# Chapter 4

## Organization for Learning Mathematics and Science

One challenge for countries around the world is how to deal with students of different abilities and interests in mathematics and science. This chapter focuses on how mathematics and science curricula are generally organized within primary and lower-secondary schools, and specifically at the fourth and eighth grades. By the final year of secondary school, there is great diversity of curricula both across and within countries depending on students' course of study (academic, technical, or apprenticeship). Those differences have been described in the TIMSS report, *Mathematics and Science Achievement in the Final Year of Secondary School*. [1]

This chapter presents information about whether countries tend to offer more than one curricular program in mathematics and science to fourth- and eighth-grade students, and if so, how the decisions are made about students' courses of study. School policies on instructional time are also discussed.

### Do Countries Have Different Curricular Organizations Within or Across Schools to Account for Differences in Student Ability?

For each participating country, TIMSS asked the principals and headmasters of fourth-grade and eighth-grade students about enrollment in different mathematics and science programs in their schools. The TIMSS results are consistent with the existing literature, indicating no clear agreement about whether homogenous or heterogeneous grouping is the most effective approach for high mathematics and science achievement in primary and middle schools. Some countries with predominantly only one course of study were among the top performers and others among the bottom performers (see Chapter 1 for overall achievement). Similarly, of the countries reporting multiple courses of study, some performed relatively well on the TIMSS tests and others less well.

The results for primary schools are presented in Table 4.1. In most countries, at least 90% of the fourth-grade students were in schools with a single course of study in mathematics. However, in several countries, fourth graders – from 80% to 90% – were in schools with single courses of study in mathematics, including Ireland, New Zealand, Portugal, and the United States. Countries with less than 80% of their fourth graders in schools with single courses of study in mathematics included Israel, and the Netherlands. For science, the data show that in all countries, at least 90% of the fourth-grade students were in schools having only one course of study in science.

[1] Mullis, I.V.S., Martin, M.O., Beaton, A.E., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1998). *Mathematics and Science Achievement in the Final Year of Secondary School: IEA's Third International Mathematics and Science Study (TIMSS)*. Chestnut Hill, MA: Boston College.

# Table 4.1

## Enrollments in Courses of Study in Mathematics and Science
## Fourth Grade*

| Country | | Percentage of Students in Schools with Only One Course of Study in Mathematics | Percentage of Students in Schools with More than One Course of Study in Mathematics | | Percentage of Students in Schools with Only One Course of Study in Science | Percentage of Students in Schools with More than One Course of Study in Science |
|---|---|---|---|---|---|---|
| *Australia* | | 90 (2.3) | 10 (2.3) | | 96 (2.1) | 4 (2.1) |
| *Austria* | | – – | – – | | – – | – – |
| **Canada** | r | 92 (1.9) | 8 (1.9) | r | 96 (2.2) | 4 (2.2) |
| **Cyprus** | r | 99 (0.6) | 1 (0.6) | r | 100 (0.2) | 0 (0.2) |
| **Czech Republic** | | 100 (0.3) | 0 (0.3) | | 100 (0.0) | 0 (0.0) |
| **England** | | 100 (0.0) | 0 (0.0) | | 100 (0.0) | 0 (0.0) |
| **Greece** | | 98 (1.2) | 2 (1.2) | | 100 (0.0) | 0 (0.0) |
| **Hong Kong** | | 100 (0.0) | 0 (0.0) | | 100 (0.0) | 0 (0.0) |
| *Hungary* | | – – | – – | | – – | – – |
| **Iceland** | | 91 (2.7) | 9 (2.7) | r | 96 (2.5) | 4 (2.5) |
| **Iran, Islamic Rep.** | | 97 (1.3) | 3 (1.3) | | 95 (1.7) | 5 (1.7) |
| **Ireland** | | 85 (3.8) | 15 (3.8) | | 94 (2.3) | 6 (2.3) |
| *Israel* | s | 74 (6.9) | 26 (6.9) | s | 98 (2.3) | 2 (2.3) |
| **Japan** | | – – | – – | | – – | – – |
| **Korea** | | 99 (0.9) | 1 (0.9) | | 99 (0.9) | 1 (0.9) |
| *Kuwait* | | – – | – – | | – – | – – |
| *Latvia (LSS)* | | 100 (0.0) | 0 (0.0) | | 100 (0.0) | 0 (0.0) |
| *Netherlands* | | 58 (5.0) | 42 (5.0) | | 95 (2.0) | 5 (2.0) |
| **New Zealand** | | 83 (3.2) | 17 (3.2) | | 97 (1.7) | 3 (1.7) |
| **Norway** | | 100 (0.0) | 0 (0.0) | | 100 (0.0) | 0 (0.0) |
| **Portugal** | | 85 (3.1) | 15 (3.1) | | 95 (1.9) | 5 (1.9) |
| **Scotland** | | – – | – – | | – – | – – |
| **Singapore** | | 100 (0.0) | 0 (0.0) | | 100 (0.0) | 0 (0.0) |
| *Slovenia* | r | 99 (1.4) | 1 (1.4) | r | 99 (0.8) | 1 (0.8) |
| *Thailand* | | 100 (0.0) | 0 (0.0) | | 98 (1.0) | 2 (1.0) |
| **United States** | r | 87 (3.4) | 13 (3.4) | r | 98 (1.4) | 2 (1.4) |
| **International Average** | | 92 (0.6) | 8 (0.6) | | 98 (0.3) | 2 (0.3) |

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

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

A dash (–) indicates data are not available.

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

The comparable results for eighth grade are presented for mathematics in Table 4.2 and for science in Table 4.3. School principals reported more differentiation in curricular programs in the eighth grade than at the fourth grade, particularly in mathematics. In mathematics, about half of the countries reported having essentially one curricular program. That is, 80% or more of the eighth graders attended schools reporting a single program. For the remaining half of the countries, however, heads of schools reported a range of approaches, from having most students in schools with only one program to having few students in such schools. The countries reporting 60% or more of their eighth graders in schools with multiple programs in mathematics included Austria, Belgium (Flemish), England, Ireland, the Netherlands, Singapore, and the United States.

In science (Table 4.3), the heads of schools in most of the countries reported that most eighth graders (80% or more) attended schools with only one curricular program. The only countries with 60% or more of their eighth graders in schools with more than one science program were Belgium (Fl), the Netherlands, and Singapore.

Among the countries and schools reporting multiple curricular programs, various approaches can be involved. The overall aim is to meet the individual needs of each child and the general strategy is to divide students into groups that can proceed through the curriculum at different rates. In most countries with multiple programs, the organization of students into different groups occurs within schools. In some countries, such as Ireland and New Zealand, students follow the same curriculum, but at different levels of difficulty (setting or streaming), which can occur by dividing a class into different groups or creating different classes. In other instances of ability grouping, different classes study different content (i.e., tracking).

On average within each country, the schools with more than one eighth-grade program in either mathematics or science reported from two to three programs. The data, however, do not reflect the type of organization (streaming, setting, tracking) or tracking across schools. For example, in Germany different groups of students attend different schools beginning with the fifth grade. Thus, principals may report one course of study within schools, even though different schools have different curricular programs. Other countries that begin different academic or vocational programs before or during the eighth grade for a small percentage of students include France, Greece, Hungary, Iran, Israel, Lithuania, the Philippines, Singapore, and Switzerland.[2]

There is considerable debate about the effect of ability grouping on achievement. The main argument for ability grouping is the need to adapt the content, level, and pace of instruction to students with different levels of

[2] Robitaille, D.F. (Ed.) (1997). *National Contexts for Mathematics and Science Education: An Encyclopedia of the Educational Systems Participating in TIMSS*. Vancouver, B.C.: Pacific Educational Press.

achievement. Proponents believe that tailoring instruction to the individual needs of students improves the scholastic achievement of all students. This is countered, however, by some research showing a decrease in low-achieving classes in intellectual stimulation, sense of challenge, and ambition to progress. The desirability of different curricular programs is also debated in the context of equity: grouping students by academic ability can be seen as curtailing many students' opportunity to learn.

