International Association for the Evaluation of Educational Achievement

# Gender Differences in Achievement

## IEA's Third International Mathematics and Science Study (TIMSS)

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TIMSS

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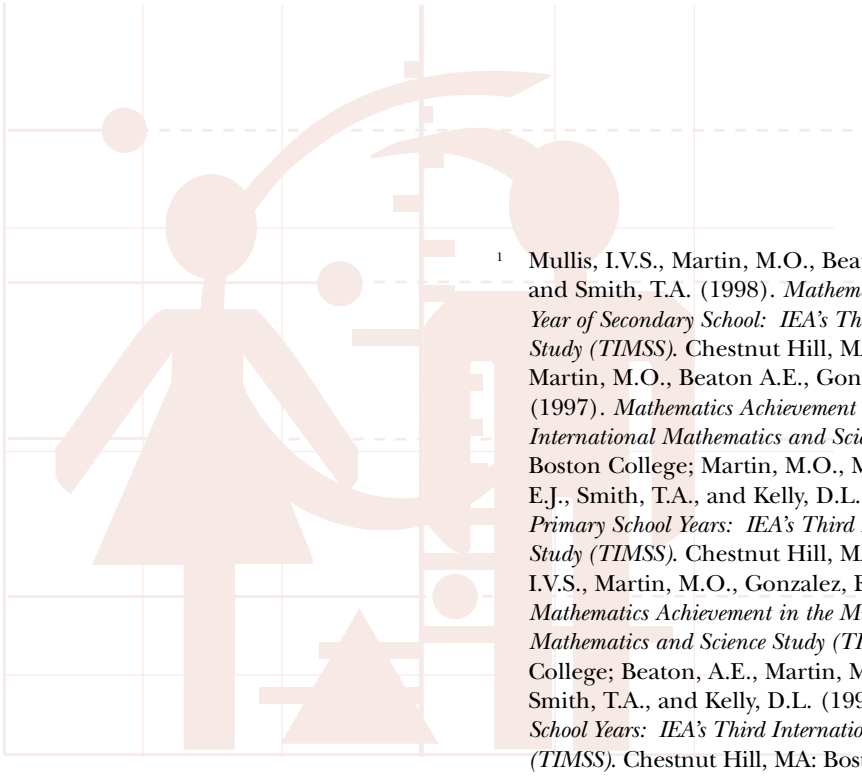
## Summary of Results

### Introduction

The Third International Mathematics and Science Study, known as TIMSS, is the largest and most ambitious of the international comparative studies conducted by the International Association for the Evaluation of Educational Achievement (IEA) since its inception in 1959. Students were tested in both mathematics and science at five different grades across primary, middle, and secondary school, totaling more than half a million students tested in 41 countries around the world. Including the 15,000 schools involved, many thousands of individuals were involved in the data collection effort. Most countries collected their data in May and June of 1995, although those countries on a Southern Hemisphere schedule tested in late 1994, which was the end of their school year.

The purpose of this report is to provide an in depth look at the TIMSS achievement results by gender. Results previously reported from TIMSS show that much effort still is needed to achieve gender equity in mathematics and science achievement around the world.[1] While the TIMSS results showed few differences in average mathematics achievement by gender at the fourth and eighth grades, there were substantial gender differences in mathematics achievement for students in the final year of secondary school (grade 12 in many countries). In science, gender differences were present in many countries even at grade four and were overwhelming for students in the final year of secondary school.



[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; Mullis, I.V.S., Martin, M.O., Beaton A.E., Gonzalez, E.J., Kelly, D.L., and Smith T.A. (1997). *Mathematics Achievement in the Primary School Years: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College; Martin, M.O., Mullis, I.V.S., Beaton, A.E., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. (1997). *Science Achievement in the Primary School Years: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College; Beaton, A.E., Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1996). *Mathematics Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College; Beaton, A.E., Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. (1996). *Science Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College.

## More About TIMSS

The success of TIMSS depended on a collaborative effort between the research centers in each country responsible for implementing the steps of the project and the network of centers responsible for managing the across-country tasks. Led by the TIMSS International Study Center at Boston College, various centers around the world conducted the tasks associated with sampling, administration and scoring training, data processing, and analysis while emphasizing quality control at every step of the way.[2]

The mathematics and science tests given to the students differed by grade level, with each covering a variety of content areas. For example, six content dimensions were covered in the mathematics test for the middle-school students: fractions and number sense; measurement; proportionality; data representation, analysis, and probability; geometry; and algebra. About one-fourth of the questions were in the free-response format requiring students to generate and write their answers. These types of questions, some of which required extended responses, were allotted approximately one-third of the testing time. The students who participated in TIMSS also completed questionnaires about their home and school experiences related to learning mathematics. In addition, teachers and school administrators completed questionnaires about instructional practices.

All countries that participated in TIMSS were to test students in the two grades with the largest proportion of 13-year-olds, seventh and eighth grades in most countries. Many countries also tested students in the two grades with the largest proportion of 9-year-olds, third and fourth grades in most countries. Additionally, some countries tested students in their final year of secondary education. For students in the final year of secondary school, there were two components to the TIMSS testing. Given the extensive diversity of students' curricula around the world, testing this "grade" was a special challenge for TIMSS. The mathematics and science literacy test was designed for all final-year students, regardless of their school curriculum. By and large, the purpose of this test was to measure how well students could use their knowledge in addressing real-world problems having a mathematics or science component. For students having taken advanced courses in mathematics and science, special tests were developed — one for students having taken advanced mathematics and another for students having taken physics. For the sciences, it was not possible to test all branches in detail. The participating countries chose physics because it is the science branch most closely aligned with mathematics, and came closest to embodying the essential elements of natural science.

