) |
| Slovak Republic | 13 (1.4) | 86 (1.5) | 1 (0.5) | 1 (0.4) | 0 (0.0) |
| Slovenia | 36 (3.0) | 61 (3.1) | 1 (0.3) | 3 (1.0) | 0 (0.0) |
| South Africa | r 7 (2.0) | 21 (3.0) | 69 (3.5) | 2 (1.2) | 0 (0.1) |
| Sweden | 30 (3.2) | 63 (3.4) | 4 (1.2) | 4 (1.2) | 0 (0.0) |
| Tunisia | 81 (3.6) | 17 (3.4) | 1 (0.7) | 1 (0.0) | 0 (0.0) |
| United States | 59 (3.0) | 41 (3.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| ‡ England | s 24 (3.7) | 76 (3.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| International Avg. | 22 (0.4) | 57 (0.4) | 18 (0.3) | 3 (0.2) | 0 (0.0) |
| Benchmarking Participants | | | | | |
| Basque Country, Spain | 50 (5.3) | 50 (5.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Indiana State, US | -- | -- | -- | -- | -- |
| Ontario Province, Can. | 15 (3.2) | 83 (3.4) | 2 (1.3) | 0 (0.0) | 0 (0.0) |
| Quebec Province, Can. | 10 (2.6) | 90 (2.6) | 0 (0.3) | 0 (0.0) | 0 (0.0) |

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

Background data provided by teachers.

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

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

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

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

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

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

Exhibit 6.4: Highest Educational Level of Science Teachers*

| Countries | Percentage of Students by Their Teachers' Educational Level | | | | |
|----------------------------------|---|-----------------------------------|--|------------------------------------|--|
| | Beyond Initial University Degree** | Finished University or Equivalent | Finished Post Secondary Education but Not University | Finished Upper Secondary Schooling | Did Not Complete Upper Secondary Schooling |
| Armenia | 68 (4.8) | 22 (4.4) | 8 (2.8) | 3 (1.6) | 0 (0.0) |
| Australia | 27 (4.1) | 49 (4.4) | 24 (3.4) | 0 (0.0) | 0 (0.0) |
| Belgium (Flemish) | 0 (0.0) | 0 (0.0) | 100 (0.0) | 0 (0.0) | 0 (0.0) |
| Chinese Taipei | 15 (3.0) | 69 (4.3) | 11 (2.7) | 4 (1.7) | 1 (0.0) |
| Cyprus | 15 (3.2) | 84 (3.2) | 0 (0.3) | 0 (0.0) | 0 (0.0) |
| England | 4 (1.9) | 96 (1.9) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Hong Kong, SAR | 4 (1.8) | 55 (5.1) | 41 (5.1) | 0 (0.0) | 0 (0.0) |
| Hungary | 3 (1.3) | 97 (1.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Iran, Islamic Rep. of | 2 (1.9) | 21 (4.2) | 34 (4.7) | 34 (3.9) | 8 (2.2) |
| Italy | 1 (0.5) | 13 (2.2) | 3 (1.0) | 84 (2.3) | 0 (0.0) |
| Japan | 3 (1.4) | 84 (3.0) | 13 (2.8) | 0 (0.0) | 0 (0.0) |
| Latvia | 0 (0.0) | 82 (3.3) | 3 (1.4) | 15 (3.2) | 0 (0.0) |
| Lithuania | 16 (2.4) | 75 (3.2) | 8 (2.1) | 0 (0.0) | 1 (0.5) |
| Moldova, Rep. of | 0 (0.0) | 65 (4.2) | 21 (4.0) | 12 (2.9) | 2 (1.0) |
| Morocco | 0 (0.0) | 22 (4.5) | 2 (1.3) | 56 (5.2) | 20 (3.8) |
| Netherlands | 1 (0.5) | -- | 98 (1.0) | 1 (0.9) | 0 (0.0) |
| New Zealand | 12 (2.3) | 53 (3.1) | 36 (3.1) | 0 (0.0) | 0 (0.0) |
| Norway | 1 (0.6) | 57 (3.9) | 38 (3.9) | 2 (1.1) | 2 (0.8) |
| Philippines | 7 (2.3) | 93 (2.3) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Russian Federation | 44 (3.8) | 26 (3.4) | 29 (3.5) | 0 (0.0) | 0 (0.0) |
| Scotland | 12 (3.1) | 88 (3.1) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Singapore | 0 (0.0) | 41 (4.0) | 40 (3.9) | 18 (3.1) | 0 (0.0) |
| Slovenia | 34 (4.4) | 56 (4.8) | 3 (1.4) | 7 (2.3) | 0 (0.0) |
| Tunisia | 2 (1.2) | 7 (2.4) | 43 (4.2) | 48 (4.0) | 1 (0.9) |
| United States | 53 (2.7) | 46 (2.7) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| International Avg. | 13 (0.5) | 52 (0.7) | 22 (0.5) | 11 (0.4) | 1 (0.2) |
| Benchmarking Participants | | | | | |
| Indiana State, US | -- | -- | -- | -- | -- |
| Ontario Province, Can. | 10 (2.8) | 84 (3.6) | 7 (2.3) | 0 (0.0) | 0 (0.0) |
| Quebec Province, Can. | 9 (2.6) | 88 (2.8) | 4 (1.2) | 0 (0.0) | 0 (0.0) |

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

Background data provided by teachers.

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

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

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

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

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

Exhibit 6.5: Preparation to Teach Science



| Countries | Teachers Receive Specific Preparation in How to Teach the Intended Science Curriculum | | Teachers' Major Area of Study in Their Postsecondary Education ¹ | | | | | |
|----------------------------------|---|---------------------------------|---|---|-----------------------|---------------------|---------------------|---------------------|
| | As Part of Pre-Service Education | As Part of In-Service Education | Education-Science | Biology, Physics, Chemistry, or Earth Science | Education-Mathematics | Mathematics | Education-General | Other |
| | | | Percent of Students | Percent of Students | Percent of Students | Percent of Students | Percent of Students | Percent of Students |
| Armenia | ● | ● | r 11 (1.6) | r 92 (1.2) | r 4 (0.9) | r 16 (2.2) | r 13 (2.0) | r 13 (1.9) |
| Australia | ● | ● | r 65 (3.4) | r 80 (3.3) | r 23 (3.3) | r 30 (3.3) | r 42 (3.7) | r 39 (4.0) |
| Bahrain | ● | ● | 45 (3.2) | 96 (1.4) | 1 (0.9) | 9 (2.1) | 23 (2.5) | 13 (1.9) |
| Belgium (Flemish) | ● | ● | -- | 77 (2.7) | -- | 23 (2.1) | 8 (1.4) | 35 (3.0) |
| Botswana | ● | ● | 54 (4.5) | 85 (3.4) | 13 (3.0) | 33 (4.4) | 36 (4.7) | r 25 (4.5) |
| Bulgaria | ● | ● | r 68 (2.9) | r 99 (0.6) | r 13 (1.3) | r 24 (1.8) | r 59 (3.1) | r 43 (2.9) |
| Chile | ○ | ○ | 37 (4.3) | 47 (4.1) | 3 (1.6) | 13 (2.5) | 66 (3.6) | r 18 (3.0) |
| Chinese Taipei | ● | ● | 39 (3.9) | 97 (1.4) | 8 (1.7) | 21 (3.1) | 43 (4.4) | 13 (2.7) |
| Cyprus | ○ | ● | 9 (0.7) | 99 (0.4) | 3 (0.4) | 12 (0.8) | 8 (0.6) | 12 (0.8) |
| Egypt | ● | ● | 61 (4.1) | 96 (1.8) | 4 (1.8) | 29 (4.0) | 35 (4.1) | 13 (2.8) |
| Estonia | ● | ● | 33 (2.6) | 90 (1.4) | 7 (1.3) | 17 (1.7) | 34 (2.7) | r 21 (2.8) |
| Ghana | ● | ● | 47 (4.8) | 55 (5.3) | 35 (5.1) | 47 (4.9) | 70 (4.7) | r 45 (4.7) |
| Hong Kong, SAR | ● | ● | 47 (4.9) | 71 (4.4) | 25 (3.9) | 30 (4.4) | 34 (4.8) | 25 (4.4) |
| Hungary | ● | ● | 33 (2.1) | 84 (1.6) | 25 (1.4) | 21 (1.4) | 5 (1.0) | 28 (1.9) |
| Indonesia | ● | ● | 51 (3.7) | 74 (3.0) | 10 (2.2) | 13 (2.7) | 22 (3.0) | 20 (3.0) |
| Iran, Islamic Rep. of | ● | ● | 86 (3.0) | 13 (2.8) | 1 (0.5) | 3 (1.3) | 3 (1.3) | 13 (3.0) |
| Israel | ● | ● | 60 (3.3) | 94 (1.7) | 1 (0.7) | 11 (2.1) | 34 (3.4) | r 21 (2.8) |
| Italy | ○ | ● | -- | 65 (3.4) | -- | 20 (3.4) | 0 (0.0) | 18 (2.6) |
| Japan | ● | ● | 42 (4.4) | 89 (2.5) | 1 (0.7) | 3 (1.4) | 24 (3.6) | 20 (3.3) |
| Jordan | ● | ● | 30 (3.8) | 67 (3.9) | 1 (0.7) | 1 (0.7) | 1 (0.7) | 9 (2.6) |
| Korea, Rep. of | ○ | ○ | r 20 (3.1) | r 92 (1.8) | r 0 (0.0) | r 0 (0.1) | r 6 (1.5) | r 7 (2.0) |
| Latvia | ● | ● | 50 (2.8) | 97 (0.8) | 19 (1.7) | 38 (2.0) | 76 (2.5) | r 52 (3.2) |
| Lebanon | ● | ● | 27 (3.6) | 90 (1.7) | 11 (2.6) | 27 (3.0) | 14 (2.7) | 19 (2.9) |
| Lithuania | ● | ● | 23 (2.2) | 93 (1.3) | 3 (0.8) | 10 (1.5) | 29 (2.5) | r 28 (2.3) |
| Macedonia, Rep. of | ● | ● | 2 (0.6) | 97 (0.7) | 3 (0.6) | 7 (0.9) | 4 (0.9) | 6 (1.1) |
| Malaysia | ● | ● | 58 (4.2) | 36 (4.1) | 22 (3.6) | 31 (4.0) | 14 (3.2) | 38 (4.1) |
| Moldova, Rep. of | ○ | ○ | r 14 (2.3) | 90 (1.5) | r 7 (1.4) | r 18 (2.1) | r 18 (2.5) | r 19 (2.9) |
| Morocco | ● | ● | 10 (3.2) | 97 (1.6) | 0 (0.0) | 5 (1.1) | 3 (1.4) | 7 (2.4) |
| Netherlands | ● | ● | r 21 (2.7) | r 74 (2.2) | r 7 (1.7) | -- | r 17 (2.6) | r 24 (2.8) |
| New Zealand | ● | ● | 33 (4.6) | 90 (2.7) | 7 (3.1) | 32 (5.2) | 26 (4.8) | r 31 (5.0) |
| Norway | ○ | ○ | r 8 (2.6) | r 52 (4.9) | r 2 (1.2) | r 34 (4.8) | r 31 (3.7) | r 52 (5.0) |
| Palestinian Nat'l Auth. | ● | ● | 24 (4.0) | 63 (4.3) | 1 (0.9) | 1 (0.8) | 6 (2.4) | 13 (3.4) |
| Philippines | ● | ● | r 19 (3.7) | r 77 (3.9) | r 3 (1.6) | r 4 (1.8) | r 10 (2.6) | s 22 (4.5) |
| Romania | ● | ● | 5 (1.0) | 89 (1.5) | 1 (0.4) | 3 (0.9) | 10 (1.6) | 19 (2.1) |
| Russian Federation | ● | ● | -- | 98 (0.5) | 6 (0.8) | 13 (0.8) | -- | -- |
| Saudi Arabia | ● | ● | 53 (5.2) | 92 (2.8) | 6 (2.3) | 32 (5.8) | 40 (5.3) | 22 (5.2) |
| Scotland | ● | ● | s 43 (3.4) | s 99 (0.4) | s 10 (1.8) | s 33 (2.8) | s 28 (2.7) | s 15 (2.3) |
| Serbia | ● | ● | 47 (2.5) | 99 (0.5) | 4 (0.9) | 12 (1.4) | 42 (2.4) | 27 (2.4) |
| Singapore | ○ | ● | 42 (2.7) | 92 (1.4) | 27 (2.5) | 58 (3.0) | 35 (2.8) | 25 (2.4) |
| Slovak Republic | ● | ○ | 7 (1.4) | 76 (1.9) | 2 (0.6) | 26 (2.5) | 8 (1.4) | 35 (2.5) |
| Slovenia | ● | ● | 31 (2.5) | 97 (0.9) | 9 (1.3) | 20 (1.6) | 16 (2.2) | 22 (2.1) |
| South Africa | ○ | ● | r 38 (3.8) | 76 (3.5) | r 17 (3.1) | 36 (4.2) | r 42 (3.6) | r 33 (3.8) |
| Sweden | ○ | ○ | 58 (3.1) | 86 (2.2) | 49 (2.9) | 62 (3.0) | 36 (3.0) | 34 (3.2) |
| Tunisia | ● | ● | 62 (3.7) | 82 (3.2) | 0 (0.0) | 5 (1.8) | 4 (1.7) | 10 (2.6) |
| United States | ● | -- | 43 (3.0) | 58 (3.3) | r 6 (1.2) | r 9 (1.9) | -- | r 40 (3.0) |
| ‡ England | ● | ● | s 45 (4.8) | s 95 (1.6) | s 5 (2.0) | s 18 (2.8) | s 26 (3.5) | s 17 (4.0) |
| International Avg. | | | 37 (0.5) | 82 (0.4) | 9 (0.3) | 20 (0.4) | 25 (0.4) | 24 (0.5) |
| Benchmarking Participants | | | | | | | | |
| Basque Country, Spain | ○ | ● | 45 (4.9) | 41 (5.5) | 25 (4.0) | 13 (3.5) | 9 (2.9) | 10 (2.8) |
| Indiana State, US | ● | ○ | -- | -- | -- | -- | -- | -- |
| Ontario Province, Can. | ● | ○ | 25 (4.7) | 46 (4.6) | 13 (3.3) | 14 (3.2) | 56 (4.8) | 72 (4.8) |
| Quebec Province, Can. | ● | ○ | 56 (4.5) | 74 (3.9) | 15 (3.7) | 14 (3.4) | r 23 (3.7) | r 22 (3.1) |

Country reported No. for the particular option
Country reported Yes for the particular option
SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators and by teachers.