The data in Tables 4.2 and 4.3 indicate different reasons for having different mathematics or science programs in schools. For example in mathematics, in the Belgian systems, Canada, France, Iceland, Israel, and Sweden, 60% or more of the students in multiple-program schools are in the most advanced program. That is, most students are taking the most rigorous mathematics, with the others in remedial courses. In several other countries (e.g., Germany, Lithuania, and Thailand), the most advanced courses are for accelerated coursework, with most students being enrolled in the least advanced program.

# Table 4.2

## Enrollments in Courses of Study in Mathematics
## Eighth Grade*

| Country | Percentage of Students in Schools with Only One Course of Study in Mathematics | Percentage of Students in Schools with More than One Course of Study in Mathematics | Schools with More Than One Course of Study in Mathematics[1] | | |
|---|---|---|---|---|---|
| | | | Average Number of Courses of Study in Mathematics | Average Percentage of Students in Most Advanced Mathematics Course of Study | Average Percentage of Students in Least Advanced Mathematics Course of Study |
| *Australia* | r 65 (4.0) | 35 (4.0) | 2.8 (0.11) | r 44 (4.4) | r 24 (3.7) |
| *Austria* | 30 (3.0) | 70 (3.0) | 3.0 (0.00) | – – | – – |
| **Belgium (Fl)** | 39 (2.3) | 61 (2.3) | 2.0 (0.00) | 67 (3.2) | 33 (3.2) |
| *Belgium (Fr)* | 45 (2.1) | 55 (2.1) | 2.0 (0.00) | 63 (1.9) | 37 (1.9) |
| **Canada** | 84 (3.0) | 16 (3.0) | 2.2 (0.06) | 69 (6.5) | 23 (6.2) |
| *Colombia* | 97 (2.2) | 3 (2.2) | ~ ~ | ~ ~ | ~ ~ |
| **Cyprus** | r 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Czech Republic** | 92 (3.4) | 8 (3.4) | ~ ~ | ~ ~ | ~ ~ |
| *Denmark* | r 99 (0.7) | 1 (0.7) | ~ ~ | ~ ~ | ~ ~ |
| **England** | 34 (4.3) | 66 (4.3) | r 3.2 (0.20) | r 34 (1.5) | r 21 (1.8) |
| **France** | 76 (3.6) | 24 (3.6) | – – | 75 (2.8) | 21 (2.0) |
| *Germany* | s 74 (4.3) | 26 (4.3) | s 2.0 (0.00) | s 40 (3.2) | s 60 (3.2) |
| *Greece* | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Hong Kong** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Hungary** | – – | – – | – – | – – | – – |
| **Iceland** | 77 (7.0) | 23 (7.0) | r 2.6 (0.00) | 60 (0.0) | 31 (0.0) |
| **Iran, Islamic Rep.** | 96 (2.7) | 4 (2.7) | ~ ~ | ~ ~ | ~ ~ |
| **Ireland** | 24 (3.5) | 76 (3.5) | 2.5 (0.05) | 47 (2.1) | 30 (2.2) |
| *Israel* | s 63 (9.5) | 37 (9.5) | s 2.2 (0.15) | s 69 (3.2) | s 27 (3.4) |
| **Japan** | 99 (0.7) | 1 (0.7) | ~ ~ | ~ ~ | ~ ~ |
| **Korea** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| *Kuwait* | – – | – – | – – | – – | – – |
| **Latvia (LSS)** | 97 (1.7) | 3 (1.7) | ~ ~ | ~ ~ | ~ ~ |
| **Lithuania** | 86 (3.0) | 14 (3.0) | 2.1 (0.07) | 33 (5.8) | 61 (6.1) |
| *Netherlands* | r 30 (4.9) | 70 (4.9) | 2.9 (0.15) | r 46 (4.2) | r 28 (2.4) |
| **New Zealand** | 61 (4.2) | 39 (4.2) | 2.8 (0.12) | 31 (4.6) | 31 (8.0) |
| **Norway** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Portugal** | 98 (1.2) | 2 (1.2) | ~ ~ | ~ ~ | ~ ~ |
| *Romania* | 98 (1.0) | 2 (1.0) | ~ ~ | ~ ~ | ~ ~ |
| **Russian Federation** | 90 (2.9) | 10 (2.9) | 2.1 (0.09) | 26 (2.8) | – – |
| *Scotland* | r 71 (5.0) | 29 (5.0) | r 2.6 (0.18) | r 46 (4.8) | r 32 (4.3) |
| **Singapore** | 20 (3.9) | 80 (3.9) | 2.0 (0.00) | 57 (0.0) | 43 (0.0) |
| **Slovak Republic** | 83 (3.8) | 17 (3.8) | 2.1 (0.07) | 35 (4.5) | 40 (15.6) |
| *Slovenia* | r 89 (2.9) | 11 (2.9) | 2.7 (0.25) | 42 (10.6) | 25 (5.2) |
| **Spain** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Sweden** | 43 (5.7) | 57 (5.7) | 2.2 (0.05) | r 75 (1.8) | r 25 (1.8) |
| [2] **Switzerland** | r 63 (4.0) | 37 (4.0) | – – | – – | – – |
| *Thailand* | 83 (4.5) | 17 (4.5) | 2.0 (0.00) | r 27 (5.2) | r 69 (7.5) |
| **United States** | 17 (3.2) | 83 (3.2) | 2.6 (0.08) | r 27 (2.9) | r 50 (4.2) |
| **International Average** | 74 (0.6) | 26 (0.6) | 2.4 (0.02) | 48 (0.9) | 36 (1.2) |

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

1 Reported for countries in which more than 10% of students are in schools with more than one course of study in mathematics. Reported values are averaged across schools.

2 Averages based on total school weights cannot be computed for Switzerland; sampling based on tracks within schools at grade 8.

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

School background data for Bulgaria and South Africa are unavailable.

A dash (–) indicates data are not available. A tilde (~) indicates insufficient data to report variable (percentage of students in schools with more than one course of study is less than 10).

An "r" indicates school data available for 70-84% of schools or students, as applicable. An "s" indicates school data available for 50-69% of schools or students, as applicable.