[2] Martin, M.O. and Kelly, D.L. (Eds.). (1996). *Third International Mathematics and Science Study (TIMSS) Technical Report Volume I: Design and Development.* Chestnut Hill, MA: Boston College; Martin, M.O. and Kelly, D.L. (Eds.). (1997). *Third International Mathematics and Science Study (TIMSS) Technical Report Volume II: Implementation and Analysis in the Primary and Middle School Years.* Chestnut Hill, MA: Boston College; Martin, M.O. and Kelly, D.L. (Eds.). (1998). *Third International Mathematics and Science Study (TIMSS) Technical Report Volume III: Implementation and Analysis in the Final Year of Secondary School.* Chestnut Hill, MA: Boston College; Martin, M.O. and Mullis, I.V.S. (1996). *Third International Mathematics and Science Study (TIMSS): Quality Assurance in Data Collection.* Chestnut Hill, MA: Boston College.

The procedures used to select the samples of students participating in the TIMSS testing were scrutinized according to rigorous standards designed to prevent bias and ensure comparability. Prior to analysis, the data from each country were subjected to exhaustive checks for adherence to the international formats as well as for within-country consistency and comparability across countries.

## The TIMSS Gender Report

This report looks in detail at differences in mathematics and science achievement by gender at the fourth and eighth grades as well as for students in their final year of secondary school. Chapter 1 summarizes the gender results previously published by the TIMSS International Study Center at Boston College. Chapters 2 through 4 present results by gender for high- and low-performing students, for different types of items, and according to several salient background questions.[3] For Chapters 2 through 4, data were analyzed for the 33 countries that followed the TIMSS sampling guidelines at the eighth grade, even though some had low participation rates. For purposes of comparison, data also are presented for these countries at the fourth grade and final year of secondary school, if the countries participated in the portions of the testing conducted for primary and secondary school students. Thus, results at the fourth grade are presented for 22 countries. For the final year of secondary school, mathematics and science literacy results are included for 18 countries, advanced mathematics results are presented for 13 countries, and physics results are presented for 13 countries. Appendix A contains the complete listing of the countries included in this report together with the school and student sample sizes for each country by gender.

## Summary of Major Findings Described in This Report

The first chapter of this report summarizes the gender differences in average mathematics and science achievement previously reported by the TIMSS International Study Center. The TIMSS results showed few gender differences in average mathematics achievement at the fourth and eighth grades. At the final year of secondary school, however, data from 18 out of 21 countries showed that males had significantly greater achievement in mathematics literacy. In science, gender differences in achievement favoring males were present in one-third of the countries even as early as the fourth grade. At the eighth grade in science, the gender gap was even wider with male performance being significantly higher than that of females in nearly two-thirds of the countries. At the final year of secondary schools, males in nearly every participating country demonstrated significantly higher achievement in science literacy than females.

[3] Some data in these chapters are adapted from *Examining Gender Differences in Mathematics Achievement on the Third International Mathematics and Science Study (TIMSS)*, December 1999. A dissertation by Edward Garcia Fierros submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, Lynch School of Education at Boston College.

The second chapter presents two additional analyses of the TIMSS achievement data. The first analysis examines those students scoring in the top quarter for their respective country and investigates the gender composition of those high-performing students. The second analysis examines the percentage of students in each gender reaching country-specific benchmarks (upper and lower quartiles). In general, findings of both additional analyses parallel the overall results – few gender differences at the fourth and eighth grades in mathematics with an increasing advantage by males developing by the final year of secondary school. In science, several countries showed males with higher achievement than females at the fourth grade, with the edge for males increasingly evident across countries at the eighth grade, and becoming pervasive at the final year of secondary school.

Chapter 3 describes an analysis using a Gender Difference Index (GDI), and presents examples of items exhibiting the greatest gender differences. In mathematics across the grades, males tended to have higher achievement than females on items involving spatial representation, proportionality, measurement, and problems with no immediate formula. At the fourth and eighth grades, females outperformed males on items involving reading graphs, computation, and algorithmic problem solving. At the final year of secondary school, there were no items where females outperformed males, on average, internationally. In science across the grades, females tended to have higher achievement on items involving health and nutrition while males had higher achievement on items involving earth science and the physical sciences, particularly if the item presentation involved a diagram. In both mathematics and science, an examination of achievement on the same items given to both eighth and final-year students showed some gender differences for the final-year students internationally, when no differences appeared on these items at the eighth grade.

Selected attitudinal and contextual data from the TIMSS background questionnaires are discussed in Chapter 4. At the final year of secondary school, more males tended to identify that it was important to do well in mathematics and science while more females tended to report that it was important to do well in language. Yet, internationally, across the grades, females reported spending more time out-of-school studying mathematics and science than males. Regarding motivating factors for high achievement in mathematics and science, at the eighth grade, more males than females agreed that it was important to do well in mathematics to please their parents and to get a desired job. In science, the same pattern held true. At the final year of secondary school, more males than females reported that they would like a job in mathematics or a mathematics-related field.

It is important to note that the data used in this report are cross-sectional in nature. Nevertheless, the trends in achievement by gender are so pervasive across countries and the sampling procedures employed so rigorous that a clear pattern can be discerned across primary, middle, and secondary school. The gender gap in achievement becomes larger as students progress through school in most countries, and the gap in achievement that is seen in mathematics is even more pronounced in science. This pattern holds for high-performing students and when results are investigated at the item level.

# 1

# Summary of Gender Differences in Average Mathematics and Science Achievement on TIMSS

## Overview

The Third International Mathematics and Science Study (TIMSS) is the largest and most ambitious of the international comparative studies conducted by the International Association for the Evaluation of Educational Achievement (IEA). In 1995, students in 41 countries around the world were tested in both mathematics and science. The TIMSS results have been disseminated to the public in a series of international reports published by the TIMSS International Study at Boston College in the United States and the data made available to researchers via public use data tapes (see Summary of Results for further details).

Since the initial release of the results during 1996 and 1997, there has been considerable analysis and use of the TIMSS data. This report takes a closer look at the results by gender. Chapter 1 begins by summarizing the gender results previously published by the TIMSS International Study Center. Specifically, Chapter 1 presents differences in mean achievement by gender for mathematics and science at the fourth and eighth grades and for students in the final year of secondary school. At the fourth and eighth grades, the results are given for mathematics and science as well as for major content areas within each curriculum area. For the final year of secondary school, results are provided for all students on tests of mathematics and science literacy as well as in advanced mathematics and physics for final-year students who have studied those subjects.

