

Executive Summary

Since its inception in 1959, the International Association for the Evaluation of Educational Achievement (IEA) has conducted a series of international comparative studies designed to provide policy makers, educators, researchers, and practitioners with information about educational achievement. The Third International Mathematics and Science Study (TIMSS) is the largest and most ambitious of these studies.

The scope and complexity of TIMSS is enormous. In 1995, the mathematics and science testing covered five grade levels, with more than 40 countries collecting data in more than 30 languages. Over half a million students were tested around the world. In addition to achievement tests in mathematics and science, TIMSS also administered background questionnaires to students, their teachers, and their schools.

Since the data were collected in 1995, the TIMSS International Study Center at Boston College has published reports detailing the results for students in third and fourth grades, seventh and eighth grades, and in their final year of secondary school, as well as background data on students and teachers. A report on the TIMSS performance assessment at fourth and eighth grades has also been published, as has a series of technical reports. The international databases containing all of the achievement and background data also have been released, together with user guides to facilitate secondary analysis.

Since the results from the school questionnaire could not be included in the initial reports because of time constraints, these data are being presented for all of the TIMSS grades together in a single volume. This report presents school questionnaire data for three grade levels in 41 countries. Results are reported for fourth grade, eighth grade, and students in the final year of secondary school (twelfth grade in most countries). The purpose of the report is to provide data on school contexts for learning mathematics and science, including school characteristics, policies, and practices. The report is organized around five major topics:

- Roles and responsibilities of schools and school principals
- School organization and staffing
- Organization for learning mathematics and science
- School resources
- School atmosphere

The school report is the final volume in the series of descriptive reports from the 1995 TIMSS assessment. The combined school results for three grade levels offer a useful overview of a range of school factors and how they vary

across grades and across countries. Together with the student achievement data and the student and teacher questionnaire results published earlier, they round off the initial presentation of the TIMSS results and provide valuable information about the relative effectiveness of a country's education system as students progress through school.

The following sections summarize the major findings described in this report.

ROLE AND RESPONSIBILITIES OF SCHOOLS AND SCHOOL PRINCIPALS

Since the school is the primary institution for formal education in all countries, its role and the responsibilities of the principal are of central concern in any comparative study of education systems. By examining which activities are a responsibility of the school, by comparing how school principals spend their time, and by reviewing the influences on the school curriculum, this section of the report sheds light on how some important school functions vary from country to country.

- ▶ One of the most obvious ways in which school systems vary is the degree to which individual schools have autonomy to make decisions about everyday affairs. At all three grade levels, on average across countries, principals reported the greatest autonomy in assigning teachers to classes and choosing textbooks. At fourth and eighth grades, hiring teachers was least often primarily a school responsibility; at the final year of secondary school, determining course content and deciding which courses are offered were also rarely primarily a school responsibility.
- ▶ In the light of research findings indicating that the school principal can be very effective in promoting school excellence, TIMSS asked principals how they divided their time among instructional leadership activities, teaching, administrative duties, and communicating with students, parents, and officials. At all three grade levels, and particularly at the final grade of secondary school, principals reported that the most time was spent on administration.
- ▶ Principals reported that the greatest influences on the curriculum taught in the school come from the national or regional education authorities, and from within the school itself. In almost every country, principals indicated that the school staff had considerable influence on the curriculum implemented in the school.

SCHOOL ORGANIZATION AND STAFFING

Organizing schools and teaching staff to provide the widest possible access to educational resources at the least cost is a challenge for every country. This report presents information on school size and staffing, admission practices, and teacher cooperation and collaboration.

- ▶ In general, countries take advantage of the economies of scale offered by large schools when providing for their upper-secondary students. Average enrollment in the schools attended by students in their final year of secondary school was approximately 622 students. With few exceptions, however, countries prefer smaller neighborhood schools (346 students on average) that may be less intimidating and require less travel time for the younger fourth-grade students.
- ▶ The ratio of students to teachers is generally highest at fourth grade and lower at eighth grade and the end of secondary school. This may mean that classes are larger on average at fourth grade or that greater numbers of specialists or ancillary staff are in the larger schools that are characteristic for the higher grades. Part-time teachers are not common at fourth grade, and are more widely employed at eighth grade and in the final grade of secondary school.
- ▶ Principals of schools with fourth- and eighth-grade students were asked about the criteria used to admit students. Among fourth-grade students, residence in the area served by the school was the most common criterion for school admission, and few schools reported applying academic criteria. At eighth grade, area of residence is also very important, but more principals report that selection practices are in use, including academic standards, parent or student interviews, or previous links with the school (e.g., parents or older siblings attended the school).