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

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

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

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

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

Exhibit 6.5: Preparation to Teach Science

SCIENCE
Grade 4

| Countries | Teachers Receive Specific Preparation in How to Teach the Intended Science Curriculum | | Teachers' Major Area of Study in Their Postsecondary Education | | | | |
|----------------------------------|---|---------------------------------|--|---|--|--|---------------------|
| | | | Primary / Elementary Education with a Major or Specialization in Science | Primary / Elementary Education with a Major or Specialization in Mathematics but Not in Science | Science or Mathematics Major or Specialization without a Major in Primary / Elementary Education | Primary / Elementary Education without a Major or Specialization in Science or Mathematics | Other |
| | As Part of Pre-Service Education | As Part of In-Service Education | Percent of Students | Percent of Students | Percent of Students | Percent of Students | Percent of Students |
| Armenia | ● | ● | 13 (3.2) | 2 (1.4) | 77 (4.4) | 3 (2.0) | 5 (1.8) |
| Australia | ● | ● | 14 (2.9) | 9 (2.6) | 1 (0.5) | 72 (4.1) | 4 (1.4) |
| Belgium (Flemish) | ● | ● | 25 (3.5) | 11 (2.4) | 2 (1.2) | 59 (3.2) | 2 (0.7) |
| Chinese Taipei | ● | ● | 30 (3.8) | 4 (1.6) | 17 (3.4) | 28 (3.2) | 22 (3.6) |
| Cyprus | ● | ○ | 20 (3.5) | 12 (2.3) | 2 (1.3) | 66 (4.2) | 0 (0.0) |
| England | ● | ○ | 8 (2.6) | 7 (3.0) | 5 (1.8) | 64 (4.3) | 16 (2.7) |
| Hong Kong, SAR | ● | ● | 22 (3.8) | 6 (2.7) | 8 (2.4) | 43 (5.1) | 21 (3.9) |
| Hungary | ● | ● | x x | x x | x x | x x | x x |
| Iran, Islamic Rep. of | ● | ● | 47 (5.7) | 6 (2.5) | 5 (2.5) | 32 (5.2) | 11 (2.8) |
| Italy | ○ | ● | 0 (0.0) | 0 (0.0) | 6 (1.8) | 5 (2.1) | 88 (2.8) |
| Japan | ● | ● | 14 (3.0) | 6 (2.1) | 3 (1.4) | 54 (4.1) | 23 (3.6) |
| Latvia | ● | ● | 57 (4.5) | 4 (1.6) | 5 (1.9) | 24 (3.5) | 10 (3.1) |
| Lithuania | ● | ● | 13 (2.4) | 2 (1.0) | 3 (1.0) | 78 (3.2) | 4 (1.3) |
| Moldova, Rep. of | ○ | ○ | 48 (4.3) | 5 (1.8) | 5 (1.7) | 32 (4.4) | 10 (2.5) |
| Morocco | ● | ● | x x | x x | x x | x x | x x |
| Netherlands | ● | ● | 13 (2.8) | 9 (2.7) | -- | 76 (3.7) | 2 (1.7) |
| New Zealand | ● | ● | 17 (2.6) | 13 (2.1) | 1 (0.6) | 63 (3.2) | 5 (1.4) |
| Norway | ○ | ○ | -- | -- | -- | -- | -- |
| Philippines | ● | ● | 13 (2.7) | 18 (3.6) | 4 (2.2) | 54 (4.3) | 11 (2.9) |
| Russian Federation | ● | ● | 52 (4.0) | 7 (2.0) | 1 (0.8) | 35 (3.7) | 5 (1.6) |
| Scotland | ● | ● | 6 (2.0) | 7 (2.2) | 1 (0.1) | 79 (3.6) | 7 (2.3) |
| Singapore | ● | ● | 32 (3.7) | 19 (3.1) | 15 (2.6) | 23 (3.4) | 12 (2.8) |
| Slovenia | ● | ● | 35 (4.4) | 2 (1.2) | 0 (0.0) | 63 (4.4) | 0 (0.0) |
| Tunisia | ● | ● | 14 (2.8) | 1 (0.0) | 6 (1.8) | 67 (4.1) | 12 (2.7) |
| United States | -- | -- | 8 (1.7) | 5 (1.5) | 3 (1.0) | 73 (2.9) | 10 (1.8) |
| International Avg. | | | 23 (0.7) | 7 (0.5) | 8 (0.4) | 50 (0.8) | 13 (0.5) |
| Benchmarking Participants | | | | | | | |
| Indiana State, US | ● | ○ | -- | -- | -- | -- | -- |
| Ontario Province, Can. | ● | ○ | 8 (2.1) | 3 (1.8) | 5 (2.1) | 63 (5.1) | 21 (3.9) |
| Quebec Province, Can. | ● | ○ | 12 (2.8) | 4 (1.6) | 3 (1.4) | 69 (4.1) | 12 (2.8) |

● Country reported Yes for the particular option

○ Country reported No for the particular option

Background data provided by National Research Coordinators and by teachers.

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

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

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

Exhibit 6.6: Teachers' Major Area of Study in Science



| Countries | Percentage of Students Taught by Teachers Having Major Area of Study in Sciences in Their Postsecondary Education ¹ | | | |
|---------------------------|--|-----------------|-----------------|-----------------|
| | Biology | Physics | Chemistry | Earth Science |
| Armenia | r 31 (1.7) | r 30 (1.6) | r 33 (1.7) | r 20 (1.2) |
| Australia | r 60 (3.6) | r 24 (3.0) | r 52 (3.8) | -- |
| Bahrain | 52 (3.1) | 19 (2.8) | 70 (2.9) | 3 (1.0) |
| Belgium (Flemish) | 63 (3.2) | 37 (3.3) | 43 (3.4) | 54 (3.4) |
| Botswana | 72 (4.3) | 55 (4.9) | 71 (4.1) | 12 (3.1) |
| Bulgaria | r 39 (1.6) | r 40 (1.7) | r 55 (2.1) | r 27 (1.4) |
| Chile | 35 (3.8) | 18 (2.9) | 25 (3.1) | 9 (2.1) |
| Chinese Taipei | 25 (3.9) | 67 (3.9) | 75 (3.7) | 22 (3.0) |
| Cyprus | 26 (0.8) | 45 (1.1) | 46 (0.8) | 18 (0.7) |
| Egypt | 65 (3.4) | 81 (3.0) | 85 (3.0) | 36 (4.0) |
| Estonia | 42 (2.2) | 31 (1.6) | 38 (2.0) | 31 (2.4) |
| Ghana | 49 (5.4) | 48 (5.3) | 46 (5.4) | 12 (3.0) |
| Hong Kong, SAR | 37 (4.2) | 34 (4.1) | 37 (4.8) | 2 (1.4) |
| Hungary | 39 (1.7) | 20 (1.3) | 26 (1.5) | 33 (1.4) |
| Indonesia | 51 (2.9) | 37 (2.8) | 11 (2.3) | 4 (1.4) |
| Iran, Islamic Rep. of | 10 (2.5) | 7 (1.9) | 9 (2.4) | 7 (2.0) |
| Israel | 75 (2.8) | 30 (3.0) | 57 (3.4) | 15 (2.6) |
| Italy | 54 (3.5) | 6 (1.8) | 3 (1.1) | 5 (1.6) |
| Japan | 35 (4.3) | 33 (3.4) | 42 (4.4) | 29 (3.6) |
| Jordan | 18 (3.5) | 21 (3.6) | 27 (3.8) | 7 (2.3) |
| Korea, Rep. of | r 35 (3.3) | r 27 (3.5) | r 25 (2.9) | r 9 (1.7) |
| Latvia | 58 (1.7) | 44 (1.7) | 62 (1.9) | -- |
| Lebanon | 60 (3.3) | 44 (3.0) | 51 (3.2) | 27 (3.3) |
| Lithuania | 38 (1.5) | 30 (1.2) | 30 (1.6) | 22 (1.4) |
| Macedonia, Rep. of | 38 (1.3) | 27 (0.9) | 44 (1.7) | 25 (0.6) |
| Malaysia | 29 (3.8) | 16 (3.3) | 19 (3.5) | 7 (2.3) |
| Moldova, Rep. of | r 41 (2.3) | r 34 (2.3) | r 29 (2.3) | r 31 (2.2) |
| Morocco | 44 (2.2) | 54 (2.4) | 47 (2.9) | 39 (2.6) |
| Netherlands | r 29 (1.9) | r 16 (2.3) | r 16 (2.2) | r 27 (1.7) |
| New Zealand | 59 (4.6) | 31 (4.3) | 53 (5.9) | 12 (2.7) |
| Norway | r 32 (4.5) | r 16 (3.3) | r 23 (4.1) | r 11 (3.2) |
| Palestinian Nat'l Auth. | 34 (4.3) | 12 (3.1) | 19 (3.7) | 1 (0.0) |
| Philippines | r 72 (4.0) | r 7 (2.6) | r 18 (3.5) | -- |
| Romania | 24 (1.0) | 38 (1.6) | 33 (1.7) | 22 (0.7) |
| Russian Federation | 48 (1.4) | 26 (0.6) | 42 (1.2) | 30 (1.1) |
| Saudi Arabia | 78 (4.4) | 42 (5.1) | 54 (6.2) | 21 (3.5) |
| Scotland | s 50 (3.1) | s 44 (3.0) | s 59 (3.1) | s 12 (2.1) |
| Serbia | 30 (1.1) | 32 (1.1) | 44 (1.3) | 26 (0.5) |
| Singapore | 47 (2.7) | 51 (2.4) | 63 (2.6) | 2 (0.9) |
| Slovak Republic | -- | 29 (1.0) | 37 (1.4) | 18 (1.5) |
| Slovenia | 58 (1.6) | 34 (1.7) | 57 (1.9) | 0 (0.1) |
| South Africa | r 53 (4.1) | r 37 (3.7) | r 27 (3.6) | r 16 (3.2) |
| Sweden | 61 (3.1) | 53 (3.2) | 64 (3.1) | 20 (2.6) |
| Tunisia | 81 (3.3) | 10 (2.6) | 22 (3.3) | 65 (3.7) |
| United States | 46 (3.3) | r 14 (2.3) | r 25 (2.7) | r 22 (2.3) |
| ‡ England | s 59 (4.1) | s 39 (4.5) | s 47 (4.8) | s 16 (3.8) |
| International Avg. | 46 (0.5) | 32 (0.4) | 40 (0.5) | 19 (0.4) |
| Basque Country, Spain | 26 (4.7) | 12 (3.6) | 19 (4.2) | 6 (2.5) |
| Indiana State, US | -- | -- | -- | -- |
| Ontario Province, Can. | 36 (5.0) | 12 (3.6) | 13 (3.3) | 18 (3.8) |
| Quebec Province, Can. | 52 (4.0) | 17 (3.4) | 32 (4.1) | r 15 (3.3) |

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

Background data provided by teachers.