## Gender Differences in Mathematics Achievement

Exhibit 1.1

Exhibit 1.1 shows the differences in average mathematics achievement by gender at the fourth grade. In the exhibits showing gender differences in overall mean achievement, the countries that met the TIMSS requirement for testing a representative sample of students are shown in the upper part of the tables by increasing order of gender differences in mean achievement. Although all countries tried very hard to meet the TIMSS sampling requirements, several encountered resistance from schools and teachers and did not have participation rates of 85% or higher as specified in the TIMSS guidelines. To provide a better curricular match, four countries (i.e., Colombia, Germany, Romania, and Slovenia) elected to test students somewhat older than those in the other TIMSS countries. Also, several countries encountered various degrees of difficulty in implementing the prescribed methods for sampling classrooms within schools.

In most countries, males and females in the fourth grade had approximately the same average mathematics achievement. The few statistically significant differences that were observed favored males rather than females (see Korea, Japan, and the Netherlands).

Exhibit 1.2

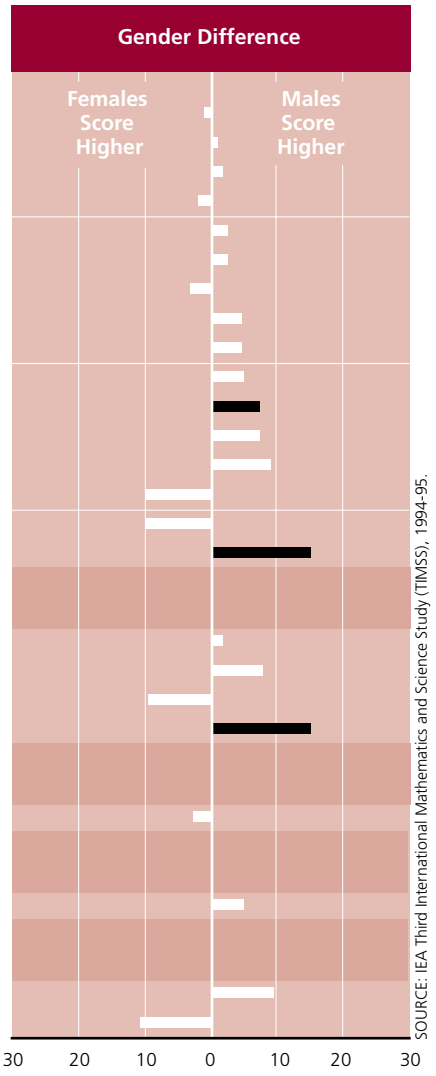
Exhibit 1.2 presents the achievement results for fourth-grade males and females by content areas within mathematics. The tables presenting results by content area use an analysis based on the average percent of correct responses to items within each content area, and present the countries in the upper parts of the tables in alphabetical order. Similar to the fourth-grade gender results for mathematics overall, there were few differences in performance between fourth-grade females and males in most of the content areas within mathematics. The exception was the area of measurement, estimation, and number sense where males had significantly higher achievement than females in about one-third of the participating countries.

Exhibit 1.3

The results in Exhibit 1.3 show that gender differences in average mathematics achievement were also small or negligible for eighth-grade students. Again, however, all of the statistically significant differences favored males rather than females. Males had significantly higher average mathematics achievement than females in Japan, Spain, Portugal, Iran, Korea, Denmark, Greece, and Israel.

## Exhibit 1.1 Gender Differences in Mathematics Achievement
### Fourth Grade*

| Country | Males' Mean | Females' Mean | Difference Absolute Value |
|---|---|---|---|
| † Scotland | 520 (4.3) | 520 (3.8) | 0 (5.8) |
| Hong Kong | 586 (4.7) | 587 (4.2) | 1 (6.3) |
| Iceland | 474 (3.3) | 473 (3.0) | 1 (4.5) |
| United States | 545 (3.1) | 544 (3.3) | 2 (4.5) |
| Greece | 491 (5.0) | 493 (4.5) | 2 (6.8) |
| Canada | 534 (3.4) | 531 (3.9) | 3 (5.2) |
| Czech Republic | 568 (3.4) | 566 (3.6) | 3 (5.0) |
| Ireland | 548 (3.9) | 551 (4.3) | 3 (5.8) |
| Portugal | 478 (3.8) | 473 (3.7) | 4 (5.3) |
| †2 England | 515 (3.4) | 510 (4.4) | 5 (5.5) |
| Norway | 504 (3.5) | 499 (3.6) | 5 (5.0) |
| Japan | 601 (2.5) | 593 (2.2) | 8 (3.3) |
| Cyprus | 506 (3.5) | 499 (3.3) | 8 (4.8) |
| Iran, Islamic Rep. | 433 (6.0) | 424 (5.0) | 9 (7.8) |
| New Zealand | 494 (5.7) | 504 (4.3) | 10 (7.1) |
| Singapore | 620 (5.5) | 630 (6.4) | 10 (8.4) |
| Korea | 618 (2.5) | 603 (2.6) | 15 (3.6) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | |
| Australia | 547 (3.5) | 545 (3.7) | 2 (5.1) |
| Austria | 563 (3.6) | 555 (3.6) | 8 (5.1) |
| 1 Latvia (LSS) | 521 (5.5) | 530 (5.2) | 9 (7.5) |
| Netherlands | 585 (3.8) | 569 (3.4) | 15 (5.1) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | |
| Slovenia | 551 (3.4) | 554 (4.0) | 3 (5.2) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A)*** | | | |
| Hungary | 552 (4.2) | 546 (3.9) | 5 (5.8) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | |
| 1 Israel | 537 (4.4) | 528 (4.1) | 9 (6.0) |
| Thailand | 485 (5.8) | 496 (4.2) | 11 (7.1) |




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

**International Averages**

| Males | Females | Difference |
|---|---|---|
| 535 | 533 | 2 |

(Averages of all country means)