ORGANIZATION FOR LEARNING MATHEMATICS AND SCIENCE

A major challenge for schools is how to deal with students of different abilities and interests in mathematics and science. This report presents information about whether countries offer more than one curricular program for students within mathematics and science, and if so, how decisions are made about students' courses of study. School policies about instructional time also are discussed.

- ▶ The results for fourth grade indicate that schools almost universally provide just one course of study for students in science, to a high degree in mathematics also, although in some countries — Israel, and the Netherlands, substantial percentages of students are in schools with more than one mathematics course. At eighth grade principals reported more differentiation in curricular programs than at fourth grade, particularly in mathematics. On average, schools with more than one eighth-grade program in either mathematics or science reported either two or three programs.
- ▶ Academic performance was reported to be the main factor in program placement decisions for eighth-grade students across countries, with teacher recommendations carrying weight in every country also. 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.

- ▶ There was a tendency for high-performing countries to report more time in school and more instruction time than lower-performing countries. At fourth grade, the high-performing countries of Singapore, Japan, Korea, and Hong Kong were the only countries with an average number of school days of 200 or more per year. At eighth grade, high-performing countries such as Japan and Korea, with 231 and 207 school days respectively, have substantially longer school years than most other countries, where the average school year is 200 days or less.
- ▶ For both mathematics and science at fourth grade, the number of hours of instructional time varied considerably across countries. There was much more emphasis on mathematics than science at this grade level, with an international average of 75 instructional hours in science compared with 144 hours in mathematics.

SCHOOL RESOURCES

In presenting school principals' testimony about resources in their schools, this report focuses on one important resource in the modern classroom, i.e., the computer, and on shortages and inadequacies that inhibit the school's capacity to provide instruction.

- ▶ Provision of computers to schools varies dramatically across countries at fourth grade, from countries such as Canada and the United States (where almost two-thirds of schools reported that they have on average one computer for every 15 students), to countries such as Iran and Thailand where no computers were reported in any schools. Generally, more computers were reported by eighth-grade principals, although there remains a wide gap between countries with the highest level of equipment and those least well equipped. Although Canada and the United States had the most computers at fourth grade, several other countries, including England, Scotland, and Australia, had comparable or better equipment levels at eighth grade.
- ▶ At fourth and eighth grades about one-third of schools on average reported that their capacity to provide instruction was affected by resource shortages, primarily inadequate school buildings, grounds, or instructional space. Countries where problems were most severe included Belgium (French), Denmark, Iran, Latvia (LSS), Lithuania, Portugal, the Russian Federation, Slovenia, and Thailand.
- ▶ Shortages that affected the school's capacity to provide instruction in science were reported more often than in mathematics, with laboratory equipment and materials a frequent problem for science instruction, and computers and computer software a problem for both mathematics and science instruction.

SCHOOL ATMOSPHERE

Research has shown that schools with an atmosphere conducive to academic achievement tend to have higher performance than those with a less supportive environment. The TIMSS data also show higher achievement within countries with less absenteeism, more stability in the student body, and fewer student problems.

- ▶ In general, absenteeism is low in schools around the world, although rates and patterns vary considerably across countries. Whereas there are countries where an absentee rate of five percent or more was quite common, it is noteworthy that very little absenteeism was reported in the high-performing countries of Japan, Hong Kong, Korea, and Singapore. Within countries, schools with poorer attendance rates often had students with lower achievement in mathematics and science, particularly at fourth and eighth grades. Also, students in schools with more stable student bodies — i.e., with little student transfer into or out of the school — usually outperformed students in less stable schools.
- ▶ The principals of fourth-grade schools reported that the most prevalent problem reported was students intimidating other students, with physical injury to students the next most prevalent. At eighth grade student intimidation remained a problem, while vandalism, theft, and physical injury to other students were also frequently reported. In upper-secondary school vandalism and theft are still a problem; intimidation of students was less frequently reported. Unfortunately, by the end of secondary schooling illegal drug possession or use has become a noticeable problem in some countries. Nearly one-fifth of high-school school principals in the United States reported having to deal with drug possession or use at least monthly.