# Table 4.3

## Enrollments in Courses of Study in Science
## Eighth Grade*

| Country | Percentage of Students in Schools with Only One Course of Study in Science | Percentage of Students in Schools with More than One Course of Study in Science | Schools with More Than One Course of Study in Science[1] | | |
|---|---|---|---|---|---|
| | | | Average Number of Courses of Study in Science | Average Percentage of Students in Most Advanced Science Course of Study | Average Percentage of Students in Least Advanced Science Course of Study |
| *Australia* | r 85 (2.8) | 15 (2.8) | 2.9 (0.29) | r 50 (5.3) | r 35 (4.2) |
| *Austria* | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Belgium (Fl)** | 33 (5.6) | 67 (5.6) | r 2.9 (0.15) | – – | – – |
| *Belgium (Fr)* | – – | – – | – – | – – | – – |
| **Canada** | r 92 (2.1) | 8 (2.1) | ~ ~ | ~ ~ | ~ ~ |
| *Colombia* | r 95 (2.5) | 5 (2.5) | ~ ~ | ~ ~ | ~ ~ |
| **Cyprus** | r 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Czech Republic** | 94 (3.0) | 6 (3.0) | ~ ~ | ~ ~ | ~ ~ |
| *Denmark* | – – | – – | – – | – – | – – |
| **England** | 76 (4.3) | 24 (4.3) | 2.7 (0.30) | r 34 (5.6) | r 25 (5.7) |
| **France** | 65 (4.5) | 35 (4.5) | – – | 77 (2.4) | 20 (1.7) |
| *Germany* | s 91 (2.7) | 9 (2.7) | ~ ~ | ~ ~ | ~ ~ |
| *Greece* | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Hong Kong** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Hungary** | – – | – – | – – | – – | – – |
| **Iceland** | 100 (0.1) | 0 (0.1) | ~ ~ | ~ ~ | ~ ~ |
| **Iran, Islamic Rep.** | 95 (2.9) | 5 (2.9) | ~ ~ | ~ ~ | ~ ~ |
| **Ireland** | 68 (4.2) | 32 (4.2) | 2.0 (0.04) | 64 (4.1) | 34 (4.1) |
| *Israel* | s 89 (6.2) | 11 (6.2) | ~ ~ | ~ ~ | ~ ~ |
| **Japan** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Korea** | 99 (0.7) | 1 (0.7) | ~ ~ | ~ ~ | ~ ~ |
| *Kuwait* | – – | – – | – – | – – | – – |
| **Latvia (LSS)** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Lithuania** | – – | – – | – – | – – | – – |
| *Netherlands* | r 30 (4.9) | 70 (4.9) | 2.9 (0.15) | r 46 (4.2) | r 28 (2.4) |
| **New Zealand** | 78 (3.3) | 22 (3.3) | 2.8 (0.13) | 37 (5.9) | 19 (3.3) |
| **Norway** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Portugal** | 99 (0.9) | 1 (0.9) | ~ ~ | ~ ~ | ~ ~ |
| *Romania* | 98 (1.2) | 2 (1.2) | ~ ~ | ~ ~ | ~ ~ |
| **Russian Federation** | 93 (2.4) | 7 (2.4) | ~ ~ | ~ ~ | ~ ~ |
| *Scotland* | r 98 (1.3) | 2 (1.3) | ~ ~ | ~ ~ | ~ ~ |
| **Singapore** | 20 (3.9) | 80 (3.9) | 2.0 (0.00) | 57 (0.0) | 43 (0.0) |
| **Slovak Republic** | 86 (3.7) | 14 (3.7) | 2.0 (0.00) | 21 (6.0) | 34 (10.0) |
| *Slovenia* | r 97 (1.7) | 3 (1.7) | ~ ~ | ~ ~ | ~ ~ |
| **Spain** | 100 (0.0) | 0 (0.0) | ~ ~ | ~ ~ | ~ ~ |
| **Sweden** | 98 (1.4) | 2 (1.4) | ~ ~ | ~ ~ | ~ ~ |
| [2] **Switzerland** | r 72 (3.4) | 28 (3.4) | – – | – – | – – |
| *Thailand* | r 88 (4.1) | 12 (4.1) | 2.0 (0.00) | ~ ~ | ~ ~ |
| **United States** | 81 (4.0) | 19 (4.0) | 2.5 (0.14) | 25 (5.7) | r 49 (6.7) |
| **International Average** | 86 (0.5) | 14 (0.5) | 2.5 (0.05) | 46 (1.6) | 32 (1.7) |

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

1 Reported for countries in which more than 10% of students are in schools with more than one course of study in science. Reported values are averaged across schools.

2 Averages based on total school weights cannot be computed for Switzerland; sampling based on tracks within schools at grade 8.

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

School background data for Bulgaria and South Africa are unavailable.

A dash (–) indicates data are not available. A tilde (~) indicates insufficient data to report variable (percentage of students in schools with more than one course of study is less than 10 or data are available for less than 5 schools).

An "r" indicates school data available for 70-84% of schools or students, as applicable. An "s" indicates school data available for 50-69% of schools or students, as applicable.

## What Factors Are Involved in Deciding Students' Courses of Study in Mathematics and Science?

Information about the factors that influence decisions about eighth-grade students' enrollment in different courses of study is presented for mathematics in Figure 4.1 and for science in Figure 4.2. In considering the data on the factors involved, please keep in mind the prevalence of differentiation in course of study in each country. For example, the data in Figure 4.1 apply to only 16% of the eighth graders in Canada; in other countries the data apply to a substantial percentage of students and can have considerable impact on their futures. In some countries, placement decisions even as early as the eighth grade can be a determinant of future type of academic program and career.

The data show that academic performance is the most crucial factor in program placement decisions across the participating countries. Teacher recommendations carry some weight in every country, and are very important in some. At the eighth-grade level, the importance of standardized test scores in placing students in different courses of study varied considerably by country, from nearly all of the students in Singapore to hardly any in Germany and Israel.[3] In most countries, the need for students to have met curricular requirements and the wishes of students and their parents also entered into decisions about students' course of study. Thailand reported school entrance examination to be important for most students; elsewhere, such examinations were important in course assignment decisions in only some schools in some countries.

[3] Values of 0 shown in Figures 4.1 and 4.2 may be due to rounding.

# Figure 4.1

## Factors That Are Moderately or Very Important in Deciding Courses of Study in Mathematics Eighth Grade*

| Country | Percent of Students in Schools with More Than One Course of Study | Percent of Students in Schools Reporting That Factor Is Moderately or Very Important[1] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Academic Performance | Teacher Recommen-dations | Standardized Tests | Entrance or Oral Examinations | Curricular Requirements | Wishes of Students or Parents |
| *Australia* | r 35 | r 100 | 94 | 35 | 12 | 50 | 63 |
| *Austria* | 70 | r 98 | 44 | 9 | 24 | – | 10 |
| **Canada** | 16 | 98 | 93 | 32 | 11 | 83 | 78 |
| **England** | 66 | r 99 | 92 | 61 | 14 | 40 | 19 |
| **France** | 24 | 90 | 96 | 40 | 9 | 66 | 94 |
| *Germany* | s 26 | s 92 | 74 | 0 | 4 | 41 | 69 |
| **Iceland** | 23 | 100 | 100 | 69 | 7 | 74 | 35 |
| **Ireland** | 76 | 98 | 91 | 52 | 27 | 47 | 75 |
| *Israel* | s 37 | s 100 | 87 | 0 | 10 | 100 | 23 |
| **Lithuania** | 14 | 100 | 91 | 52 | 34 | 73 | 100 |
| *Netherlands* | r 70 | r 100 | 98 | 64 | 8 | 95 | 69 |
| **New Zealand** | 39 | 100 | 84 | 78 | 61 | 33 | 34 |
| **Russian Federation** | 10 | 85 | 72 | 81 | 74 | 79 | 91 |
| *Scotland* | r 29 | r 97 | 84 | 60 | 4 | 66 | 47 |
| [2] **Singapore** | 80 | 100 | 67 | 99 | 0 | 0 | 0 |
| **Slovak Republic** | 17 | 95 | 81 | 77 | 78 | 59 | 85 |
| *Slovenia* | r 11 | r 100 | 92 | 84 | 51 | 67 | 100 |
| **Sweden** | 57 | 95 | 90 | 22 | 14 | 39 | 100 |
| **Switzerland** | r 37 | r 99 | 93 | 31 | 32 | 46 | 47 |
| *Thailand* | 17 | 97 | 61 | 66 | 93 | 89 | 87 |
| **United States** | 83 | 97 | 95 | 87 | 38 | 71 | 73 |
| **International Average** | 41 | 97 | 85 | 52 | 29 | 61 | 62 |

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

Percent of Students

1 Percentages based only on students in schools with more than one course of study in mathematics.

2 Data for Singapore pertaining to entrance examinations, oral examinations, curricular requirements, student's own wishes, and parental wishes were obtained from the ministry.