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

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

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

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

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

average, 46 percent of students were taught by teachers majoring in biology, 40 percent by chemistry majors, 32 percent by physics majors, and just 19 percent by teachers majoring in earth science.

In today's fast-paced world of frequent important discoveries and new technologies in the fields of pedagogy and science, it is very important for teachers to continually update their knowledge. To provide context for considering this important part of teacher training in the TIMSS countries, Exhibits 6.7 through 6.9 contain information about teachers' opportunities for and participation in professional development activities.

Exhibit 6.7 presents schools' reports about the opportunities provided to teachers in five major areas: supporting implementation of the official curriculum, supporting school-level goals, improving content knowledge, improving teaching skills, and using technology. Within each area, schools reported the frequency of teachers' involvement. At both grades, schools reported that their professional development programs emphasized improving content knowledge and teaching skills. About 80 percent of the students were taught science by teachers having a least some professional development training in these areas.

Exhibit 6.8 presents teachers' reports about their professional development participation in six different aspects of science teaching. The results were relatively consistent across the six topics – content, pedagogy, curriculum, technology, critical thinking/inquiry skills, and assessment. At the eighth grade, from 45 to 58 percent of the students, on average, internationally, were taught by teachers having participated in professional development in the area during the past two years. The highest percentage (58%) was for science content. At the fourth grade, on average, the percentages were somewhat lower, ranging from 27 to 37 percent. The highest percentages were for content and pedagogy (37% each). The lowest percentage was for integrating information technology into science (27%).

Because opportunities for professional development do not necessarily have to be structured by the school, teachers also were asked

Exhibit 6.7: Professional Development Opportunities for Teachers in Mathematics and Science



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

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

Background data provided by schools.

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

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

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

Exhibit 6.7: Professional Development Opportunities for Teachers in Mathematics and Science (Continued...)


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

Background data provided by schools.

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

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

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

Exhibit 6.7: Professional Development Opportunities for Teachers in Mathematics and Science (...Continued)

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

Background data provided by schools.

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

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

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

Exhibit 6.7: Professional Development Opportunities for Teachers in Mathematics and Science (Continued...)

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

Background data provided by schools.

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

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

Exhibit 6.7: Professional Development Opportunities for Teachers in Mathematics and Science (...Continued)


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

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

Background data provided by schools.

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

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

Exhibit 6.7: Professional Development Opportunities for Teachers in Mathematics and Science

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

Background data provided by schools.

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

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

Exhibit 6.8: Teachers' Participation in Professional Development in Science



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

| Countries | Percentage of Students by Their Teachers' Participation in Professional Development in Science in the Past Two Years | | | | | | | | | | | |
|----------------------------------|--|-------------------------------|--------------------|---|---|--------------------|---|-----------------|---|-----------------|---|-----------------|
| | Science Content | Science Pedagogy/ Instruction | Science Curriculum | Integrating Information Technology into Science | Improving Students' Critical Thinking or Inquiry Skills | Science Assessment | | | | | | |
| Armenia | r | 19 (1.8) | r | 34 (3.0) | r | 27 (2.6) | r | 14 (1.8) | r | 35 (2.3) | r | 32 (2.7) |
| Australia | r | 69 (3.7) | r | 57 (4.1) | r | 71 (3.1) | r | 64 (3.7) | r | 53 (4.2) | r | 60 (3.9) |
| Bahrain | | 66 (3.1) | | 68 (3.5) | | 50 (3.8) | | 62 (4.0) | | 41 (3.5) | | 52 (3.4) |
| Belgium (Flemish) | | 47 (3.1) | | 35 (3.2) | | 44 (3.3) | | 50 (3.3) | | 11 (2.0) | | 15 (2.2) |
| Botswana | | 27 (3.4) | | 22 (3.6) | | 10 (2.7) | | 18 (3.5) | | 32 (3.8) | | 33 (4.2) |
| Bulgaria | r | 22 (2.6) | r | 23 (2.7) | r | 25 (3.0) | r | 11 (1.9) | r | 19 (2.9) | r | 17 (2.5) |
| Chile | | 69 (3.4) | | 65 (3.1) | | 45 (3.4) | | 39 (3.6) | | 40 (4.0) | | 46 (3.9) |
| Chinese Taipei | | 82 (3.3) | | 74 (3.9) | | 78 (3.5) | | 82 (3.0) | | 38 (3.5) | | 59 (4.0) |
| Cyprus | | 61 (1.4) | | 59 (1.0) | | 56 (1.4) | | 59 (1.0) | | 46 (1.4) | | 38 (0.9) |
| Egypt | | 41 (4.6) | | 56 (4.1) | | 27 (4.0) | | 49 (4.2) | | 66 (4.2) | | 66 (4.3) |
| Estonia | | 66 (2.8) | | 71 (2.2) | | 65 (2.7) | | 70 (2.5) | | 39 (2.4) | | 33 (2.5) |
| Ghana | | 50 (5.3) | | 39 (4.4) | | 45 (4.9) | | 30 (4.7) | | 44 (4.9) | | 53 (5.1) |
| Hong Kong, SAR | | 79 (3.6) | | 69 (4.2) | | 67 (3.9) | | 68 (4.3) | | 61 (4.5) | | 45 (4.2) |
| Hungary | | 53 (2.7) | | 41 (2.6) | | 48 (2.6) | | 16 (1.8) | | 23 (2.3) | | 23 (2.3) |
| Indonesia | | 60 (3.4) | | 66 (3.3) | | 54 (3.4) | | 29 (3.6) | | 51 (3.6) | | 53 (3.4) |
| Iran, Islamic Rep. of | | 81 (3.0) | | 89 (2.6) | | 32 (3.8) | | 49 (3.9) | | 62 (4.1) | | x x |
| Israel | | 68 (3.7) | | 56 (3.6) | | 61 (3.8) | | 64 (3.5) | | 65 (3.9) | | 60 (3.4) |
| Italy | | 35 (3.4) | | 24 (3.0) | | 11 (2.3) | | 24 (3.2) | | 8 (1.9) | | 10 (2.3) |
| Japan | | 77 (3.4) | | 66 (3.7) | | 53 (3.8) | | 33 (4.0) | | 18 (3.0) | | 62 (3.8) |
| Jordan | | 51 (4.6) | | 68 (4.2) | | 46 (4.8) | | 39 (4.3) | | 63 (4.2) | | 54 (4.1) |
| Korea, Rep. of | r | 49 (3.8) | r | 35 (3.5) | r | 40 (3.4) | r | 44 (3.8) | r | 27 (3.2) | r | 24 (2.9) |
| Latvia | r | 67 (2.6) | r | 66 (2.9) | r | 70 (2.5) | r | 55 (2.9) | r | 49 (3.7) | r | 64 (2.4) |
| Lebanon | | 65 (3.2) | | 63 (3.9) | | 66 (3.4) | | 41 (3.5) | | 58 (3.3) | | 70 (3.3) |
| Lithuania | | 74 (1.9) | | 61 (2.3) | | 71 (2.0) | | 70 (2.3) | | 44 (2.6) | | 53 (2.8) |
| Macedonia, Rep. of | | 64 (2.5) | | 53 (2.7) | | 66 (2.5) | | 18 (2.1) | | 49 (2.6) | | 39 (3.0) |
| Malaysia | | 67 (4.1) | | 71 (3.8) | | 67 (4.1) | | 53 (4.5) | | 70 (3.9) | | 33 (4.1) |
| Moldova, Rep. of | r | 34 (3.3) | r | 38 (2.5) | r | 43 (2.9) | r | 37 (3.1) | r | 66 (2.7) | r | 65 (3.1) |
| Morocco | | 29 (4.6) | | 58 (6.1) | | 37 (5.6) | | 23 (3.8) | | 63 (5.0) | | 60 (5.2) |
| Netherlands | r | 42 (2.9) | r | 37 (3.2) | r | 13 (1.8) | r | 35 (2.8) | r | 33 (3.7) | r | 9 (2.0) |
| New Zealand | | 72 (5.0) | | 46 (5.3) | | 79 (3.6) | | 52 (5.1) | | 45 (4.2) | | 84 (3.6) |
| Norway | | 20 (2.7) | | 18 (2.9) | | 9 (2.7) | | 16 (3.1) | | 4 (1.6) | | 8 (2.4) |
| Palestinian Nat'l Auth. | | 85 (3.1) | | 88 (2.9) | | 85 (3.2) | | 52 (4.5) | | 61 (4.2) | | 68 (3.9) |
| Philippines | | 79 (3.5) | | 68 (3.8) | | 66 (4.4) | | 56 (5.0) | | 72 (4.4) | | 57 (4.6) |
| Romania | | 51 (2.6) | | 62 (5.2) | | 51 (2.9) | | 37 (2.6) | | 42 (2.4) | | 61 (2.5) |
| Russian Federation | | 60 (3.0) | | 68 (2.9) | | 70 (2.2) | | 50 (2.9) | | 36 (2.7) | | 46 (2.1) |
| Saudi Arabia | | 39 (5.2) | | 49 (6.7) | | 34 (6.0) | | 14 (3.9) | | 34 (6.4) | | 29 (3.5) |
| Scotland | s | 65 (3.0) | s | 67 (2.7) | s | 56 (2.8) | s | 68 (2.9) | s | 50 (3.5) | s | 44 (2.9) |
| Serbia | | 75 (2.1) | | 63 (2.5) | | 67 (2.0) | | 42 (2.8) | | 39 (2.8) | | 48 (2.5) |
| Singapore | | 79 (2.0) | | 76 (2.6) | | 66 (2.7) | | 82 (2.3) | | 63 (2.4) | | 70 (2.2) |
| Slovak Republic | | 67 (2.8) | | 47 (3.4) | | 52 (2.9) | | 43 (2.5) | | 30 (2.4) | | 35 (2.5) |
| Slovenia | | 90 (1.6) | | 71 (2.5) | | 74 (2.4) | | 61 (2.9) | | 55 (2.5) | | 76 (2.3) |
| South Africa | r | 64 (3.8) | r | 40 (3.9) | r | 55 (4.1) | r | 39 (3.8) | r | 52 (3.9) | r | 67 (4.0) |
| Sweden | | 48 (3.3) | | 40 (3.3) | | 26 (2.9) | | 20 (2.5) | | 27 (2.9) | | 22 (2.8) |
| Tunisia | | 29 (4.0) | | 56 (4.2) | | 42 (4.2) | | 28 (3.4) | | 48 (4.2) | | 54 (4.0) |
| United States | | 82 (2.3) | | 65 (3.2) | | 85 (2.0) | | 80 (2.7) | | 77 (2.6) | | 65 (2.6) |
| ‡ England | s | 67 (4.7) | s | 82 (3.6) | s | 73 (3.8) | s | 64 (5.0) | s | 54 (4.5) | s | 59 (4.2) |
| International Avg. | | 58 (0.5) | | 56 (0.5) | | 52 (0.5) | | 45 (0.5) | | 45 (0.5) | | 47 (0.5) |
| Benchmarking Participants | | | | | | | | | | | | |
| Basque Country, Spain | | 21 (4.4) | | 43 (5.0) | | 33 (4.4) | | 50 (5.3) | | 27 (4.9) | | 34 (4.6) |
| Indiana State, US | s | 81 (5.4) | s | 75 (4.4) | s | 80 (4.8) | s | 90 (2.4) | s | 80 (5.0) | s | 54 (6.1) |
| Ontario Province, Can. | | 70 (4.1) | | 62 (5.0) | | 74 (4.2) | | 53 (5.5) | | 53 (4.4) | | 53 (4.3) |
| Quebec Province, Can. | r | 35 (4.4) | r | 43 (4.3) | r | 35 (4.5) | r | 42 (5.0) | r | 36 (4.7) | r | 17 (3.8) |

Background data provided by teachers.