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.2 Average Percent Correct for Males and Females by Mathematics Content Areas
### Fourth Grade*

| Country | Mathematics Overall | | Whole Numbers | | Fractions and Proportionality | | Measurement, Estimation, and Number Sense | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Canada | 61 (1.1) | 60 (1.2) | 69 (0.8) | 66 (1.3) | 47 (1.1) | 48 (1.2) | 55 (1.1) | 53 (1.3) |
| Cyprus | 55 (0.8) | 53 (0.7) | 66 (0.9) | 64 (0.9) | 49 (0.9) | 47 (0.8) | ▲ 49 (1.1) | 46 (0.8) |
| Czech Republic | 67 (0.7) | 66 (0.7) | 75 (0.8) | 74 (0.6) | 53 (1.0) | 52 (0.9) | ▲ 69 (0.8) | 67 (0.8) |
| †2 England | 57 (0.8) | 56 (0.9) | ▲ 60 (0.9) | 57 (1.0) | 46 (1.1) | 45 (1.2) | ▲ 54 (0.9) | 50 (1.0) |
| Greece | 50 (1.2) | 51 (0.9) | 61 (1.4) | 63 (0.9) | 42 (1.3) | 42 (1.1) | 49 (1.2) | 48 (1.0) |
| Hong Kong | 73 (1.1) | 73 (0.8) | 79 (1.1) | 79 (0.9) | 67 (1.1) | 66 (1.0) | 69 (1.2) | 69 (0.7) |
| Iceland | 50 (1.0) | 49 (0.9) | 58 (1.2) | 55 (1.0) | 36 (1.1) | 35 (1.1) | 44 (1.1) | 44 (1.2) |
| Iran, Islamic Rep. | 39 (1.4) | 37 (1.1) | 52 (1.9) | 49 (1.5) | 32 (1.3) | 32 (1.4) | ▲ 38 (1.4) | 34 (1.1) |
| Ireland | 63 (0.9) | 64 (0.9) | 70 (0.9) | 70 (1.1) | 57 (1.1) | 59 (1.2) | 57 (1.1) | 55 (1.1) |
| Japan | 75 (0.5) | 74 (0.5) | ▲ 83 (0.5) | 81 (0.5) | 66 (0.8) | 65 (0.6) | ▲ 73 (0.6) | 71 (0.6) |
| Korea | ▲ 77 (0.4) | 75 (0.5) | ▲ 89 (0.4) | 87 (0.5) | ▲ 66 (0.7) | 63 (0.7) | ▲ 73 (0.7) | 70 (0.7) |
| New Zealand | 52 (1.3) | 54 (0.9) | 57 (1.5) | 57 (1.1) | 41 (1.5) | 42 (1.0) | 48 (1.3) | 49 (1.2) |
| Norway | 54 (0.9) | 53 (0.8) | 62 (1.0) | 61 (1.1) | 39 (1.0) | 38 (0.8) | ▲ 57 (1.0) | 54 (1.1) |
| Portugal | 48 (0.8) | 48 (0.8) | 57 (1.0) | 57 (0.9) | 38 (0.9) | 38 (0.7) | 50 (0.9) | 49 (1.0) |
| † Scotland | 58 (0.9) | 58 (0.9) | 61 (1.0) | 61 (1.0) | 46 (1.2) | 47 (1.2) | 54 (1.0) | 53 (1.1) |
| Singapore | 75 (0.9) | 76 (1.0) | 81 (0.8) | ▲ 84 (0.8) | 73 (1.0) | 75 (1.2) | 67 (1.0) | 66 (1.3) |
| United States | 63 (0.7) | 62 (0.7) | 71 (0.7) | 70 (0.8) | 51 (0.9) | 50 (0.8) | ▲ 54 (0.7) | 52 (0.8) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | | | |
| Australia | 63 (0.7) | 63 (0.8) | 68 (0.9) | 67 (0.8) | 51 (0.8) | 51 (1.0) | 60 (0.8) | 59 (0.9) |
| Austria | 66 (0.9) | 64 (0.8) | 74 (0.9) | 74 (0.9) | ▲ 53 (1.1) | 50 (1.0) | 71 (1.1) | 68 (1.0) |
| 1 Latvia (LSS) | 58 (1.2) | 60 (1.1) | 66 (1.1) | 69 (1.1) | 43 (1.5) | 44 (1.4) | 60 (1.3) | 61 (1.2) |
| Netherlands | ▲ 71 (0.8) | 68 (0.8) | 76 (0.9) | 74 (1.0) | 61 (1.1) | 59 (1.0) | ▲ 72 (0.8) | 68 (1.0) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | | | | | |
| Slovenia | 64 (0.7) | 65 (0.9) | 73 (0.7) | 75 (0.8) | 51 (1.1) | 49 (1.2) | 65 (1.0) | 63 (1.2) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | | | | | |
| Hungary | 64 (0.8) | 64 (0.9) | 77 (0.9) | 76 (0.9) | 50 (1.0) | 49 (1.1) | 65 (1.0) | 63 (1.1) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | | | | | |
| 1 Israel | 60 (1.1) | 59 (1.0) | 71 (1.1) | 71 (1.1) | 48 (1.2) | 47 (1.2) | ▲ 57 (1.4) | 52 (1.1) |
| Thailand | 49 (1.3) | 52 (1.0) | 57 (1.5) | 60 (1.4) | 42 (1.3) | 45 (1.1) | 44 (1.3) | 43 (1.2) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%,Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.2 (Continued)