* See Table 1.2 for more information about the grades tested in each country.

Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

School background data for Bulgaria and South Africa are unavailable.

A dash (–) indicates data are not available.

Data for the following countries are not available or are excluded because less than 10% of students attend schools with more than one course of study: Belgium (Fl), Belgium (Fr), Colombia, Cyprus, Czech Republic, Denmark, Greece, Hong Kong, Hungary, Iran, Japan, Korea, Kuwait, Latvia, Norway, Portugal, Romania, and Spain (see Table 4.2).

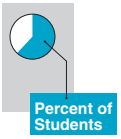
An "r" indicates school data available for 70-84% of students. An "s" indicates school data available for 50-69% of students.

# Figure 4.2

## Factors That Are Moderately or Very Important in Deciding Courses of Study in Science Eighth Grade*

| Country | Percent of Students in Schools with More Than One Course of Study | Percent of Students in Schools Reporting That Factor Is Moderately or Very Important[1] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Academic Performance | Teacher Recommen-dations | Standardized Tests | Entrance or Oral Examinations | Curricular Requirements | Wishes of Students or Parents |
| *Australia* | r 15 | r 87 | 72 | 19 | 0 | 60 | 46 |
| **England** | 24 | r 95 | 77 | 54 | 5 | 29 | 20 |
| **France** | 35 | r 74 | 83 | 20 | 11 | 61 | 79 |
| **Ireland** | 32 | 89 | 87 | 41 | 32 | 48 | 72 |
| *Netherlands* | r 70 | r 100 | 98 | 64 | 8 | 95 | 69 |
| **New Zealand** | 22 | 97 | 77 | 77 | 49 | 36 | 39 |
| [2] **Singapore** | 80 | 100 | 67 | 99 | 0 | 0 | 0 |
| **Slovak Republic** | 14 | 100 | 87 | 81 | 80 | 56 | 87 |
| **Switzerland** | r 28 | r 96 | 86 | 14 | 21 | 41 | 44 |
| *Thailand* | r 12 | r 96 | 52 | 77 | 91 | 95 | 100 |
| **United States** | 19 | 98 | 95 | 86 | 32 | 82 | 68 |
| **International Average** | 33 | 94 | 80 | 57 | 30 | 55 | 57 |

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




1 Percentages based only on students in schools with more than one course of study in science.

2 Data for Singapore pertaining to entrance examinations, oral examinations, curricular requirements, student's own wishes, and parental wishes were obtained from the ministry.

* See Table 1.2 for more information about the grades tested in each country.

Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

School background data for Bulgaria and South Africa are unavailable.

Data for the following countries are not available or are excluded because less than 10% of students attend schools with more than one course of study or data are available for less than 5 schools: Austria, Belgium (Fl), Belgium (Fr), Canada, Colombia, Cyprus, Czech Republic, Denmark, Germany, Greece, Hong Kong, Hungary, Iceland, Iran, Israel, Japan, Korea, Kuwait, Latvia, Lithuania, Norway, Portugal, Romania, Russian Federation, Scotland, Slovenia, Spain, and Sweden (see Table 4.2).

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

## What Are School Policies for Students' Instructional Time in Mathematics and Science?

Figure 4.3 presents the average instructional days per year reported by the schools in each country for the fourth and eighth grades. The number of instructional days in the school year reported by schools varies across countries, and the average number of instructional days was positively correlated with national mean achievement.[4] Internationally, an average of about 190 days was reported at both the fourth and eighth grades, and at both levels ranged from about 160 in Iceland to about 230 in Japan. The number of instructional days reported by schools may vary somewhat from the official length of the school year, as the days devoted to examinations and other special activities may not be included. The high-performing countries of Singapore, Japan, and Korea reported an average number of instructional days of 200 or more per year at both the fourth and eighth grades — a longer school year than in most other countries. In most countries that participated at both grade levels, the average number of instructional days reported was comparable at the fourth and eighth grades. In a few, a lower number was reported at eighth grade; the most notable of these is Hong Kong, one of the highest performing countries in mathematics at both grades, where the average number of days was only 171 at grade eight versus 208 at grade four. In Hong Kong, the length of the official school year is about 200 days at eighth grade,[5] but there are several days in the school year devoted to national examinations that are not reflected in the total reported.[6]

Figures 4.4 and 4.5 show, for fourth and eighth graders, respectively, the number of hours reported by schools that students spend in school per year, and how much of that time is devoted to instruction. Interestingly enough, on average across countries, only about 80% of students' time in school at either the fourth or eighth grade is devoted to instruction. This finding was relatively consistent from country to country. However, there was a general tendency for higher-performing countries to report more time in school and more instruction time than lower-performing countries.

[4] Pearson correlation coefficients between the national mean scale score and the average instructional days per year reported in Figure 4.3 were found to be 0.68 ($p<0.001$, $n=23$) for grade 4 mathematics, 0.54 ($p<0.01$, $n=23$) for grade 4 science, and 0.48 ($p<0.01$, $n=33$) for both mathematics and science at grade 8.

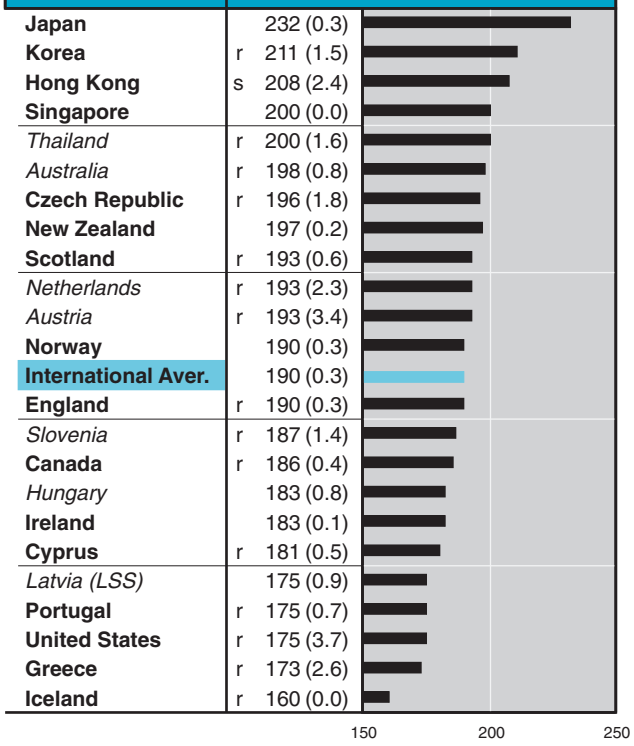
[5] Robitaille, D.F. (Ed.) (1997). *National Contexts for Mathematics and Science Education: An Encyclopedia of the Educational Systems Participating in TIMSS*. Vancouver, B.C.: Pacific Educational Press.