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

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

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

Exhibit 6.8: Teachers' Participation in Professional Development in Science

| Countries | Percentage of Students by Their Teachers' Participation in Professional Development in Science in the Past Two Years | | | | | |
|----------------------------------|--|-------------------------------|--------------------|---|---|--------------------|
| | Science Content | Science Pedagogy/ Instruction | Science Curriculum | Integrating Information Technology into Science | Improving Students' Critical Thinking or Problem Solving Skills | Science Assessment |
| Armenia | x x | x x | x x | x x | x x | x x |
| Australia | 38 (4.2) | 27 (4.0) | 44 (4.2) | 27 (4.0) | 41 (4.5) | 21 (3.9) |
| Belgium (Flemish) | 18 (2.7) | 20 (2.7) | 4 (1.4) | 10 (2.4) | 17 (3.0) | 6 (1.6) |
| Chinese Taipei | 64 (4.1) | 67 (4.2) | 63 (3.9) | 67 (3.7) | 39 (4.2) | 45 (4.3) |
| Cyprus | 46 (4.8) | 52 (4.3) | 21 (3.7) | 35 (4.2) | 40 (4.4) | 15 (3.4) |
| England | r 43 (4.8) | r 47 (4.9) | r 47 (5.1) | r 31 (4.9) | r 37 (4.9) | r 30 (4.3) |
| Hong Kong, SAR | 38 (4.3) | 31 (4.2) | 28 (4.0) | 51 (5.1) | 47 (4.6) | 26 (4.3) |
| Hungary | 21 (3.7) | 21 (3.7) | 13 (3.2) | 6 (2.1) | 19 (3.6) | 10 (2.8) |
| Iran, Islamic Rep. of | 46 (4.9) | 52 (4.6) | 33 (4.5) | 20 (4.0) | 31 (4.2) | 39 (4.4) |
| Italy | 22 (2.9) | 15 (2.3) | 10 (2.0) | 11 (2.3) | 5 (1.2) | 5 (1.3) |
| Japan | 37 (3.8) | 42 (3.8) | 17 (2.7) | 19 (3.3) | 10 (2.1) | 19 (2.9) |
| Latvia | 47 (4.8) | 50 (5.0) | 47 (4.8) | 22 (3.9) | 57 (4.0) | 54 (4.9) |
| Lithuania | 22 (3.0) | 36 (3.4) | 18 (2.8) | 26 (3.7) | 50 (4.1) | 34 (3.8) |
| Moldova, Rep. of | 28 (4.3) | 37 (4.4) | 37 (4.5) | 36 (4.5) | 53 (4.9) | 60 (4.4) |
| Morocco | x x | x x | x x | x x | x x | x x |
| Netherlands | 4 (1.9) | 9 (2.5) | 2 (1.3) | 8 (2.9) | 10 (2.7) | 5 (2.0) |
| New Zealand | r 33 (3.1) | r 22 (2.9) | r 36 (3.2) | r 29 (3.5) | r 41 (3.5) | r 26 (2.9) |
| Norway | 9 (1.8) | 6 (1.9) | 7 (1.8) | 4 (1.1) | 4 (1.2) | 2 (0.9) |
| Philippines | 70 (4.5) | 51 (4.9) | 74 (4.3) | 52 (5.0) | 62 (4.5) | 61 (4.7) |
| Russian Federation | 46 (3.4) | 51 (3.3) | 56 (4.3) | 27 (3.3) | 32 (4.1) | 45 (4.1) |
| Scotland | r 38 (4.7) | r 44 (5.1) | r 39 (4.5) | s 21 (4.6) | r 24 (4.4) | r 20 (4.6) |
| Singapore | 54 (4.4) | 59 (3.9) | 45 (3.7) | 48 (3.6) | 51 (3.8) | 41 (4.2) |
| Slovenia | 74 (3.7) | 58 (4.7) | 63 (4.2) | 34 (4.1) | 45 (4.3) | 55 (4.5) |
| Tunisia | 10 (2.7) | 27 (4.0) | 19 (3.8) | 7 (2.3) | 30 (3.8) | 33 (4.0) |
| United States | 48 (2.8) | 38 (3.1) | r 51 (3.0) | 35 (2.6) | 43 (3.0) | 34 (3.1) |
| International Avg. | 37 (0.8) | 37 (0.8) | 34 (0.8) | 27 (0.8) | 34 (0.8) | 30 (0.8) |
| Benchmarking Participants | | | | | | |
| Indiana State, US | 21 (4.0) | 21 (4.4) | 30 (4.9) | 19 (3.8) | 33 (4.4) | 18 (3.8) |
| Ontario Province, Can. | 32 (4.6) | 23 (3.8) | 41 (4.6) | 27 (4.6) | 31 (4.6) | 30 (4.4) |
| Quebec Province, Can. | 38 (4.4) | 37 (4.3) | 44 (4.4) | 24 (4.0) | 24 (4.2) | 11 (2.6) |

Background data provided by teachers.

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

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

Exhibit 6.9: Types of Interactions Among Science Teachers



| Countries | Percentage of Students by Their Teachers' Interactions with Other Teachers | | | | | | | |
|----------------------------------|--|------------------------|-----------------------|--|------------------------|-----------------------|-----------------|-----------------|
| | Discussion About How to Teach a Particular Concept | | | Working on Preparing Instructional Materials | | | | |
| | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never | | |
| Armenia | r | 50 (3.0) | 44 (3.0) | 7 (1.3) | r | 29 (2.3) | 49 (2.6) | 22 (2.3) |
| Australia | r | 54 (3.5) | 37 (3.2) | 9 (2.0) | r | 51 (3.9) | 30 (3.4) | 19 (3.2) |
| Bahrain | | 64 (2.5) | 33 (2.5) | 3 (1.5) | | 70 (3.0) | 26 (3.5) | 5 (1.7) |
| Belgium (Flemish) | | 36 (3.2) | 46 (3.0) | 18 (2.4) | | 19 (2.3) | 39 (3.1) | 42 (3.2) |
| Botswana | | 60 (4.7) | 34 (4.4) | 6 (2.2) | | 66 (4.1) | 28 (3.7) | 6 (2.2) |
| Bulgaria | r | 44 (2.9) | 41 (2.5) | 14 (2.1) | r | 59 (3.1) | 33 (2.7) | 8 (1.6) |
| Chile | | 40 (3.6) | 33 (3.8) | 28 (3.4) | | 39 (3.3) | 27 (3.4) | 34 (3.9) |
| Chinese Taipei | | 45 (4.5) | 47 (4.6) | 8 (2.4) | | 15 (3.3) | 49 (4.1) | 36 (4.0) |
| Cyprus | | 61 (1.0) | 31 (0.9) | 8 (0.6) | | 58 (1.3) | 33 (1.3) | 8 (1.0) |
| Egypt | | 89 (2.8) | 11 (2.8) | 1 (0.0) | | 73 (3.5) | 24 (3.7) | 3 (1.4) |
| Estonia | | 49 (2.6) | 44 (2.4) | 7 (1.5) | | 35 (2.1) | 49 (2.2) | 16 (1.6) |
| Ghana | | 39 (4.8) | 36 (4.4) | 25 (4.0) | | 44 (4.2) | 32 (4.2) | 23 (3.7) |
| Hong Kong, SAR | | 32 (3.9) | 57 (4.1) | 10 (3.0) | | 15 (3.3) | 51 (4.7) | 34 (4.8) |
| Hungary | | 38 (2.4) | 53 (2.3) | 9 (1.3) | | 48 (2.8) | 40 (2.5) | 12 (1.3) |
| Indonesia | | 45 (3.3) | 50 (3.3) | 5 (1.5) | | 68 (3.0) | 29 (3.1) | 3 (1.0) |
| Iran, Islamic Rep. of | | 43 (4.2) | 54 (4.2) | 3 (1.5) | | 44 (3.9) | 42 (3.7) | 14 (2.8) |
| Israel | | 40 (3.6) | 49 (3.7) | 11 (2.0) | | 38 (4.0) | 50 (4.1) | 11 (2.1) |
| Italy | | 33 (3.4) | 46 (3.8) | 21 (2.9) | | 23 (3.1) | 44 (3.3) | 33 (3.4) |
| Japan | | 29 (3.3) | 51 (4.0) | 20 (3.1) | | 18 (3.3) | 40 (3.8) | 42 (4.0) |
| Jordan | | 66 (4.4) | 29 (4.4) | 5 (2.0) | | 51 (4.6) | 43 (4.9) | 5 (2.0) |
| Korea, Rep. of | r | 36 (3.7) | 41 (3.8) | 23 (3.5) | r | 51 (3.8) | 39 (3.5) | 10 (2.5) |
| Latvia | | 36 (2.7) | 54 (2.9) | 10 (1.4) | | 25 (2.4) | 56 (2.9) | 20 (2.8) |
| Lebanon | | 43 (3.4) | 41 (3.3) | 16 (2.2) | | 46 (3.7) | 41 (3.9) | 13 (2.2) |
| Lithuania | | 25 (1.8) | 59 (2.3) | 15 (1.6) | | 33 (2.2) | 48 (2.3) | 18 (1.9) |
| Macedonia, Rep. of | | 53 (2.4) | 41 (2.4) | 6 (1.0) | | 54 (2.7) | 38 (2.5) | 7 (1.4) |
| Malaysia | | 64 (4.6) | 34 (4.5) | 2 (1.3) | | 41 (4.4) | 47 (4.1) | 13 (3.0) |
| Moldova, Rep. of | | 60 (2.2) | 31 (2.4) | 9 (1.4) | | 61 (2.8) | 30 (2.5) | 10 (1.6) |
| Morocco | | 29 (4.5) | 38 (2.8) | 32 (4.4) | | 32 (4.4) | 35 (5.9) | 33 (5.5) |
| Netherlands | | 24 (2.2) | 47 (3.2) | 29 (2.8) | | 18 (2.3) | 44 (2.9) | 39 (2.9) |
| New Zealand | | 60 (4.4) | 34 (4.7) | 7 (2.3) | | 48 (4.7) | 42 (4.7) | 10 (2.2) |
| Norway | | 51 (4.5) | 42 (4.2) | 7 (2.2) | | 29 (4.1) | 52 (4.8) | 19 (3.6) |
| Palestinian Nat'l Auth. | | 74 (3.8) | 22 (3.4) | 4 (1.8) | | 66 (3.8) | 31 (3.8) | 3 (1.4) |
| Philippines | | 60 (4.4) | 32 (4.2) | 8 (2.7) | | 62 (4.5) | 30 (4.3) | 8 (2.6) |
| Romania | | 54 (2.6) | 43 (2.5) | 3 (0.8) | | 70 (2.1) | 24 (1.7) | 6 (1.4) |
| Russian Federation | | 49 (2.8) | 47 (2.6) | 4 (0.8) | | 47 (2.6) | 43 (2.1) | 10 (1.4) |
| Saudi Arabia | | 57 (5.4) | 30 (5.7) | 13 (4.4) | | 59 (4.4) | 31 (4.3) | 10 (2.6) |
| Scotland | s | 40 (3.4) | 42 (3.3) | 18 (2.4) | s | 36 (2.7) | 43 (3.0) | 21 (2.5) |
| Serbia | | 48 (2.6) | 44 (2.6) | 9 (1.3) | | 39 (2.3) | 49 (2.4) | 12 (1.6) |
| Singapore | | 39 (2.2) | 50 (2.2) | 11 (1.5) | | 41 (2.7) | 36 (2.6) | 23 (2.1) |
| Slovak Republic | | 39 (2.7) | 48 (2.8) | 13 (1.9) | | 43 (2.9) | 41 (2.8) | 16 (1.7) |
| Slovenia | | 43 (2.5) | 41 (2.9) | 16 (2.1) | | 16 (2.1) | 40 (2.4) | 44 (2.7) |
| South Africa | | 53 (3.8) | 37 (3.5) | 10 (2.2) | | 67 (3.4) | 24 (3.1) | 9 (2.4) |
| Sweden | | 60 (3.2) | 31 (2.8) | 9 (1.9) | | 50 (2.7) | 31 (2.5) | 19 (2.5) |
| Tunisia | | 58 (3.9) | 35 (4.0) | 7 (1.6) | | 25 (3.8) | 34 (3.9) | 41 (4.2) |
| United States | | 42 (3.0) | 36 (3.3) | 21 (2.8) | | 42 (3.1) | 35 (2.9) | 22 (2.7) |
| ‡ England | s | 54 (4.8) | 34 (4.1) | 12 (3.0) | s | 41 (4.2) | 38 (4.7) | 21 (4.3) |
| International Avg. | | 48 (0.5) | 40 (0.5) | 12 (0.3) | | 44 (0.5) | 38 (0.5) | 18 (0.4) |
| Benchmarking Participants | | | | | | | | |
| Basque Country, Spain | | 55 (5.4) | 29 (4.7) | 16 (3.9) | | 46 (5.1) | 39 (5.3) | 15 (3.8) |
| Indiana State, US | | 42 (6.1) | 42 (5.4) | 16 (4.5) | | 41 (6.5) | 35 (6.8) | 24 (5.0) |
| Ontario Province, Can. | | 42 (4.4) | 40 (4.6) | 18 (3.3) | | 34 (4.7) | 43 (4.9) | 23 (3.7) |
| Quebec Province, Can. | | 40 (4.4) | 35 (4.7) | 25 (4.5) | | 32 (4.5) | 43 (4.5) | 25 (4.2) |

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

Background data provided by teachers.