### Average Percent Correct for Males and Females by Mathematics Content Areas
### Fourth Grade*

| Country | Data Representation, Analysis, & Probability | | Geometry | | Patterns, Relations, and Functions | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Canada | 67 (1.6) | 69 (1.4) | 72 (1.3) | 72 (1.6) | 62 (1.6) | 60 (2.1) |
| Cyprus | 53 (1.1) | 52 (1.1) | 52 (1.2) | 53 (1.1) | 57 (1.2) | 54 (1.6) |
| Czech Republic | 67 (1.1) | 67 (1.1) | 71 (0.9) | 71 (0.8) | 67 (1.1) | 66 (1.1) |
| †2 England | 64 (1.2) | 65 (1.2) | 74 (0.9) | 74 (1.0) | 56 (1.4) | 54 (1.2) |
| Greece | 48 (1.6) | 51 (1.4) | 53 (1.8) | 54 (1.1) | 46 (1.8) | 48 (1.3) |
| Hong Kong | 75 (1.2) | 77 (1.0) | 75 (0.9) | 74 (1.1) | 71 (1.5) | 75 (1.2) |
| Iceland | 59 (1.7) | 58 (1.3) | 62 (1.3) | 63 (1.2) | 49 (1.8) | 48 (1.6) |
| Iran, Islamic Rep. | 25 (1.5) | 22 (0.8) | 42 (1.4) | 43 (1.2) | 40 (2.0) | 40 (1.8) |
| Ireland | 68 (1.2) | 70 (1.1) | 66 (1.0) | 67 (1.0) | 64 (1.4) | 63 (1.1) |
| Japan | 79 (0.7) | 79 (0.7) | 73 (0.8) | 72 (0.7) | 77 (0.7) | 76 (0.8) |
| Korea | 80 (0.8) | 79 (0.8) | 72 (0.8) | 71 (0.8) | 84 (0.9) | 82 (1.1) |
| New Zealand | 58 (1.8) | ▲ 64 (1.4) | 64 (1.5) | ▲ 69 (1.2) | 50 (1.5) | ▲ 55 (1.4) |
| Norway | 59 (1.2) | 60 (1.1) | 57 (1.2) | 58 (1.1) | 49 (1.5) | 51 (1.7) |
| Portugal | 43 (1.1) | 43 (1.3) | 52 (1.2) | 52 (1.2) | 49 (1.3) | 46 (1.4) |
| † Scotland | 65 (1.3) | 67 (1.2) | 72 (1.0) | 73 (0.9) | 58 (1.4) | 57 (1.2) |
| Singapore | 80 (0.9) | 82 (1.0) | 71 (0.9) | 73 (1.0) | 76 (1.0) | 76 (1.2) |
| United States | 72 (1.1) | 74 (1.0) | 71 (0.7) | 71 (0.9) | 67 (1.1) | 66 (1.0) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | 66 (1.0) | 68 (1.0) | 73 (0.8) | 75 (1.0) | 65 (1.2) | 63 (1.2) |
| Austria | 67 (1.5) | 66 (1.4) | 68 (0.9) | 67 (1.0) | 65 (1.5) | 64 (1.8) |
| 1 Latvia (LSS) | 52 (1.5) | 55 (1.6) | 65 (1.3) | 68 (1.2) | 64 (1.7) | 67 (1.2) |
| Netherlands | 76 (1.0) | 75 (1.3) | ▲ 73 (1.0) | 69 (0.9) | 65 (1.3) | 66 (1.5) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | | | |
| Slovenia | 64 (1.1) | 64 (1.3) | 71 (1.1) | 73 (1.0) | 67 (1.3) | 69 (1.1) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | | | |
| Hungary | 60 (1.3) | 61 (1.3) | 67 (1.0) | 65 (1.2) | 68 (1.2) | 71 (1.4) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | | | |
| 1 Israel | 65 (1.5) | 64 (1.3) | 61 (1.3) | 63 (1.0) | 60 (1.5) | 61 (1.8) |
| Thailand | 53 (1.8) | ▲ 59 (1.5) | 52 (1.6) | 54 (1.2) | 48 (1.8) | 51 (1.2) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

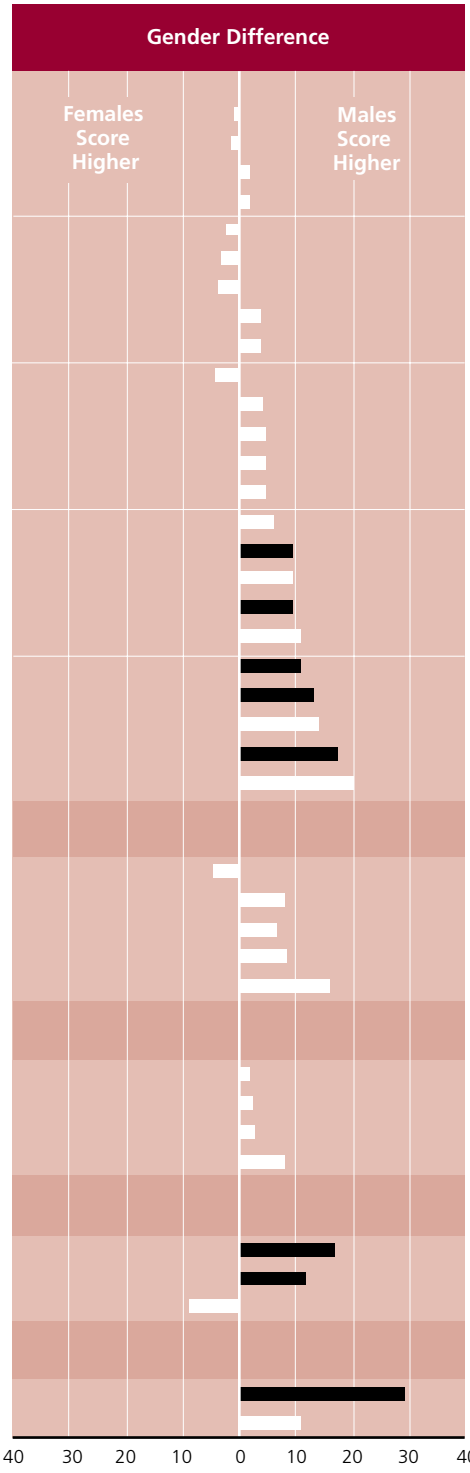
1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%,Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.3 Gender Differences in Mathematics Achievement
### Eighth Grade*