[6] Some schools in Hong Kong have up to three sets of examinations at grade 8 every academic year, each requiring 10-15 days.

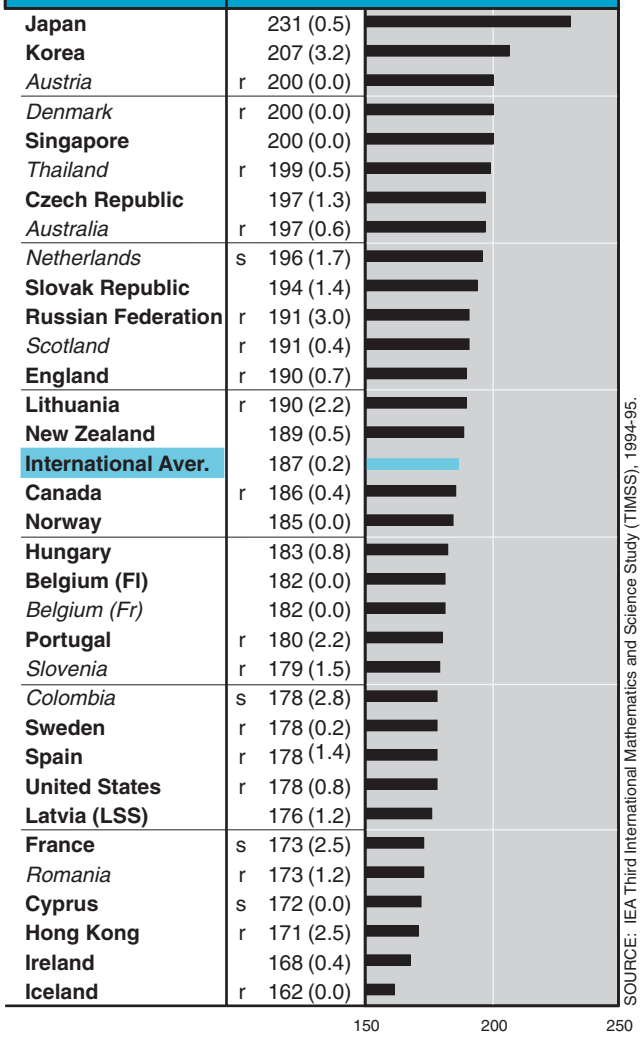
# Figure 4.3

## Instructional Days in the School Year[1] Fourth and Eighth Grade*

| Country | Fourth Grade: Average Number of Instructional Days in the School Year |
|---|---|
| **Japan** | 232 (0.3) |
| **Korea** | r 211 (1.5) |
| **Hong Kong** | s 208 (2.4) |
| **Singapore** | 200 (0.0) |
| *Thailand* | r 200 (1.6) |
| *Australia* | r 198 (0.8) |
| **Czech Republic** | r 196 (1.8) |
| **New Zealand** | 197 (0.2) |
| **Scotland** | r 193 (0.6) |
| *Netherlands* | r 193 (2.3) |
| *Austria* | r 193 (3.4) |
| **Norway** | 190 (0.3) |
| **International Aver.** | 190 (0.3) |
| **England** | r 190 (0.3) |
| *Slovenia* | r 187 (1.4) |
| **Canada** | r 186 (0.4) |
| *Hungary* | 183 (0.8) |
| **Ireland** | 183 (0.1) |
| **Cyprus** | r 181 (0.5) |
| *Latvia (LSS)* | 175 (0.9) |
| **Portugal** | r 175 (0.7) |
| **United States** | r 175 (3.7) |
| **Greece** | r 173 (2.6) |
| **Iceland** | r 160 (0.0) |




| Country | Eighth Grade: Average Number of Instructional Days in the School Year |
|---|---|
| **Japan** | 231 (0.5) |
| **Korea** | 207 (3.2) |
| *Austria* | r 200 (0.0) |
| *Denmark* | r 200 (0.0) |
| **Singapore** | 200 (0.0) |
| *Thailand* | r 199 (0.5) |
| **Czech Republic** | 197 (1.3) |
| *Australia* | r 197 (0.6) |
| *Netherlands* | s 196 (1.7) |
| **Slovak Republic** | 194 (1.4) |
| **Russian Federation** | r 191 (3.0) |
| *Scotland* | r 191 (0.4) |
| **England** | r 190 (0.7) |
| **Lithuania** | r 190 (2.2) |
| **New Zealand** | 189 (0.5) |
| **International Aver.** | 187 (0.2) |
| **Canada** | r 186 (0.4) |
| **Norway** | 185 (0.0) |
| **Hungary** | 183 (0.8) |
| **Belgium (Fl)** | 182 (0.0) |
| *Belgium (Fr)* | 182 (0.0) |
| **Portugal** | r 180 (2.2) |
| *Slovenia* | r 179 (1.5) |
| *Colombia* | s 178 (2.8) |
| **Sweden** | r 178 (0.2) |
| **Spain** | r 178 (1.4) |
| **United States** | r 178 (0.8) |
| **Latvia (LSS)** | 176 (1.2) |
| **France** | s 173 (2.5) |
| *Romania* | r 173 (1.2) |
| **Cyprus** | s 172 (0.0) |
| **Hong Kong** | r 171 (2.5) |
| **Ireland** | 168 (0.4) |
| **Iceland** | r 162 (0.0) |




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

1 Reported as number of instructional days in the school year averaged across schools.

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

School background data for Bulgaria and South Africa are unavailable at the eighth grade.

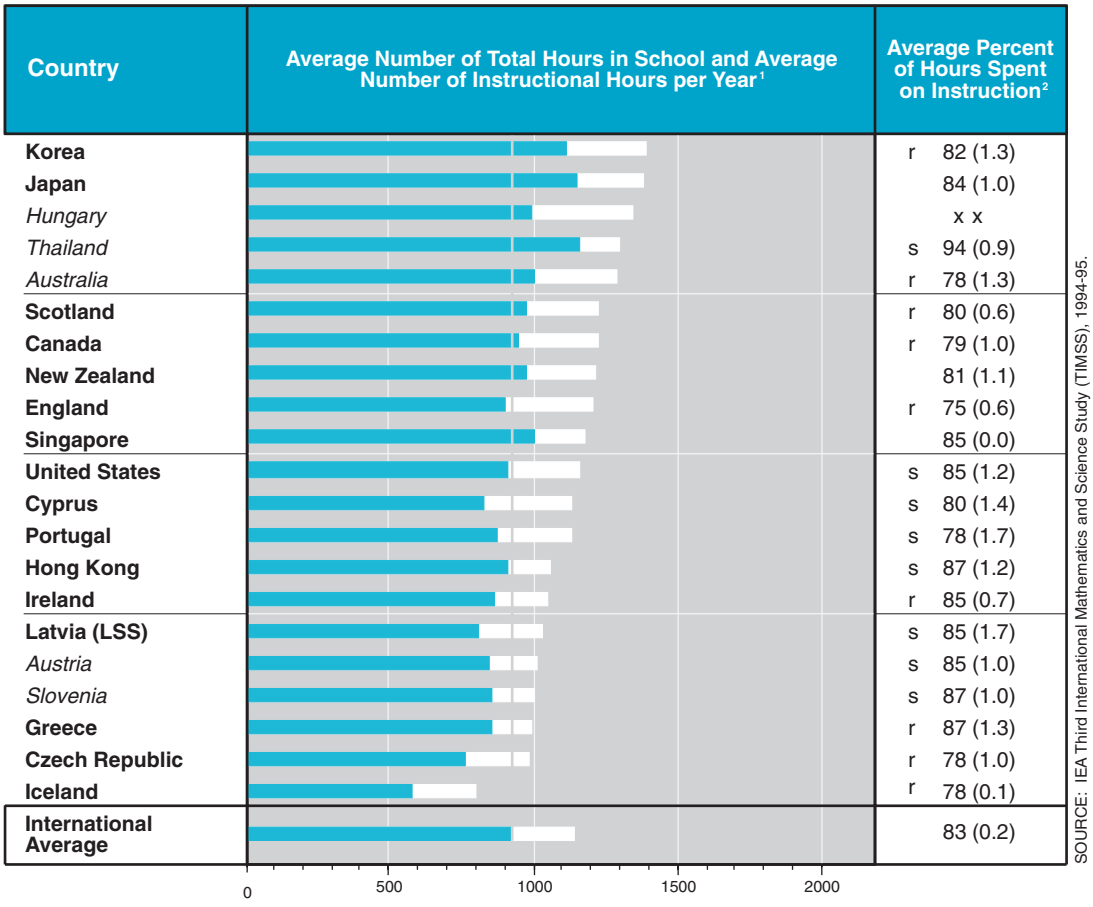
Countries where data were available for <50% of schools are omitted from the figure: Iran, Israel, and Kuwait are omitted from the first panel; Germany, Greece, Iran, Israel, and Kuwait are omitted from the second panel.