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

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

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

Exhibit 6.9: Types of Interactions Among Science Teachers (Continued...)



| Countries | Percentage of Students by Their Teachers' Interactions with Other Teachers | | | | | |
|----------------------------------|--|------------------------|-----------------------|---|------------------------|-----------------------|
| | Visit to Another Teacher's Classroom to Observe Teaching | | | Informal Observations of Their Classroom by Another Teacher | | |
| | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never |
| Armenia | r 24 (2.1) | 61 (2.7) | 15 (2.2) | r 13 (1.6) | 63 (2.4) | 24 (2.7) |
| Australia | r 6 (1.4) | 13 (2.3) | 81 (2.7) | r 5 (1.6) | 19 (2.8) | 75 (2.9) |
| Bahrain | 7 (2.3) | 53 (2.9) | 40 (2.9) | 5 (1.2) | 41 (3.1) | 53 (3.2) |
| Belgium (Flemish) | 1 (0.4) | 1 (0.6) | 98 (0.7) | 4 (1.2) | 5 (1.3) | 91 (1.7) |
| Botswana | 6 (2.0) | 43 (4.7) | 51 (4.6) | 7 (2.3) | 49 (4.4) | 44 (4.5) |
| Bulgaria | r 3 (0.8) | 23 (2.6) | 74 (2.6) | r 2 (0.6) | 19 (2.5) | 79 (2.5) |
| Chile | 7 (2.2) | 12 (2.3) | 81 (2.6) | 14 (3.1) | 17 (2.6) | 69 (3.6) |
| Chinese Taipei | 2 (1.1) | 29 (3.7) | 69 (3.8) | 3 (1.5) | 13 (2.6) | 84 (3.0) |
| Cyprus | 5 (0.5) | 16 (0.8) | 80 (0.8) | 24 (0.9) | 30 (1.1) | 46 (1.2) |
| Egypt | 35 (4.2) | 37 (3.9) | 28 (3.7) | 12 (2.6) | 34 (4.0) | 54 (4.3) |
| Estonia | 2 (0.7) | 32 (2.3) | 66 (2.4) | 2 (0.7) | 30 (2.6) | 68 (2.6) |
| Ghana | 30 (4.0) | 43 (4.4) | 26 (3.4) | 42 (4.8) | 35 (4.2) | 23 (3.8) |
| Hong Kong, SAR | 1 (0.9) | 26 (3.6) | 74 (3.7) | 2 (1.3) | 16 (3.0) | 83 (3.2) |
| Hungary | 3 (0.7) | 43 (2.5) | 54 (2.5) | 1 (0.4) | 23 (2.0) | 77 (2.1) |
| Indonesia | 12 (2.4) | 32 (3.3) | 56 (3.7) | 9 (2.2) | 33 (3.2) | 58 (3.5) |
| Iran, Islamic Rep. of | 3 (1.2) | 15 (2.9) | 82 (2.9) | 3 (1.3) | 25 (3.2) | 72 (3.3) |
| Israel | 2 (0.7) | 7 (1.4) | 91 (1.6) | 4 (1.5) | 14 (2.5) | 82 (2.8) |
| Italy | 2 (1.0) | 3 (1.6) | 95 (1.9) | 11 (2.5) | 15 (2.9) | 75 (3.1) |
| Japan | 4 (1.6) | 18 (3.1) | 78 (3.2) | 4 (1.6) | 10 (2.5) | 86 (2.8) |
| Jordan | 4 (1.7) | 60 (4.4) | 37 (4.3) | 8 (2.8) | 37 (4.4) | 54 (4.3) |
| Korea, Rep. of | r 2 (0.7) | 11 (2.3) | 87 (2.4) | r 2 (0.6) | 8 (2.1) | 90 (2.2) |
| Latvia | 5 (1.1) | 41 (3.1) | 54 (3.0) | 6 (1.2) | 39 (3.3) | 55 (3.1) |
| Lebanon | 9 (2.1) | 23 (3.5) | 69 (3.7) | 12 (2.6) | 36 (3.5) | 52 (3.9) |
| Lithuania | 2 (0.7) | 40 (2.8) | 58 (3.0) | 4 (0.9) | 38 (2.6) | 58 (2.7) |
| Macedonia, Rep. of | r 10 (1.7) | 45 (2.7) | 45 (3.0) | 10 (1.7) | 44 (2.6) | 47 (2.9) |
| Malaysia | 8 (2.3) | 39 (4.3) | 52 (4.2) | 7 (2.2) | 50 (4.1) | 43 (4.2) |
| Moldova, Rep. of | 20 (2.1) | 60 (2.6) | 20 (2.4) | r 15 (2.2) | 50 (2.9) | 35 (3.2) |
| Morocco | 2 (1.5) | 8 (2.3) | 89 (2.8) | 3 (1.7) | 5 (2.3) | 92 (2.7) |
| Netherlands | 2 (0.8) | 9 (2.1) | 89 (2.2) | r 2 (0.8) | 9 (1.8) | 89 (2.0) |
| New Zealand | 6 (2.0) | 30 (5.0) | 64 (5.2) | 13 (3.1) | 39 (5.5) | 48 (6.1) |
| Norway | 11 (3.0) | 11 (2.5) | 78 (3.5) | 22 (3.7) | 12 (2.6) | 66 (4.0) |
| Palestinian Nat'l Auth. | 5 (1.8) | 46 (4.3) | 49 (4.5) | 6 (1.8) | 28 (3.9) | 66 (4.2) |
| Philippines | 8 (2.6) | 41 (4.3) | 50 (4.6) | 13 (2.9) | 59 (4.4) | 28 (4.0) |
| Romania | 7 (1.2) | 61 (2.6) | 32 (2.4) | 37 (2.5) | 41 (2.6) | 22 (2.2) |
| Russian Federation | 12 (1.1) | 74 (2.4) | 14 (1.9) | 8 (1.0) | 60 (1.8) | 32 (2.0) |
| Saudi Arabia | 5 (1.9) | 47 (5.9) | 47 (6.0) | 5 (2.1) | 25 (5.5) | 70 (5.7) |
| Scotland | s 8 (1.9) | 17 (2.2) | 75 (2.7) | s 17 (2.5) | 20 (2.8) | 63 (3.1) |
| Serbia | 10 (1.3) | 29 (2.3) | 61 (2.6) | 10 (1.4) | 29 (2.4) | 60 (2.5) |
| Singapore | 3 (0.9) | 12 (1.6) | 85 (1.8) | 2 (0.8) | 23 (2.3) | 75 (2.4) |
| Slovak Republic | 4 (1.0) | 25 (2.3) | 71 (2.6) | 3 (0.7) | 28 (2.7) | 69 (2.8) |
| Slovenia | 3 (0.9) | 8 (1.5) | 89 (1.6) | 2 (0.7) | 13 (2.1) | 85 (2.1) |
| South Africa | 11 (2.2) | 28 (3.6) | 61 (3.7) | 14 (2.6) | 32 (3.4) | 53 (3.8) |
| Sweden | 4 (1.2) | 11 (2.1) | 85 (2.2) | 5 (1.4) | 12 (2.0) | 83 (2.4) |
| Tunisia | x x | x x | x x | 7 (2.2) | 10 (2.7) | 83 (3.4) |
| United States | 8 (1.6) | 13 (1.9) | 79 (2.3) | 7 (1.5) | 18 (2.2) | 75 (2.4) |
| ‡ England | s 3 (1.0) | 24 (4.0) | 73 (3.9) | s 8 (2.9) | 30 (4.2) | 62 (4.4) |
| International Avg. | 7 (0.3) | 29 (0.5) | 63 (0.5) | 9 (0.3) | 28 (0.5) | 63 (0.5) |
| Benchmarking Participants | | | | | | |
| Basque Country, Spain | 5 (2.6) | 5 (2.5) | 89 (3.5) | 8 (2.9) | 8 (2.4) | 84 (3.3) |
| Indiana State, US | 4 (2.8) | 13 (4.5) | 82 (5.2) | 2 (1.9) | 29 (6.3) | 68 (6.5) |
| Ontario Province, Can. | 5 (1.9) | 12 (3.4) | 83 (3.8) | 7 (2.5) | 12 (3.3) | 81 (4.1) |
| Quebec Province, Can. | 1 (0.7) | 0 (0.1) | 99 (0.7) | 1 (1.3) | 4 (1.8) | 95 (2.2) |

Background data provided by teachers.

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

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

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

Exhibit 6.9: Types of Interactions Among Science Teachers (...Continued)

| Countries | Percentage of Students by Their Teachers' Interactions with Other Teachers | | | | | |
|----------------------------------|--|------------------------|-----------------------|--|------------------------|-----------------------|
| | Discussion About How to Teach a Particular Concept | | | Working on Preparing Instructional Materials | | |
| | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never |
| Armenia | s 44 (5.9) | 50 (5.5) | 6 (2.7) | s 34 (5.7) | 53 (6.0) | 13 (3.7) |
| Australia | 51 (4.2) | 37 (4.8) | 12 (2.7) | 54 (4.6) | 31 (4.9) | 15 (2.9) |
| Belgium (Flemish) | 52 (3.8) | 39 (3.7) | 9 (2.0) | 41 (4.0) | 39 (3.6) | 21 (2.7) |
| Chinese Taipei | 41 (3.7) | 53 (3.8) | 6 (2.0) | 24 (3.3) | 54 (3.7) | 22 (3.2) |
| Cyprus | 58 (4.1) | 29 (3.8) | 13 (3.2) | 61 (3.8) | 28 (3.4) | 11 (2.3) |
| England | r 61 (5.2) | 28 (5.0) | 10 (2.7) | r 62 (4.9) | 20 (4.2) | 17 (3.5) |
| Hong Kong, SAR | 41 (4.5) | 51 (4.7) | 8 (2.4) | 24 (4.3) | 52 (5.0) | 24 (3.8) |
| Hungary | 55 (4.3) | 41 (4.2) | 4 (1.2) | 57 (4.2) | 35 (3.9) | 7 (2.3) |
| Iran, Islamic Rep. of | 62 (4.3) | 35 (4.2) | 3 (1.7) | 64 (4.6) | 31 (4.5) | 5 (2.0) |
| Italy | 47 (3.0) | 42 (3.0) | 11 (2.0) | 55 (3.6) | 32 (3.3) | 13 (2.5) |
| Japan | 46 (4.2) | 40 (4.2) | 14 (2.9) | 39 (3.7) | 42 (4.2) | 20 (2.9) |
| Latvia | 41 (4.3) | 46 (4.4) | 14 (2.9) | 30 (3.9) | 57 (4.4) | 13 (3.1) |
| Lithuania | 60 (3.5) | 33 (3.4) | 7 (1.9) | 68 (3.2) | 27 (3.0) | 5 (1.8) |
| Moldova, Rep. of | 57 (4.3) | 37 (4.2) | 6 (2.0) | 74 (3.3) | 18 (3.1) | 8 (2.2) |
| Morocco | s 22 (3.7) | 40 (5.3) | 38 (4.9) | s 12 (2.9) | 18 (3.3) | 69 (4.0) |
| Netherlands | 42 (4.7) | 42 (4.7) | 16 (3.2) | 25 (4.4) | 44 (4.7) | 32 (4.4) |
| New Zealand | 64 (3.3) | 31 (2.8) | 5 (1.5) | 54 (3.4) | 35 (3.2) | 12 (2.2) |
| Norway | 64 (2.9) | 28 (3.9) | 8 (2.6) | 50 (3.6) | 30 (3.9) | 20 (3.3) |
| Philippines | 58 (5.0) | 38 (5.1) | 3 (1.4) | 71 (4.6) | 26 (4.6) | 3 (1.3) |
| Russian Federation | 55 (3.3) | 43 (3.2) | 2 (1.0) | 46 (3.4) | 48 (3.9) | 6 (1.9) |
| Scotland | r 43 (4.9) | 41 (4.7) | 16 (3.2) | r 39 (4.7) | 37 (4.5) | 24 (3.5) |
| Singapore | 46 (4.4) | 45 (4.5) | 9 (2.5) | 38 (3.8) | 52 (4.0) | 10 (2.6) |
| Slovenia | 64 (4.0) | 30 (3.7) | 6 (2.2) | 38 (4.5) | 45 (4.6) | 17 (3.4) |
| Tunisia | 55 (4.4) | 23 (3.3) | 23 (3.7) | r 29 (3.9) | 29 (3.7) | 42 (4.4) |
| United States | 63 (3.0) | 30 (2.5) | 7 (1.7) | 60 (2.8) | 29 (2.7) | 11 (1.9) |
| International Avg. | 52 (0.8) | 38 (0.8) | 10 (0.5) | 46 (0.8) | 36 (0.8) | 18 (0.6) |
| Benchmarking Participants | | | | | | |
| Indiana State, US | 60 (5.4) | 33 (5.1) | 7 (2.6) | 49 (4.8) | 37 (4.4) | 14 (2.7) |
| Ontario Province, Can. | 46 (4.8) | 45 (4.7) | 9 (2.7) | 47 (5.1) | 33 (4.6) | 20 (3.7) |
| Quebec Province, Can. | 53 (5.0) | 33 (4.4) | 13 (2.9) | 47 (4.7) | 30 (4.4) | 23 (3.6) |

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

Background data provided by teachers.