| Country | Males' Mean | Females' Mean | Difference Absolute Value |
|---|---|---|---|
| Hungary | 537 (3.6) | 537 (3.6) | 0 (5.1) |
| [1] Lithuania | 477 (4.0) | 478 (4.1) | 1 (5.7) |
| Russian Federation | 535 (6.3) | 536 (5.0) | 1 (8.0) |
| Iceland | 488 (5.5) | 486 (5.6) | 2 (7.8) |
| Sweden | 520 (3.6) | 518 (3.1) | 2 (4.7) |
| Singapore | 642 (6.3) | 645 (5.4) | 2 (8.3) |
| Cyprus | 472 (2.8) | 475 (2.5) | 3 (3.7) |
| Canada | 526 (3.2) | 530 (2.7) | 4 (4.2) |
| Slovak Republic | 549 (3.7) | 545 (3.6) | 4 (5.2) |
| Norway | 505 (2.8) | 501 (2.7) | 4 (3.9) |
| † Belgium (Fl) | 563 (8.8) | 567 (7.4) | 4 (11.5) |
| †[2] England | 508 (5.1) | 504 (3.5) | 4 (6.2) |
| [1] Latvia (LSS) | 496 (3.8) | 491 (3.5) | 4 (5.2) |
| † United States | 502 (5.2) | 497 (4.5) | 5 (6.9) |
| [1] Switzerland | 548 (3.5) | 543 (3.1) | 5 (4.7) |
| France | 542 (3.1) | 536 (3.8) | 6 (4.9) |
| Japan | 609 (2.6) | 600 (2.1) | 9 (3.3) |
| New Zealand | 512 (5.9) | 503 (5.3) | 9 (7.9) |
| Spain | 492 (2.5) | 483 (2.6) | 10 (3.6) |
| Czech Republic | 569 (4.5) | 558 (6.3) | 11 (7.7) |
| Portugal | 460 (2.8) | 449 (2.7) | 11 (3.9) |
| Iran, Islamic Rep. | 434 (2.9) | 421 (3.3) | 13 (4.4) |
| Ireland | 535 (7.2) | 520 (6.0) | 14 (9.3) |
| Korea | 615 (3.2) | 598 (3.4) | 17 (4.7) |
| Hong Kong | 597 (7.7) | 577 (7.7) | 20 (10.9) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | |
| Australia | 527 (5.1) | 532 (4.6) | 5 (6.9) |
| Austria | 544 (3.2) | 536 (4.5) | 8 (5.6) |
| Belgium (Fr) | 530 (4.7) | 524 (3.7) | 6 (6.0) |
| Netherlands | 545 (7.8) | 536 (6.4) | 8 (10.1) |
| Scotland | 506 (6.6) | 490 (5.2) | 16 (8.4) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | |
| Colombia | 386 (6.9) | 384 (3.6) | 2 (7.7) |
| †[1] Germany | 512 (5.1) | 509 (5.0) | 3 (7.1) |
| Romania | 483 (4.8) | 480 (4.0) | 3 (6.2) |
| Slovenia | 545 (3.8) | 537 (3.3) | 8 (5.0) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | |
| Denmark | 511 (3.2) | 494 (3.4) | 17 (4.7) |
| Greece | 490 (3.7) | 478 (3.1) | 12 (4.8) |
| Thailand | 517 (5.6) | 526 (7.0) | 9 (9.0) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | |
| [1] Israel | 539 (6.6) | 509 (6.9) | 29 (9.6) |
| South Africa | 360 (6.3) | 349 (4.1) | 11 (7.5) |




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

**International Averages**

| Males | Females | Difference |
|---|---|---|
| 519 | 512 | 8 |

(Averages of all country means)

■ Gender difference statistically significant at .05 level
□ Gender difference not statistically significant

* Eighth grade in most countries; see Appendix A for information about the grades tested in each country.
† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).
1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

Exhibit 1.4

As shown in Exhibit 1.4, there were few significant differences by gender at the eighth grade within the content areas. Parallel to the fourth-grade results, across countries the greatest number of differences in average performance by gender were found in measurement where males had higher achievement than did females in a number of countries. The differences were significant in Korea, Portugal, Spain, and Denmark. Interestingly, the pattern for algebra showed females having a slightly higher average than males in a number of countries. The patterns of higher achievement for males in measurement and higher achievement for females in algebra are consistent with findings from the Second International Mathematics Study conducted in 1980-82.[4]

Exhibit 1.5-1.6

For students in their final year of secondary school (the twelfth grade in many countries), TIMSS had two measures of mathematics achievement. The mathematics literacy test was designed to measure the mathematics achievement of all final-year students, regardless of their mathematics curriculum. The advanced mathematics test was designed to measure learning of advanced mathematics concepts among final-year students who had studied advanced mathematics. As shown in Exhibits 1.5 and 1.6, the results by gender for the secondary students differ from those at the earlier grades. In most of the countries, males had significantly higher average achievement than females in both mathematics literacy and in advanced mathematics.

[4] Robitaille, D.F. (1989). "Students' Achievements: Population A" in D.F. Robitaille and R.A. Garden (Eds.), *The IEA Study of Mathematics II: Contexts and Outcomes of School Mathematics.* New York: Pergamon Press.