Averages based on total school weights cannot be computed for Switzerland; sampling based on tracks within schools at grade 8.

An "r" indicates school data available for 70-84% of schools. An "s" indicates school data available for 50-69% of schools.

# Figure 4.4

## Amount of Time in School Scheduled for Instruction
## Fourth Grade*




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

1 Computed from the reported instructional days in the school year, the full and half instructional days in the school week, and the total and instructional hours in the school week. Reported as number of total hours and number of instructional hours averaged across schools.

2 Reported as ratio of instructional hours to total hours averaged across schools.

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

Countries where questions were not asked or data were available for <50% of schools are omitted from the figure: Kuwait, the Netherlands, and Norway did not ask these questions; data available for <50% of schools in Iran and Israel.

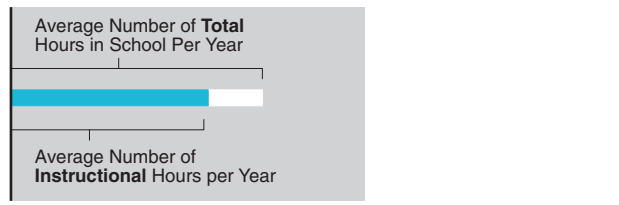
An "r" indicates school data available for 70-84% of schools. An "s" indicates school data available for 50-69% of schools.

An "x" indicates school data available for <50% of schools.

# Figure 4.5

## Amount of Time in School Scheduled for Instruction
## Eighth Grade*

| Country | Average Yearly Amount of Time in School and Average Amount of Instructional Time in Hours[1] | Average Percent of Hours Spent on Instruction[2] |
|---|---|---|
| **Korea** | | 81 (1.5) |
| **Japan** | | 76 (1.1) |
| *Thailand* | | r 94 (0.7) |
| **Portugal** | | r 80 (1.3) |
| **France** | | s 78 (1.5) |
| **Singapore** | | 72 (0.0) |
| *Australia* | | r 77 (0.8) |
| **Slovak Republic** | | r 91 (0.8) |
| **Belgium (Fl)** | | 78 (0.0) |
| *Belgium (Fr)* | | 78 (0.0) |
| **Canada** | | r 76 (1.1) |
| *Colombia* | | s 88 (1.9) |
| **Scotland** | | r 82 (1.0) |
| **New Zealand** | | 75 (1.2) |
| **Lithuania** | | r 82 (1.8) |
| **England** | | r 74 (0.5) |
| **Latvia (LSS)** | | s 73 (1.0) |
| **United States** | | s 86 (1.4) |
| **Hong Kong** | | s 78 (1.5) |
| **Ireland** | | r 78 (1.5) |
| *Romania* | | r 94 (0.9) |
| **Sweden** | | s 68 (1.6) |
| **Russian Federation** | | r 75 (1.4) |
| *Slovenia* | | s 86 (0.8) |
| **Spain** | | s 82 (1.6) |
| **Iceland** | | s 77 (0.0) |
| **International Average** | | 80 (0.2) |




**Legend**

Average Number of **Total** Hours in School Per Year

Average Number of **Instructional** Hours per Year

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

1 Computed from the reported instructional days in the school year, the full and half instructional days in the school week, and the total and instructional hours in the school week. Reported as number of total hours and number of instructional hours averaged across schools.

2 Reported as ratio of instructional hours to total hours averaged across schools.

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

School background data for Bulgaria and South Africa are unavailable.

Countries where questions were not asked or data were available for <50% of schools are omitted from the figure: Austria, Czech Republic, Denmark, Greece, Kuwait, and Norway did not ask these questions; data available for <50% of schools in Cyprus, Germany, Hungary, Iran, Israel, the Netherlands, and Switzerland.

An "r" indicates school data available for 70-84% of schools. An "s" indicates school data available for 50-69% of schools.

For both mathematics and science at fourth grade, Table 4.4 presents the number of hours devoted to instruction in the subject and the percentage of total instructional time accounted for by those hours. There is tremendous variation in the number of instructional hours schools reported being devoted to mathematics per year, from 219 in Singapore to 92 in Korea, with an international average of 144 hours. On average across countries, 18% of the available instructional time was devoted to mathematics. This is a substantial amount of the total time, and the figure did not vary much from country to country (except Korea at only 9%).

For science at fourth grade, there was also a considerable range in the number of hours per year devoted to instruction, from 181 in Thailand to 18 in Latvia (LSS). Most countries reported substantially less emphasis on science than on mathematics instruction in the primary school, the average number of instructional hours — 75 hours — being only about half that reported for mathematics. Correspondingly, on average across countries, about 9% of the instructional time at fourth grade is devoted to science.

At eighth grade, information about instructional time in mathematics and science is more complicated to obtain because it differs by type of curricular program. Table 4.5 presents mathematics instructional time in hours and as a percentage of the total available time for students in schools with a single curricular program. For students in schools with more than one program, it shows instructional time for students in the most and least advanced courses of study. Table 4.6 presents the corresponding data for science.

Several patterns emerge from the data in Tables 4.5 and 4.6. In general, school principals reported spending less instructional time on mathematics at eighth grade than at fourth grade: about 20 hours less, on average, for students in schools with a single program and for those in advanced programs. The number of hours was reduced even further for students in the least advanced programs (108 hours per year at grade 8 compared with the 145 reported at grade 4).

In contrast, the amount of instructional time devoted to science increased at eighth grade to be equal to (or even greater than) the number devoted to mathematics. By the eighth grade, on average across countries, students in schools with only one science program or those in the least advanced programs received approximately 125-130 hours of science instruction per year, with higher average instructional hours for the most advanced program in some countries. In some countries, including Austria, the Czech Republic, Romania, and the Slovak Republic, the average amount of yearly science instruction was more than 200 hours.