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

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

Exhibit 6.9: Types of Interactions Among Science Teachers

| Countries | Percentage of Students by Their Teachers' Interactions with Other Teachers | | | | | |
|----------------------------------|--|------------------------|-----------------------|---|------------------------|-----------------------|
| | Visit to Another Teacher's Classroom to Observe Teaching | | | Informal Observations of Their Classroom by Another Teacher | | |
| | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never | At Least Weekly | 2 or 3 Times per Month | Never or Almost Never |
| Armenia | s 17 (4.0) | 78 (4.5) | 5 (2.0) | s 12 (3.5) | 64 (4.8) | 24 (4.8) |
| Australia | 9 (2.3) | 23 (4.0) | 68 (4.3) | 18 (3.6) | 22 (3.5) | 60 (4.3) |
| Belgium (Flemish) | 1 (0.4) | 4 (1.3) | 95 (1.4) | 5 (1.6) | 11 (2.4) | 85 (2.8) |
| Chinese Taipei | 6 (2.0) | 57 (3.9) | 37 (3.7) | 5 (1.9) | 30 (4.0) | 65 (4.3) |
| Cyprus | 7 (2.5) | 28 (3.2) | 65 (3.1) | 30 (4.1) | 42 (4.8) | 28 (4.1) |
| England | r 2 (1.5) | 31 (4.2) | 66 (4.4) | r 3 (1.6) | 39 (4.9) | 58 (4.8) |
| Hong Kong, SAR | 0 (0.0) | 37 (4.3) | 62 (4.3) | 0 (0.2) | 13 (3.2) | 87 (3.2) |
| Hungary | 3 (1.4) | 52 (4.4) | 45 (4.3) | 2 (1.2) | 31 (3.6) | 66 (3.5) |
| Iran, Islamic Rep. of | 12 (3.3) | 35 (4.7) | 54 (5.0) | 9 (2.9) | 43 (5.0) | 48 (5.2) |
| Italy | 8 (1.8) | 12 (2.5) | 80 (2.9) | 9 (1.8) | 15 (2.4) | 76 (3.0) |
| Japan | 4 (1.3) | 47 (3.8) | 49 (3.6) | 9 (2.4) | 21 (3.4) | 69 (3.8) |
| Latvia | 3 (1.5) | 88 (2.8) | 9 (2.4) | r 7 (2.1) | 76 (3.7) | 17 (3.2) |
| Lithuania | 1 (0.6) | 64 (3.7) | 35 (3.7) | 1 (0.7) | 53 (4.1) | 46 (4.1) |
| Moldova, Rep. of | 18 (3.3) | 67 (3.9) | 15 (2.9) | 11 (2.7) | 50 (3.9) | 39 (4.2) |
| Morocco | s 5 (2.9) | 6 (2.7) | 89 (3.8) | s 3 (1.6) | 3 (2.1) | 93 (2.6) |
| Netherlands | 1 (0.9) | 8 (2.8) | 92 (3.0) | 1 (0.9) | 11 (3.2) | 88 (3.3) |
| New Zealand | r 5 (1.6) | 30 (3.2) | 65 (3.1) | r 11 (2.2) | 39 (2.9) | 50 (3.3) |
| Norway | 13 (3.1) | 10 (2.0) | 77 (3.5) | 27 (3.6) | 11 (2.6) | 62 (4.4) |
| Philippines | 18 (3.3) | 38 (4.4) | 44 (4.1) | 22 (4.3) | 48 (5.0) | 30 (4.2) |
| Russian Federation | 12 (2.6) | 83 (2.8) | 5 (1.3) | 9 (2.3) | 63 (3.6) | 28 (3.1) |
| Scotland | r 1 (0.7) | 11 (2.7) | 88 (2.7) | r 11 (2.9) | 29 (5.1) | 61 (5.4) |
| Singapore | 0 (0.5) | 10 (2.3) | 89 (2.3) | 3 (1.5) | 16 (2.9) | 81 (3.3) |
| Slovenia | 0 (0.2) | 11 (2.9) | 88 (2.9) | 1 (0.6) | 9 (2.4) | 89 (2.4) |
| Tunisia | 8 (2.2) | 15 (2.9) | 77 (3.4) | r 5 (1.5) | 9 (2.6) | 85 (2.8) |
| United States | 5 (1.2) | 16 (1.9) | 79 (2.2) | 5 (1.3) | 18 (2.1) | 77 (2.4) |
| International Avg. | 6 (0.4) | 34 (0.7) | 59 (0.7) | 9 (0.5) | 31 (0.7) | 61 (0.8) |
| Benchmarking Participants | | | | | | |
| Indiana State, US | 3 (1.6) | 8 (2.4) | 89 (2.5) | 6 (1.9) | 7 (2.1) | 87 (3.0) |
| Ontario Province, Can. | 6 (2.4) | 12 (2.8) | 82 (3.8) | 8 (2.6) | 15 (3.4) | 78 (4.2) |
| Quebec Province, Can. | 2 (1.2) | 10 (2.9) | 88 (3.1) | 5 (1.9) | 12 (3.1) | 83 (3.2) |

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

Background data provided by teachers.

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

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

about how often they interacted with their colleagues. More specifically, they were asked about discussing teaching strategies for particular concepts, preparing instructional materials, and classroom observations. As shown in Exhibit 6.9, on average, the results for the TIMSS participants were consistent across grades. Teachers of most students (80% or more) reported weekly or monthly interaction about instructional issues. In contrast, observing other teachers or being observed themselves was relatively infrequent (63% never).

How Ready Do Teachers Think They Are to Teach Science?

TIMSS 2003 asked teachers how ready they felt to teach the science topics included in the TIMSS 2003 science assessment. Across the five major content areas (life science, chemistry, physics, earth science, and environmental science), the eighth-grade teachers were asked about 21 topics (sub-areas). Exhibit 6.10 contains teachers' reports, indicating that the teachers of almost all the eighth-grade students felt ready to teach nearly all the topics. On average, internationally, the results ranged from 86 to 97 percent, with the results above 90 percent for all but the three earth science topics (Earth's structure and physical features; Earth's processes, cycles, and history; and Earth in the solar system and the universe) and two of the three environmental science topics (trends in human population and its effects on the environment; and changes in environments).

Although in most countries essentially all students were taught the topics in the basic science subjects – life science, chemistry, and physics – by teachers who felt ready to teach the topics, there were some notable exceptions, including Morocco, for all three subjects, and the Philippines and Tunisia for chemistry and physics. Also, teachers in Singapore and Sweden felt somewhat less ready to teach the topics in biology than in the other two subjects, and teachers in Belgium (Flemish) less ready to teach the physics topics. Among the benchmarking participants, Quebec teachers felt somewhat less ready to teach the biology topics and the majority of topics in chemistry and physics. Con-

sistent with information presented in Chapter 5 showing that topics in earth science and environmental science were included less often in the intended curricula of TIMSS participants and taught less often to the students, teachers in many countries reported that they felt less ready to teach these than the other science subjects.

At the fourth grade, teachers felt generally less well-prepared. Teachers were asked about 19 science topics, with the results ranging from 66 to 94 percent, on average, internationally. The results were above 90 percent for 8 of the 19 topics: two of the six life science topics (relationships in a living community and changes in environments), two of the seven physical science topics (states of matter and differences in their physical properties; and common energy sources and forms and their practical uses), and four of six earth science topics (features on Earth's landscape; water on Earth; air; and common features of Earth's landscape and their relationship to human use). However, results dipped below 70 percent for three topics: reproduction and development in plants and animals (life science - 66%); forming and separating mixtures (physical science - 66%); and fossils of animals and plants (earth science - 69%).

In every country, there were at least some fourth-grade science topics that teachers indicated they were less ready to teach. However, in Belgium (Flemish), the Netherlands, and Quebec, for all topics in both life science and physical science and the majority in earth science, the percentage of students taught by teachers ready to teach the topics was below 90 percent. For Japan, this was true also for all topics in earth science.



Exhibit 6.10: Readiness to Teach Science (Continued...)