## Exhibit 1.4 Average Percent Correct for Males and Females by Mathematics Content Areas
### Eighth Grade*

| Country | Mathematics Overall | | Fractions & Number Sense | | Geometry | | Algebra | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| † Belgium (Fl) | 65 (2.0) | 66 (1.9) | 71 (1.8) | 72 (1.7) | 63 (2.1) | 64 (2.1) | 60 (2.5) | 65 (2.4) |
| Canada | 59 (0.7) | 59 (0.6) | 63 (0.8) | 64 (0.7) | 58 (0.9) | 58 (0.7) | 52 (0.9) | 55 (1.0) |
| Cyprus | 47 (0.6) | 48 (0.6) | 50 (0.7) | 50 (0.8) | 47 (0.9) | 48 (0.8) | 46 (0.9) | 49 (1.0) |
| Czech Republic | 67 (1.0) | 64 (1.3) | 70 (1.1) | 68 (1.3) | 68 (1.1) | 65 (1.4) | 64 (1.4) | 66 (1.4) |
| †2 England | 53 (1.3) | 53 (0.9) | 54 (1.3) | 53 (1.0) | 54 (1.5) | 54 (1.3) | 47 (1.6) | 51 (1.1) |
| France | 62 (0.8) | 61 (0.9) | 65 (0.9) | 64 (1.0) | 67 (1.0) | 65 (1.1) | 54 (1.1) | 54 (1.3) |
| Hong Kong | 72 (1.7) | 68 (1.7) | 74 (1.7) | 70 (1.7) | 74 (1.8) | 71 (1.9) | 71 (1.8) | 69 (2.0) |
| Hungary | 61 (0.8) | 62 (0.8) | 64 (1.0) | 65 (0.9) | 61 (1.0) | 60 (1.0) | 61 (1.0) | 66 (1.1) |
| Iceland | 49 (1.3) | 50 (1.3) | 54 (1.8) | 55 (1.4) | 50 (1.3) | 52 (1.6) | 39 (1.1) | 41 (1.9) |
| Iran, Islamic Rep. | 39 (0.8) | 36 (0.8) | 40 (0.9) | 37 (0.8) | 45 (1.1) | 40 (1.2) | 36 (0.9) | 38 (1.2) |
| Ireland | 60 (1.6) | 58 (1.4) | 65 (1.7) | 64 (1.5) | 54 (1.7) | 49 (1.6) | 54 (1.7) | 53 (1.7) |
| Japan | 74 (0.5) | 73 (0.4) | 76 (0.6) | 75 (0.5) | 79 (0.6) | 80 (0.5) | 72 (0.7) | 72 (0.7) |
| Korea | ▲ 73 (0.6) | 70 (0.7) | ▲ 76 (0.7) | 72 (0.8) | 77 (0.8) | 73 (0.8) | 70 (0.8) | 69 (0.9) |
| 1 Latvia (LSS) | 52 (1.0) | 51 (0.8) | 53 (1.2) | 53 (1.0) | 58 (1.0) | 56 (1.1) | 50 (1.3) | 51 (0.9) |
| 1 Lithuania | 48 (1.1) | 49 (1.0) | 51 (1.2) | 52 (1.2) | 54 (1.2) | 53 (1.2) | 45 (1.5) | 49 (1.4) |
| New Zealand | 55 (1.4) | 53 (1.3) | 58 (1.4) | 55 (1.3) | 54 (1.5) | 55 (1.4) | 48 (1.5) | 49 (1.3) |
| Norway | 54 (0.6) | 53 (0.6) | 58 (0.7) | 58 (0.7) | 50 (0.8) | 51 (0.9) | 44 (0.9) | 46 (0.9) |
| Portugal | 44 (0.8) | 42 (0.7) | 45 (0.9) | 42 (0.8) | 46 (1.2) | 42 (0.9) | 39 (1.0) | 40 (1.0) |
| Russian Federation | 59 (1.4) | 61 (1.3) | 61 (1.5) | 62 (1.1) | 62 (1.7) | 64 (1.4) | 61 (1.8) | 64 (1.3) |
| Singapore | 79 (1.1) | 79 (1.0) | 83 (1.0) | 84 (0.8) | 76 (1.3) | 77 (1.2) | 75 (1.3) | 77 (1.3) |
| Slovak Republic | 63 (0.9) | 62 (0.8) | 66 (1.0) | 66 (0.8) | 65 (0.9) | 62 (1.0) | 60 (1.1) | 64 (1.0) |
| Spain | 52 (0.7) | 50 (0.7) | 53 (0.7) | 51 (0.7) | 51 (0.8) | 48 (0.8) | 54 (1.0) | 54 (0.9) |
| Sweden | 56 (0.8) | 56 (0.8) | 62 (0.9) | 62 (0.9) | 48 (0.8) | 49 (0.8) | 43 (1.0) | 45 (1.1) |
| 1 Switzerland | 63 (0.8) | 61 (0.7) | 67 (0.8) | 66 (0.9) | 60 (1.1) | 59 (0.9) | 53 (1.1) | 53 (0.9) |
| † United States | 53 (1.2) | 53 (1.1) | 60 (1.3) | 59 (1.2) | 49 (1.4) | 47 (1.1) | 50 (1.4) | 51 (1.2) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | | | |
| Australia | 57 (1.2) | 59 (1.1) | 60 (1.2) | 61 (1.1) | 57 (1.3) | 58 (1.2) | 53 (1.3) | 57 (1.2) |
| Austria | 63 (0.8) | 61 (1.2) | 67 (0.9) | 65 (1.1) | 57 (1.3) | 57 (1.4) | 59 (0.9) | 60 (1.2) |
| Belgium (Fr) | 59 (1.1) | 58 (1.0) | 62 (1.4) | 62 (0.9) | 60 (1.3) | 57 (1.1) | 52 (1.6) | 55 (1.3) |
| Netherlands | 61 (1.8) | 59 (1.6) | 63 (1.8) | 60 (1.7) | 61 (2.1) | 58 (1.8) | 52 (1.8) | 53 (1.8) |
| Scotland | 53 (1.7) | 50 (1.3) | 55 (1.5) | 51 (1.3) | 54 (1.8) | 50 (1.4) | 46 (2.0) | 46 (1.4) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | | | | | |
| Colombia | 30 (1.6) | 29 (0.9) | 31 (1.8) | 30 (0.7) | 29 (1.6) | 29 (1.1) | 28 (1.7) | 28 (1.0) |
| †1 Germany | 54 (1.3) | 54 (1.2) | 60 (1.3) | 57 (1.3) | 51 (1.5) | 53 (1.5) | 47 (1.5) | 49 (1.4) |
| Romania | 49 (1.1) | 49 (1.0) | 48 (1.2) | 48 (1.0) | 53 (1.1) | 51 (1.1) | 50 (1.5) | 54 (1.2) |
| Slovenia | 62 (0.8) | 60 (0.7) | 64 (0.9) | 62 (0.8) | 61 (1.1) | 59 (1.1) | 61 (1.0) | 61 (0.9) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | | | | | |
| Denmark | ▲ 54 (0.8) | 50 (0.9) | 55 (1.0) | 51 (1.1) | 56 (1.1) | 53 (1.3) | 47 (0.8) | 44 (1.0) |
| Greece | 51 (0.9) | 48 (0.7) | 54 (1.0) | 51 (0.8) | ▲ 53 (0.9) | 48 (0.9) | 46 (1.0) | 46 (0.9) |
| Thailand | 56 (1.4) | 58 (1.7) | 59 (1.5) | 61 (1.8) | 60 (1.3) | 63 (1.5) | 51 (1.8) | 55 (2.0) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | | | | | |
| 1 Israel | 61 (1.5) | 55 (1.5) | 64 (1.6) | 58 (1.6) | 61 (1.3) | 55 (1.8) | 63 (1.7) | 59 (1.9) |
| South Africa | 25 (1.7) | 22 (1.0) | 28 (2.0) | 24 (1.2) | 25 (1.6) | 24 (0.9) | 24 (1.5) | 23 (1.2) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Eighth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.4 (Continued)