# Table 4.4

## Amount of Instruction in Mathematics and Science[1]
## Fourth Grade*

| Country | Mathematics | | | | Science | | | |
|---|---|---|---|---|---|---|---|---|
| | Average Amount of Yearly Mathematics Instruction in Hours[2] | | Average Percent of Instructional Time Devoted to Mathematics[3] | | Average Amount of Yearly Science Instruction in Hours[2] | | Average Percent of Instructional Time Devoted to Science[3] | |
| *Australia* | r | 182 (6.3) | r | 18 (0.7) | r | 49 (2.6) | r | 5 (0.3) |
| *Austria* | | – – | | – – | | – – | | – – |
| **Canada** | r | 165 (4.2) | s | 19 (1.3) | r | 92 (2.7) | s | 10 (0.7) |
| **Cyprus** | r | 139 (1.7) | s | 21 (1.8) | r | 48 (0.4) | s | 7 (0.5) |
| **Czech Republic** | | 156 (2.2) | r | 21 (0.4) | | 63 (1.3) | r | 8 (0.2) |
| **England** | r | 169 (3.6) | r | 19 (0.5) | r | 99 (4.9) | r | 11 (0.7) |
| **Greece** | | 97 (6.3) | s | 12 (1.1) | | 76 (3.5) | s | 9 (0.6) |
| **Hong Kong** | | 130 (5.2) | s | 16 (0.7) | r | 40 (1.6) | s | 5 (0.2) |
| *Hungary* | | – – | | – – | | – – | | – – |
| **Iceland** | | 103 (0.1) | r | 20 (0.0) | r | 43 (0.5) | s | 8 (0.1) |
| **Iran, Islamic Rep.** | r | 98 (6.8) | | x x | | 66 (5.5) | | x x |
| **Ireland** | r | 145 (3.8) | r | 19 (1.2) | s | 50 (2.8) | s | 6 (0.5) |
| *Israel* | | x x | | x x | | x x | | x x |
| **Japan** | | – – | | – – | | – – | | – – |
| **Korea** | | 92 (4.1) | r | 9 (0.5) | | 92 (3.9) | r | 9 (0.5) |
| *Kuwait* | | – – | | – – | | – – | | – – |
| *Latvia (LSS)* | s | 114 (2.0) | s | 19 (1.9) | r | 18 (1.4) | r | 3 (0.3) |
| *Netherlands* | | – – | | – – | | – – | | – – |
| **New Zealand** | | 149 (5.3) | | 15 (0.6) | r | 45 (3.6) | r | 5 (0.4) |
| **Norway** | | 111 (0.0) | | – – | | – – | | – – |
| **Portugal** | r | 190 (7.2) | s | 22 (0.9) | r | 154 (6.3) | s | 18 (0.9) |
| **Scotland** | | – – | | – – | | – – | | – – |
| **Singapore** | | 219 (0.0) | | 22 (0.0) | | 81 (0.0) | | 8 (0.0) |
| *Slovenia* | r | 127 (2.0) | s | 17 (1.1) | r | 54 (1.2) | s | 7 (0.4) |
| *Thailand* | r | 188 (5.9) | s | 18 (1.4) | r | 181 (7.5) | s | 17 (1.4) |
| **United States** | r | 156 (4.1) | s | 18 (1.5) | s | 106 (5.3) | s | 13 (1.2) |
| **International Average** | | 144 (1.0) | | 18 (0.3) | | 75 (0.9) | | 9 (0.2) |

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

1 Reported for schools where students follow the same course of study in mathematics or science (see Table 4.1).

2 Computed as yearly mathematics or science instruction averaged across schools.

3 Average percent of instructional time computed from the ratio of yearly mathematics or science instruction to the total amount of instructional time (see Figure 4.4).

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

A dash (–) indicates data are not available.

An "r" indicates school data available for 70-84% of schools. An "s" indicates school data available for 50-69% of schools.

An "x" indicates school data available for <50% of schools.

# Table 4.5

## Amount of Instruction in Mathematics
## Eighth Grade*

| Country | Schools with One Course of Study | | Schools with More than One Course of Study [1] | | | |
|---|---|---|---|---|---|---|
| | | | Most Advanced Course of Study | | Least Advanced Course of Study | |
| | Average Amount of Yearly Mathematics Instruction in Hours [2] | Average Percent of Instructional Time Devoted to Mathematics [3] | Average Amount of Yearly Mathematics Instruction in Hours [2] | Average Percent of Instructional Time Devoted to Mathematics [3] | Average Amount of Yearly Mathematics Instruction in Hours [2] | Average Percent of Instructional Time Devoted to Mathematics [3] |
| *Australia* | r 142 (2.7) | r 14 (0.4) | r 139 (7.0) | r 13 (0.6) | r 137 (3.9) | r 14 (0.5) |
| *Austria* | 120 (0.0) | – – | 120 (1.0) | – – | 120 (1.0) | – – |
| **Belgium (Fl)** | 127 (0.0) | 12 (0.0) | 127 (0.0) | 12 (0.0) | 63 (0.0) | 6 (0.0) |
| *Belgium (Fr)* | 127 (0.0) | 12 (0.0) | 127 (0.0) | 12 (0.0) | 63 (0.0) | 6 (0.0) |
| **Canada** | r 153 (2.5) | r 16 (0.3) | 148 (5.1) | 15 (0.8) | 150 (6.0) | 15 (0.9) |
| *Colombia* | r 120 (6.9) | s 15 (1.7) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Cyprus** | s 89 (0.0) | x x | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Czech Republic** | 147 (2.4) | r 17 (0.2) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Denmark* | r 120 (0.0) | – – | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **England** | r 115 (4.9) | r 12 (0.6) | r 116 (1.6) | r 12 (0.2) | r 117 (1.5) | r 12 (0.2) |
| **France** | r 133 (1.4) | s 12 (0.2) | 125 (4.9) | 11 (0.5) | 110 (14.3) | 10 (1.3) |
| *Germany* | x x | x x | x x | x x | x x | x x |
| *Greece* | – – | – – | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Hong Kong** | r 118 (2.8) | s 13 (0.4) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Hungary** | – – | – – | – – | – – | – – | – – |
| **Iceland** | 110 (0.0) | r 15 (0.0) | 111 (0.0) | 15 (0.0) | 112 (0.0) | 15 (0.0) |
| **Iran, Islamic Rep.** | r 129 (6.4) | x x | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Ireland** | 105 (2.6) | 11 (0.7) | 106 (1.8) | r 11 (0.2) | 106 (1.9) | r 11 (0.2) |
| *Israel* | s 125 (7.1) | x x | x x | x x | x x | x x |
| **Japan** | 118 (1.0) | 10 (0.1) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Korea** | 100 (1.0) | 8 (0.4) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Kuwait* | – – | – – | – – | – – | – – | – – |
| **Latvia (LSS)** | s 134 (1.8) | s 15 (0.4) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Lithuania** | 107 (2.0) | r 10 (0.4) | 157 (8.4) | 14 (1.0) | 106 (6.4) | 9 (0.7) |
| *Netherlands* | r 100 (1.9) | s 8 (0.3) | r 102 (2.3) | s 8 (0.3) | r 97 (1.7) | s 8 (0.2) |
| **New Zealand** | 139 (3.2) | r 15 (0.4) | 140 (3.6) | 15 (0.3) | 142 (3.9) | 15 (0.3) |
| **Norway** | 111 (0.0) | – – | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Portugal** | 118 (1.5) | r 11 (0.2) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Romania* | 114 (1.9) | r 10 (0.2) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Russian Federation** | 141 (2.2) | r 17 (0.4) | 178 (14.1) | 17 (2.6) | – – | – – |
| *Scotland* | r 139 (3.1) | r 13 (0.4) | r 134 (5.4) | r 13 (0.5) | r 134 (5.4) | r 13 (0.5) |
| **Singapore** | 126 (0.0) | 12 (0.0) | 130 (0.0) | 13 (0.0) | 133 (0.0) | 13 (0.0) |
| **Slovak Republic** | 153 (2.7) | 13 (0.3) | 174 (17.3) | 15 (0.2) | 91 (13.3) | 7 (1.1) |
| *Slovenia* | r 100 (0.9) | s 10 (0.2) | 106 (3.7) | r 10 (0.4) | 85 (13.7) | r 8 (1.4) |
| **Spain** | r 131 (2.2) | s 16 (1.1) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Sweden** | 96 (0.9) | r 12 (0.4) | 97 (1.6) | r 12 (0.4) | 97 (1.6) | r 12 (0.4) |
| [4] **Switzerland** | – – | – – | – – | – – | – – | – – |
| *Thailand* | r 107 (5.4) | s 8 (0.5) | 58 (6.0) | 4 (0.4) | 62 (7.9) | 4 (0.6) |
| **United States** | r 146 (4.2) | r 13 (0.9) | r 136 (5.7) | s 12 (0.8) | r 134 (5.9) | s 12 (0.8) |
| **International Average** | 122 (0.5) | 13 (0.1) | 127 (1.4) | 12 (0.2) | 108 (1.5) | 11 (0.2) |