| Countries | Percentage of Students Whose Teachers Report Feeling Ready to Teach Science Topics | | | | | | | | |
|----------------------------------|--|---|-------------------------------------|-------------------|------------------|---|---------------------------------------|--|--|
| | Physics | | | | | Earth Science | | | |
| | Physical states and changes in matter | Energy types, sources, and conversions including heat transfers | Basic properties/behaviors of light | Electric circuits | Force and motion | Earth's structure and physical features | Earth's processes, cycles and history | Earth in the solar system and the universe | |
| Armenia | s 97 (1.4) | s 97 (1.4) | s 97 (1.4) | s 97 (1.4) | s 97 (1.4) | r 100 (0.0) | r 96 (2.8) | r 95 (2.9) | |
| Australia | r 99 (0.4) | r 100 (0.0) | r 95 (1.3) | r 98 (0.7) | r 99 (0.5) | r 98 (1.0) | r 95 (1.8) | r 99 (0.3) | |
| Bahrain | 96 (1.4) | 98 (1.3) | 98 (1.3) | 99 (0.0) | 95 (1.1) | 76 (2.3) | 76 (2.9) | 91 (2.1) | |
| Belgium (Flemish) | 88 (3.3) | 81 (5.9) | 82 (4.2) | 79 (6.2) | 87 (4.0) | 92 (1.7) | 87 (2.4) | 85 (2.5) | |
| Botswana | 92 (2.1) | 97 (1.5) | 95 (1.9) | 89 (3.1) | 86 (3.2) | 77 (3.6) | 84 (3.7) | 72 (4.4) | |
| Bulgaria | r 99 (0.7) | r 100 (0.0) | r 99 (0.6) | r 99 (1.0) | r 99 (0.9) | r 99 (0.9) | r 99 (0.9) | r 99 (0.9) | |
| Chile | 94 (1.6) | 95 (1.5) | 75 (3.4) | 74 (3.4) | 91 (2.3) | 92 (2.0) | 93 (2.0) | 96 (1.5) | |
| Chinese Taipei | 99 (1.0) | 98 (1.3) | 99 (1.0) | 99 (1.0) | 99 (1.0) | -- | -- | -- | |
| Cyprus | 100 (0.0) | 100 (0.0) | 100 (0.0) | 100 (0.0) | 100 (0.0) | 100 (0.0) | 99 (0.8) | 99 (0.4) | |
| Egypt | 99 (0.8) | 99 (0.7) | 100 (0.0) | 100 (0.0) | 95 (1.9) | 89 (2.9) | 88 (3.0) | 97 (1.6) | |
| Estonia | 99 (0.7) | 100 (0.0) | 100 (0.0) | 99 (0.7) | 100 (0.0) | 100 (0.0) | 100 (0.0) | 100 (0.0) | |
| Ghana | 92 (2.6) | r 96 (1.8) | 93 (2.8) | 95 (2.0) | 93 (2.4) | r 78 (4.2) | 77 (4.0) | r 98 (1.4) | |
| Hong Kong, SAR | 98 (1.3) | 100 (0.0) | 96 (1.8) | 98 (1.2) | 95 (1.7) | 65 (4.2) | 66 (4.2) | 77 (3.8) | |
| Hungary | 99 (0.8) | 99 (0.8) | 98 (1.2) | 97 (1.3) | 97 (1.3) | 99 (0.9) | 99 (0.6) | 99 (0.6) | |
| Indonesia | r 99 (1.0) | r 98 (1.4) | r 97 (1.6) | r 89 (3.3) | r 100 (0.0) | -- | -- | -- | |
| Iran, Islamic Rep. of | 99 (0.7) | 99 (0.5) | 97 (1.5) | 94 (1.8) | 97 (1.5) | 96 (1.5) | 94 (1.7) | 93 (2.1) | |
| Israel | 96 (1.1) | 94 (1.3) | 80 (2.9) | 96 (1.3) | 82 (2.9) | 56 (3.8) | 57 (3.6) | 62 (3.4) | |
| Italy | 98 (1.1) | 97 (1.4) | 86 (2.5) | 86 (2.4) | 96 (1.5) | 95 (1.6) | 92 (2.1) | 94 (1.8) | |
| Japan | 83 (3.3) | 91 (2.5) | 95 (1.9) | 97 (1.6) | 96 (1.4) | 89 (2.7) | 92 (2.4) | 94 (2.0) | |
| Jordan | 97 (1.4) | 97 (1.5) | 95 (1.7) | 95 (2.0) | 94 (2.0) | 92 (2.4) | 94 (2.2) | 91 (2.9) | |
| Korea, Rep. of | s 93 (2.1) | s 93 (2.0) | s 82 (2.5) | s 93 (2.1) | s 97 (1.6) | s 96 (1.4) | s 94 (1.8) | s 89 (2.4) | |
| Latvia | s 99 (0.9) | s 97 (1.5) | s 95 (2.7) | s 95 (2.3) | s 94 (2.7) | -- | -- | -- | |
| Lebanon | r 93 (1.8) | r 92 (1.6) | r 93 (1.6) | r 91 (1.8) | r 92 (1.7) | r 84 (2.4) | r 84 (2.5) | r 80 (2.8) | |
| Lithuania | 99 (1.0) | 99 (1.0) | 99 (1.0) | 97 (1.4) | 99 (1.0) | 97 (1.5) | 94 (2.5) | 94 (2.0) | |
| Macedonia, Rep. of | 99 (0.9) | 99 (0.8) | 99 (0.9) | 98 (1.1) | 99 (0.9) | 98 (1.0) | 97 (1.4) | 97 (1.4) | |
| Malaysia | 92 (2.1) | 95 (1.9) | 97 (1.4) | 81 (3.2) | 98 (1.4) | 78 (3.5) | 76 (3.7) | 82 (3.0) | |
| Moldova, Rep. of | x x | x x | x x | x x | x x | x x | x x | x x | |
| Morocco | s 84 (4.9) | s 62 (7.1) | s 62 (6.8) | r 76 (5.4) | r 66 (7.0) | s 87 (4.4) | x x | s 56 (6.2) | |
| Netherlands | 100 (0.0) | 98 (1.2) | 99 (0.7) | 99 (0.7) | 100 (0.0) | 99 (1.1) | 96 (1.7) | 85 (3.4) | |
| New Zealand | 100 (0.2) | 99 (1.3) | 98 (1.4) | 98 (1.4) | 100 (0.2) | 99 (0.8) | 99 (0.8) | 99 (0.3) | |
| Norway | 91 (2.4) | 97 (1.1) | 94 (1.8) | 94 (1.7) | 93 (2.0) | 93 (1.6) | 85 (2.5) | 93 (2.0) | |
| Palestinian Nat'l Auth. | 97 (1.5) | 97 (1.6) | 98 (1.2) | 98 (1.2) | 95 (2.0) | 92 (2.4) | 90 (2.9) | 98 (1.1) | |
| Philippines | r 56 (4.8) | r 62 (4.8) | r 44 (4.5) | r 38 (4.5) | r 57 (5.0) | r 82 (3.5) | r 85 (3.4) | r 84 (3.5) | |
| Romania | 99 (1.0) | 99 (0.8) | 100 (0.0) | 100 (0.0) | 99 (0.9) | 99 (0.7) | 95 (1.8) | 99 (0.9) | |
| Russian Federation | -- | -- | -- | -- | -- | -- | -- | -- | |
| Saudi Arabia | r 88 (4.3) | r 98 (0.9) | r 97 (1.6) | r 90 (2.5) | r 93 (1.9) | r 90 (2.5) | r 81 (5.9) | r 96 (1.2) | |
| Scotland | s 94 (1.6) | s 98 (1.2) | s 93 (1.9) | s 96 (1.5) | s 91 (2.3) | s 80 (2.4) | s 84 (2.1) | s 80 (2.4) | |
| Serbia | r 95 (1.9) | r 96 (1.8) | 95 (1.8) | r 94 (2.1) | r 94 (1.9) | 99 (0.7) | 99 (0.9) | 99 (1.0) | |
| Singapore | r 96 (1.3) | r 96 (1.2) | r 95 (1.5) | r 93 (1.7) | r 92 (1.7) | r 37 (3.0) | r 41 (2.6) | r 53 (2.8) | |
| Slovak Republic | 100 (0.0) | 100 (0.0) | 100 (0.0) | 100 (0.1) | 100 (0.0) | 100 (0.3) | 92 (4.1) | 99 (1.1) | |
| Slovenia | 100 (0.0) | 100 (0.0) | 100 (0.0) | 98 (1.3) | 100 (0.0) | -- | -- | -- | |
| South Africa | r 82 (3.4) | r 86 (2.5) | r 77 (3.5) | r 94 (1.8) | r 90 (2.3) | r 67 (3.9) | r 69 (3.7) | r 64 (3.9) | |
| Sweden | 92 (1.4) | 94 (1.1) | 91 (1.5) | 89 (2.1) | 92 (1.4) | r 68 (3.1) | r 80 (2.8) | r 86 (2.4) | |
| Tunisia | s 42 (5.0) | s 53 (5.4) | s 40 (5.0) | s 32 (4.6) | s 49 (5.5) | r 89 (3.0) | r 88 (2.9) | r 50 (4.7) | |
| United States | r 93 (1.4) | r 92 (1.7) | r 90 (1.9) | r 83 (2.0) | r 94 (1.4) | 95 (1.3) | 94 (1.5) | 96 (1.2) | |
| ‡ England | -- | -- | -- | -- | -- | -- | -- | -- | |
| International Avg. | 93 (0.3) | 94 (0.3) | 91 (0.3) | 91 (0.4) | 93 (0.3) | 88 (0.4) | 87 (0.4) | 88 (0.4) | |
| Benchmarking Participants | | | | | | | | | |
| Basque Country, Spain | 97 (1.7) | 96 (1.8) | 91 (3.0) | 91 (3.2) | 96 (2.0) | 100 (0.4) | 93 (2.7) | 100 (0.0) | |
| Indiana State, US | s 96 (2.6) | s 97 (2.6) | s 91 (4.4) | s 85 (5.3) | s 89 (4.4) | s 97 (2.6) | s 97 (2.5) | s 93 (3.8) | |
| Ontario Province, Can. | 94 (2.2) | 95 (2.1) | 86 (3.8) | 65 (3.8) | 88 (3.1) | 93 (2.6) | 88 (3.4) | 89 (3.1) | |
| Quebec Province, Can. | r 93 (2.7) | r 92 (2.6) | r 73 (4.4) | r 80 (4.1) | r 75 (4.8) | r 83 (3.5) | r 86 (3.0) | r 89 (2.8) | |

Background data provided by teachers.

Does not include students whose teachers report that they do not teach the content area.

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

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

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

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

Exhibit 6.10: Readiness to Teach Science (...Continued)

| Countries | Percentage of Students Whose Teachers Report Feeling Ready to Teach Science Topics | | | | | |
|----------------------------------|--|-----------------|---|-----------------|-------------------------|-----------------|
| | Environmental Science | | | | | |
| | Trends in human population and its effects on the environment | | Use and conservation of Earth's natural resources | | Changes in environments | |
| Armenia | | x x | | x x | | x x |
| Australia | r | 94 (2.0) | r | 95 (1.9) | r | 96 (1.7) |
| Bahrain | | 80 (3.3) | | 84 (3.0) | | 85 (2.5) |
| Belgium (Flemish) | r | 78 (2.8) | r | 78 (2.6) | r | 75 (2.6) |
| Botswana | | 94 (2.2) | | 98 (1.4) | | 91 (2.8) |
| Bulgaria | s | 85 (2.3) | s | 88 (2.2) | s | 96 (1.3) |
| Chile | | 96 (1.5) | | 99 (0.9) | | 94 (1.9) |
| Chinese Taipei | | 89 (2.4) | | 90 (2.5) | | 87 (2.7) |
| Cyprus | s | 91 (1.0) | s | 95 (0.6) | s | 95 (0.7) |
| Egypt | | 81 (3.6) | | 96 (1.8) | | 84 (3.4) |
| Estonia | s | 88 (1.8) | s | 96 (1.4) | s | 96 (1.4) |
| Ghana | | 96 (1.9) | | 94 (2.1) | | 93 (1.5) |
| Hong Kong, SAR | | 90 (2.6) | | 95 (2.1) | | 94 (2.2) |
| Hungary | | x x | | x x | | x x |
| Indonesia | | x x | | x x | | x x |
| Iran, Islamic Rep. of | | 98 (1.3) | | 95 (2.0) | | 96 (1.5) |
| Israel | | 83 (2.9) | | 84 (2.8) | | 86 (2.4) |
| Italy | | 87 (2.3) | | 95 (1.5) | | 94 (1.6) |
| Japan | | 71 (3.8) | | 83 (3.3) | | 85 (3.0) |
| Jordan | | 93 (2.6) | | 94 (2.3) | | 93 (2.3) |
| Korea, Rep. of | s | 89 (2.3) | s | 85 (2.6) | s | 89 (2.5) |
| Latvia | | -- | | -- | | -- |
| Lebanon | r | 86 (2.8) | r | 95 (1.4) | r | 85 (2.8) |
| Lithuania | s | 87 (1.6) | s | 94 (1.2) | s | 95 (1.2) |
| Macedonia, Rep. of | | x x | | x x | | x x |
| Malaysia | | 91 (2.5) | | 94 (2.1) | | 95 (1.9) |
| Moldova, Rep. of | | x x | | x x | | x x |
| Morocco | s | 60 (6.2) | | x x | s | 68 (7.2) |
| Netherlands | r | 96 (1.0) | r | 96 (1.2) | r | 96 (1.4) |
| New Zealand | | 90 (3.4) | | 97 (1.3) | | 92 (3.5) |
| Norway | | 95 (1.8) | | 96 (1.6) | | 97 (1.3) |
| Palestinian Nat'l Auth. | | 87 (2.8) | | 96 (1.3) | | 92 (2.1) |
| Philippines | r | 93 (2.6) | | 95 (2.2) | r | 92 (2.9) |
| Romania | | x x | | x x | | x x |
| Russian Federation | | -- | | -- | | -- |
| Saudi Arabia | r | 91 (3.5) | r | 94 (3.2) | r | 93 (4.9) |
| Scotland | s | 83 (2.2) | s | 94 (1.4) | s | 87 (1.9) |
| Serbia | | x x | | x x | | x x |
| Singapore | r | 72 (2.7) | r | 84 (2.2) | r | 80 (2.2) |
| Slovak Republic | | x x | | x x | | x x |
| Slovenia | r | 89 (1.6) | r | 94 (1.2) | r | 92 (1.2) |
| South Africa | r | 81 (3.3) | r | 86 (2.7) | r | 76 (3.5) |
| Sweden | | 84 (2.2) | | 92 (1.9) | | 89 (2.3) |
| Tunisia | r | 44 (4.8) | r | 82 (3.5) | r | 80 (3.6) |
| United States | | 95 (1.4) | | 96 (1.2) | | 95 (1.2) |
| ‡ England | | -- | | -- | | -- |
| International Avg. | | 86 (0.5) | | 92 (0.4) | | 89 (0.5) |
| Benchmarking Participants | | | | | | |
| Basque Country, Spain | | 98 (1.7) | | 99 (1.1) | | 99 (1.1) |
| Indiana State, US | s | 96 (2.6) | s | 99 (1.1) | s | 98 (2.3) |
| Ontario Province, Can. | | 94 (2.4) | | 97 (1.6) | | 97 (1.7) |
| Quebec Province, Can. | r | 91 (2.6) | r | 90 (2.8) | r | 92 (2.3) |

Background data provided by teachers.

Does not include students whose teachers report that they do not teach the content area.

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

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

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

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

Exhibit 6.10: Readiness to Teach Science (Continued...)

| Countries | Percentage of Students Whose Teachers Report Feeling Ready to Teach Science Topics | | | | | |
|----------------------------------|--|--|---|-------------------------------------|-------------------------|-----------------|
| | Life Science | | | | | |
| | Major body structures and their functions in humans and other organisms | Reproduction and development in plants and animals | Physical features, behavior, and survival of organisms living in different environments | Relationships in a living community | Changes in environments | Human health |
| Armenia | x x | x x | x x | x x | x x | x x |
| Australia | 83 (4.3) | 64 (4.3) | 76 (3.4) | 89 (2.4) | 93 (2.1) | 73 (4.2) |
| Belgium (Flemish) | 48 (4.0) | 30 (3.5) | 43 (3.8) | 82 (2.6) | 81 (2.6) | 39 (3.8) |
| Chinese Taipei | 97 (1.5) | 87 (2.7) | 95 (1.9) | 99 (0.7) | 98 (1.1) | 97 (1.5) |
| Cyprus | 98 (1.2) | 93 (2.5) | 87 (2.5) | 99 (0.8) | 98 (1.2) | 98 (0.8) |
| England | -- | -- | -- | -- | -- | -- |
| Hong Kong, SAR | 86 (3.2) | 61 (4.4) | 85 (3.4) | 95 (2.4) | 92 (2.5) | 91 (2.4) |
| Hungary | 93 (2.2) | 68 (4.4) | -- | 97 (1.2) | 91 (2.3) | 53 (4.0) |
| Iran, Islamic Rep. of | 94 (2.0) | 97 (1.4) | 92 (2.4) | 98 (1.2) | 92 (2.1) | 89 (2.3) |
| Italy | 89 (2.2) | 84 (2.8) | 82 (2.9) | 98 (1.0) | 90 (2.2) | 63 (3.7) |
| Japan | 65 (3.6) | 49 (4.0) | 56 (3.8) | 93 (2.2) | 74 (3.7) | 85 (2.8) |
| Latvia | s 79 (4.4) | s 63 (6.1) | s 77 (4.6) | s 98 (1.1) | s 94 (2.5) | s 42 (6.0) |
| Lithuania | 82 (3.1) | 46 (3.8) | 82 (2.5) | 87 (2.2) | 96 (1.1) | 70 (3.4) |
| Moldova, Rep. of | r 83 (3.5) | r 65 (4.9) | 79 (3.7) | 96 (1.2) | 92 (2.1) | r 72 (4.0) |
| Morocco | x x | x x | x x | x x | x x | x x |
| Netherlands | 63 (4.6) | 38 (4.5) | 59 (4.5) | 82 (3.2) | 87 (3.0) | 53 (4.4) |
| New Zealand | r 92 (1.4) | r 78 (2.7) | r 77 (2.8) | r 93 (1.7) | r 94 (1.7) | r 88 (2.1) |
| Norway | 67 (3.9) | 46 (4.1) | 74 (3.9) | 91 (1.7) | 93 (2.3) | 71 (3.8) |
| Philippines | 91 (3.0) | 89 (3.3) | 93 (2.3) | 100 (0.0) | 95 (2.4) | 77 (3.4) |
| Russian Federation | -- | -- | -- | -- | -- | -- |
| Scotland | s 76 (4.1) | s 65 (5.3) | s 67 (5.0) | s 88 (3.6) | s 93 (3.1) | s 78 (4.6) |
| Singapore | 98 (1.3) | 72 (4.3) | 80 (3.5) | 99 (0.5) | 96 (1.6) | 87 (3.0) |
| Slovenia | 89 (3.2) | 72 (4.2) | 69 (4.6) | 91 (2.3) | 95 (2.2) | 90 (2.9) |
| Tunisia | r 93 (2.4) | r 52 (3.9) | r 55 (4.6) | 98 (1.1) | 97 (1.4) | r 69 (4.1) |
| United States | 93 (1.3) | 74 (2.6) | 82 (1.9) | 94 (1.3) | 93 (1.5) | 86 (2.0) |
| International Avg. | 84 (0.7) | 66 (0.9) | 76 (0.8) | 94 (0.4) | 92 (0.5) | 75 (0.8) |
| Benchmarking Participants | | | | | | |
| Indiana State, US | 93 (3.0) | 72 (5.3) | 82 (5.1) | 99 (1.0) | 94 (2.6) | 84 (3.9) |
| Ontario Province, Can. | 94 (2.1) | 63 (5.0) | 75 (4.4) | 91 (2.5) | 93 (2.6) | 76 (4.0) |
| Quebec Province, Can. | 73 (3.7) | 42 (4.2) | 43 (4.7) | 84 (3.4) | 75 (4.1) | 46 (4.7) |

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

Background data provided by teachers.

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

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

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

Exhibit 6.10: Readiness to Teach Science (...Continued)

| Countries | Percentage of Students Whose Teachers Report Feeling Ready to Teach Science Topics | | | | | | |
|----------------------------------|--|---------------------------------|-------------------------------|---|--|--|-----------------------------------|
| | Physical Science | | | | | | |
| | Classification of objects/materials based on physical properties | Forming and separating mixtures | Chemical and physical changes | States of matter and differences in their physical properties, including changes in state of water by heating and cooling | Common energy sources/forms and their practical uses | Common uses of electricity and electrical circuits | Forces that cause objects to move |
| Armenia | x x | x x | x x | x x | x x | x x | x x |
| Australia | 86 (2.9) | 64 (4.3) | 76 (3.4) | 89 (2.4) | 93 (2.1) | 73 (4.2) | 86 (2.9) |
| Belgium (Flemish) | 55 (4.0) | 30 (3.5) | 43 (3.8) | 82 (2.6) | 81 (2.6) | 39 (3.8) | 55 (4.0) |
| Chinese Taipei | 96 (1.8) | 87 (2.7) | 95 (1.9) | 99 (0.7) | 98 (1.1) | 97 (1.5) | 96 (1.8) |
| Cyprus | 98 (1.2) | 93 (2.5) | 87 (2.5) | 99 (0.8) | 98 (1.2) | 98 (0.8) | 98 (1.2) |
| England | -- | -- | -- | -- | -- | -- | -- |
| Hong Kong, SAR | 84 (3.6) | 61 (4.4) | 85 (3.4) | 95 (2.4) | 92 (2.5) | 91 (2.4) | 84 (3.6) |
| Hungary | 58 (3.4) | 68 (4.4) | -- | 97 (1.2) | 91 (2.3) | 53 (4.0) | 58 (3.4) |
| Iran, Islamic Rep. of | 91 (2.2) | 97 (1.4) | 92 (2.4) | 98 (1.2) | 92 (2.1) | 89 (2.3) | 91 (2.2) |
| Italy | 82 (2.9) | 84 (2.8) | 82 (2.9) | 98 (1.0) | 90 (2.2) | 63 (3.7) | 82 (2.9) |
| Japan | 68 (3.9) | 49 (4.0) | 56 (3.8) | 93 (2.2) | 74 (3.7) | 85 (2.8) | 68 (3.9) |
| Latvia | s 65 (5.5) | s 63 (6.1) | s 77 (4.6) | s 98 (1.1) | s 94 (2.5) | s 42 (6.0) | s 65 (5.5) |
| Lithuania | 61 (4.0) | 46 (3.8) | 82 (2.5) | 87 (2.2) | 96 (1.1) | 70 (3.4) | 61 (4.0) |
| Moldova, Rep. of | r 73 (4.1) | r 65 (4.9) | 79 (3.7) | 96 (1.2) | 92 (2.1) | r 72 (4.0) | r 73 (4.1) |
| Morocco | x x | x x | x x | x x | x x | x x | x x |
| Netherlands | 65 (3.9) | 38 (4.5) | 59 (4.5) | 82 (3.2) | 87 (3.0) | 53 (4.4) | 65 (3.9) |
| New Zealand | r 92 (1.8) | r 78 (2.7) | r 77 (2.8) | r 93 (1.7) | r 94 (1.7) | r 88 (2.1) | r 92 (1.8) |
| Norway | 84 (3.2) | 46 (4.1) | 74 (3.9) | 91 (1.7) | 93 (2.3) | 71 (3.8) | 84 (3.2) |
| Philippines | 91 (3.3) | 89 (3.3) | 93 (2.3) | 100 (0.0) | 95 (2.4) | 77 (3.4) | 91 (3.3) |
| Russian Federation | -- | -- | -- | -- | -- | -- | -- |
| Scotland | s 88 (3.4) | s 65 (5.3) | s 67 (5.0) | s 88 (3.6) | s 93 (3.1) | s 78 (4.6) | s 88 (3.4) |
| Singapore | 82 (3.4) | 72 (4.3) | 80 (3.5) | 99 (0.5) | 96 (1.6) | 87 (3.0) | 82 (3.4) |
| Slovenia | 73 (4.2) | 72 (4.2) | 69 (4.6) | 91 (2.3) | 95 (2.2) | 90 (2.9) | 73 (4.2) |
| Tunisia | r 84 (3.4) | r 52 (3.9) | r 55 (4.6) | 98 (1.1) | 97 (1.4) | r 69 (4.1) | r 84 (3.4) |
| United States | 92 (1.5) | 74 (2.6) | 82 (1.9) | 94 (1.3) | 93 (1.5) | 86 (2.0) | 92 (1.5) |
| International Avg. | 79 (0.7) | 66 (0.9) | 76 (0.8) | 94 (0.4) | 92 (0.5) | 75 (0.8) | 79 (0.7) |
| Benchmarking Participants | | | | | | | |
| Indiana State, US | 92 (2.6) | 72 (5.3) | 82 (5.1) | 99 (1.0) | 94 (2.6) | 84 (3.9) | 92 (2.6) |
| Ontario Province, Can. | 93 (2.6) | 63 (5.0) | 75 (4.4) | 91 (2.5) | 93 (2.6) | 76 (4.0) | 93 (2.6) |
| Quebec Province, Can. | 53 (4.2) | 42 (4.2) | 43 (4.7) | 84 (3.4) | 75 (4.1) | 46 (4.7) | 53 (4.2) |

Background data provided by teachers.

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

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

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

Exhibit 6.10: Readiness to Teach Science

| Countries | Percentage of Students Whose Teachers Report Feeling Ready to Teach Science Topics | | | | | |
|----------------------------------|--|-----------------|-----------------|--|-------------------------------|----------------------|
| | Earth Science | | | | | |
| | Features on Earth's landscape | Water on Earth | Air | Common features of the Earth's landscape and relationship to human use | Fossils of animals and plants | Earth's solar system |
| Armenia | x x | x x | x x | x x | x x | x x |
| Australia | 98 (0.9) | 94 (2.3) | 92 (2.2) | 98 (1.2) | 82 (3.1) | 97 (1.3) |
| Belgium (Flemish) | 93 (2.0) | 82 (3.3) | 68 (3.3) | 91 (2.3) | 46 (4.0) | 81 (2.9) |
| Chinese Taipei | 97 (1.3) | 98 (1.2) | 98 (1.1) | 98 (1.3) | 85 (3.1) | 95 (1.8) |
| Cyprus | 93 (2.1) | 93 (2.1) | 99 (0.6) | 96 (1.9) | 67 (4.1) | 88 (2.7) |
| England | -- | -- | -- | -- | -- | -- |
| Hong Kong, SAR | 92 (3.0) | 86 (3.4) | 97 (1.3) | 92 (3.0) | 68 (4.3) | 86 (3.0) |
| Hungary | 100 (0.0) | 99 (0.9) | 96 (1.7) | 96 (2.0) | 63 (4.1) | 92 (1.7) |
| Iran, Islamic Rep. of | 94 (1.7) | 94 (1.9) | 91 (2.3) | 95 (1.9) | 74 (3.7) | 90 (2.5) |
| Italy | 100 (0.0) | 100 (0.0) | 100 (0.0) | 98 (0.8) | 86 (2.7) | 97 (1.3) |
| Japan | 75 (3.4) | 75 (3.1) | 76 (3.6) | 76 (3.4) | 47 (4.4) | 77 (3.4) |
| Latvia | s 100 (0.3) | s 99 (0.6) | s 99 (0.6) | s 99 (0.5) | s 76 (5.0) | s 97 (1.9) |
| Lithuania | 99 (0.7) | 97 (1.2) | 98 (0.8) | 97 (1.4) | 78 (3.3) | 94 (1.8) |
| Moldova, Rep. of | 97 (1.5) | 97 (1.5) | 99 (0.8) | 100 (0.0) | 78 (3.7) | 95 (1.4) |
| Morocco | x x | x x | x x | x x | x x | x x |
| Netherlands | 95 (2.2) | 93 (2.6) | 88 (2.8) | 95 (2.0) | 70 (4.1) | 65 (4.6) |
| New Zealand | r 98 (0.8) | r 96 (1.3) | r 88 (2.3) | r 95 (1.3) | r 80 (2.8) | r 97 (1.1) |
| Norway | 96 (1.9) | 91 (2.4) | 89 (2.5) | 92 (1.8) | 75 (3.1) | 96 (1.3) |
| Philippines | 93 (2.5) | 89 (2.9) | 88 (3.1) | 89 (3.0) | 77 (4.3) | 94 (2.4) |
| Russian Federation | -- | -- | -- | -- | -- | -- |
| Scotland | s 98 (1.3) | s 97 (1.4) | s 82 (3.5) | s 93 (2.3) | s 67 (4.4) | s 97 (1.2) |
| Singapore | 71 (3.4) | 71 (3.9) | 92 (2.0) | 70 (4.2) | 45 (4.3) | 74 (3.6) |
| Slovenia | 97 (1.8) | 98 (1.1) | 99 (0.7) | 98 (1.2) | 67 (4.2) | 82 (3.6) |
| Tunisia | r 69 (4.5) | r 65 (4.4) | r 92 (2.2) | r 72 (4.0) | r 32 (4.3) | r 48 (4.7) |
| United States | 99 (0.3) | 96 (1.0) | 90 (1.6) | 98 (0.9) | 84 (2.0) | 94 (1.3) |
| International Avg. | 93 (0.4) | 91 (0.5) | 91 (0.5) | 92 (0.5) | 69 (0.8) | 87 (0.6) |
| Benchmarking Participants | | | | | | |
| Indiana State, US | 100 (0.0) | 95 (3.5) | 91 (3.9) | 100 (0.0) | 83 (4.4) | 95 (2.1) |
| Ontario Province, Can. | 100 (0.4) | 95 (2.0) | 87 (3.1) | 97 (1.7) | 86 (3.6) | 89 (3.0) |
| Quebec Province, Can. | 97 (1.5) | 87 (3.1) | 89 (2.9) | 93 (2.4) | 59 (4.3) | 81 (3.5) |

Background data provided by teachers.

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

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

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