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

1 Reported for countries in which more than 10% of students are in schools with more than one course of study in mathematics (see Table 4.2).

2 Computed as yearly mathematics instruction averaged across schools.

3 Average percent of instructional time computed from the ratio of yearly mathematics instruction to the total amount of instructional time (see Figure 4.5).

4 Averages based on total school weights cannot be computed for Switzerland; sampling based on tracks within schools at grade 8.

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

School background data for Bulgaria and South Africa are unavailable.

A dash (–) indicates data are not available. A tilde (~) indicates insufficient data to report variable (percentage of students in schools with more than one course of study is less than 10).

An "r" indicates school data available for 70-84% of schools. An "s" indicates school data available for 50-69% of schools.

An "x" indicates school data available for <50% of schools.

# Table 4.6

## Amount of Instruction in Science
## Eighth Grade*

| Country | Schools with One Course of Study | | Schools with More than One Course of Study[1] | | | |
|---|---|---|---|---|---|---|
| | | | Most Advanced Course of Study | | Least Advanced Course of Study | |
| | Average Amount of Yearly Science Instruction in Hours[2] | Average Percent of Instructional Time Devoted to Science[3] | Average Amount of Yearly Science Instruction in Hours[2] | Average Percent of Instructional Time Devoted to Science[3] | Average Amount of Yearly Science Instruction in Hours[2] | Average Percent of Instructional Time Devoted to Science[3] |
| *Australia* | r 122 (2.3) | s 12 (0.3) | r 147 (8.0) | r 14 (0.7) | r 137 (6.0) | r 13 (0.8) |
| *Austria* | 238 (0.7) | – – | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Belgium (Fl)** | 127 (0.0) | 12 (0.0) | – – | – – | – – | – – |
| *Belgium (Fr)* | – – | – – | – – | – – | – – | – – |
| **Canada** | r 105 (3.2) | s 11 (0.4) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Colombia* | r 95 (4.7) | s 12 (1.5) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Cyprus** | x x | x x | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Czech Republic** | 222 (7.3) | r 26 (0.8) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Denmark* | – – | – – | – – | – – | – – | – – |
| **England** | r 136 (3.6) | r 15 (0.4) | r 127 (8.4) | r 13 (1.1) | r 128 (8.5) | r 13 (1.1) |
| **France** | r 94 (5.9) | r 9 (0.7) | 102 (7.3) | r 9 (0.8) | 70 (6.9) | r 6 (0.7) |
| *Germany* | x x | x x | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Greece* | – – | – – | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Hong Kong** | r 84 (2.4) | s 9 (0.3) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Hungary** | – – | – – | – – | – – | – – | – – |
| **Iceland** | 64 (0.0) | s 9 (0.0) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Iran, Islamic Rep.** | r 114 (4.6) | x x | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Ireland** | 96 (1.9) | r 10 (0.4) | 93 (2.4) | 10 (0.3) | 93 (2.9) | 10 (0.3) |
| *Israel* | x x | x x | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Japan** | 91 (1.2) | 8 (0.1) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Korea** | 83 (1.3) | r 7 (0.3) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Kuwait* | – – | – – | – – | – – | – – | – – |
| **Latvia (LSS)** | s 105 (9.4) | s 13 (1.0) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Lithuania** | – – | – – | – – | – – | – – | – – |
| *Netherlands* | r 176 (10.9) | s 13 (1.4) | r 167 (5.4) | s 14 (0.7) | r 170 (4.8) | s 14 (0.5) |
| **New Zealand** | 134 (2.4) | r 14 (0.3) | 148 (3.1) | 15 (0.3) | 148 (3.2) | 15 (0.4) |
| **Norway** | 83 (0.0) | – – | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Portugal** | 113 (4.2) | r 11 (0.5) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Romania* | 208 (7.6) | r 19 (0.6) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Russian Federation** | 192 (5.9) | r 23 (0.9) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| *Scotland* | r 115 (2.2) | r 11 (0.3) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Singapore** | 134 (0.0) | 13 (0.0) | 139 (0.0) | 14 (0.0) | 137 (0.0) | 14 (0.0) |
| **Slovak Republic** | 270 (10.8) | 22 (0.9) | 218 (23.9) | 18 (4.1) | 125 (35.1) | ~ ~ |
| *Slovenia* | r 135 (3.4) | s 14 (0.4) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Spain** | r 101 (2.4) | s 13 (0.7) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| **Sweden** | r 123 (2.8) | r 15 (0.4) | ~ ~ | ~ ~ | ~ ~ | ~ ~ |
| [4] **Switzerland** | – – | – – | – – | – – | – – | – – |
| *Thailand* | r 100 (5.2) | r 7 (0.5) | r 56 (5.9) | r 4 (0.4) | 80 (17.7) | 5 (1.2) |
| **United States** | r 139 (2.2) | s 13 (0.3) | 159 (5.1) | r 15 (0.6) | 156 (5.7) | r 14 (0.5) |
| **International Average** | 131 (0.9) | 13 (0.1) | 135 (2.9) | 13 (0.5) | 125 (4.2) | 12 (0.2) |

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

1 Reported for countries in which more than 10% of students are in schools with more than one course of study in Science (see Table 4.3).

2 Computed as yearly science instruction averaged across schools.

3 Average percent of instructional time computed from the ratio of yearly science instruction to the total amount of instructional time (see Figure 4.5).

4 Averages based on total school weights cannot be computed for Switzerland; sampling based on tracks within schools at grade 8.

* See Table 1.2 for more information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A).

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

School background data for Bulgaria and South Africa are unavailable.

A dash (–) indicates data are not available. A tilde (~) indicates insufficient data to report variable (percentage of students in schools with more than one course of study is less than 10 or data are available for less than 5 schools).

An "r" indicates school data available for 70-84% of schools. An "s" indicates school data available for 50-69% of schools.

An "x" indicates school data available for <50% of schools.