**Average Percent Correct for Males and Females by Mathematics Content Areas**
**Eighth Grade***

| Country | Data Representation, Analysis & Probability | | Measurement | | Proportionality | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| † Belgium (Fl) | 72 (2.2) | 73 (1.4) | 60 (1.9) | 59 (2.0) | 52 (2.2) | 53 (2.7) |
| Canada | 69 (0.9) | 69 (0.6) | 52 (0.9) | 50 (0.8) | 48 (0.9) | 48 (1.0) |
| Cyprus | 52 (0.9) | 54 (0.9) | 44 (1.1) | 43 (1.1) | 40 (1.0) | 39 (0.9) |
| Czech Republic | 70 (0.9) | 67 (1.4) | 64 (1.2) | 60 (1.5) | 54 (1.4) | 49 (1.7) |
| †2 England | 67 (1.2) | 65 (1.1) | 51 (1.5) | 48 (1.1) | 42 (1.5) | 40 (1.3) |
| France | 72 (0.8) | 70 (1.1) | 58 (1.0) | 56 (1.1) | 50 (1.2) | 48 (1.2) |
| Hong Kong | 73 (1.6) | 69 (1.4) | 68 (1.9) | 62 (2.1) | 63 (1.5) | 60 (1.9) |
| Hungary | 66 (0.9) | 65 (0.9) | 57 (1.0) | 56 (1.0) | 47 (1.2) | 46 (1.1) |
| Iceland | 63 (1.6) | 62 (1.4) | 45 (1.8) | 45 (2.0) | 40 (1.6) | 37 (1.4) |
| Iran, Islamic Rep. | 42 (0.8) | 40 (0.9) | 32 (1.7) | 26 (1.4) | 38 (1.3) | 34 (1.1) |
| Ireland | 70 (1.6) | 68 (1.3) | 55 (1.9) | 51 (1.6) | 52 (1.8) | 49 (1.2) |
| Japan | 79 (0.5) | 77 (0.5) | 68 (0.6) | 67 (0.6) | 62 (0.8) | 60 (0.8) |
| Korea | ▲ 80 (0.7) | 75 (0.8) | ▲ 69 (0.9) | 62 (1.0) | 62 (0.9) | 61 (0.9) |
| 1 Latvia (LSS) | 57 (1.0) | 55 (1.0) | 49 (1.2) | 46 (1.1) | 41 (1.1) | 37 (1.0) |
| 1 Lithuania | 52 (1.2) | 52 (1.1) | 44 (1.1) | 41 (1.2) | 34 (1.1) | 35 (1.2) |
| New Zealand | 67 (1.3) | 65 (1.3) | 50 (1.5) | 46 (1.4) | 44 (1.5) | 40 (1.4) |
| Norway | 67 (0.8) | 66 (0.8) | 53 (0.8) | 50 (0.7) | 41 (0.8) | 40 (0.8) |
| Portugal | 55 (0.9) | 53 (0.8) | ▲ 41 (0.9) | 36 (0.8) | 33 (1.0) | 30 (0.9) |
| Russian Federation | 60 (1.2) | 60 (1.4) | 56 (1.3) | 56 (1.8) | 48 (1.6) | 49 (1.6) |
| Singapore | 79 (1.1) | 79 (1.0) | 77 (1.3) | 77 (1.0) | 75 (1.2) | 76 (1.1) |
| Slovak Republic | 62 (0.9) | 61 (0.8) | 62 (1.1) | 59 (1.0) | 50 (1.1) | 48 (1.3) |
| Spain | 61 (0.8) | 59 (0.8) | ▲ 47 (1.0) | 42 (0.9) | 42 (1.1) | 38 (0.9) |
| Sweden | 70 (0.9) | 69 (0.9) | 57 (1.1) | 55 (1.0) | 46 (1.1) | 43 (1.1) |
| 1 Switzerland | 73 (1.0) | 71 (0.7) | 62 (1.0) | 59 (1.0) | 53 (1.0) | 52 (0.9) |
| † United States | 65 (1.1) | 66 (1.2) | 42 (1.2) | 38 (1.2) | 43 (1.1) | 42 (1.2) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | 66 (1.1) | 69 (1.0) | 54 (1.2) | 53 (1.1) | 47 (1.3) | 46 (1.1) |
| Austria | 69 (0.9) | 68 (1.2) | 64 (1.0) | 60 (1.6) | 50 (1.0) | 48 (1.3) |
| Belgium (Fr) | 69 (1.4) | 67 (1.1) | 56 (1.2) | 55 (1.2) | 49 (1.1) | 46 (1.2) |
| Netherlands | 74 (2.0) | 70 (1.5) | 58 (1.8) | 56 (1.7) | 54 (2.4) | 49 (1.9) |
| Scotland | 67 (1.6) | 63 (1.3) | 50 (2.0) | 45 (1.4) | 43 (1.7) | 37 (1.4) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | | | |
| Colombia | 38 (1.9) | 36 (1.1) | 25 (1.9) | 25 (2.5) | 24 (1.5) | 22 (0.9) |
| †1 Germany | 65 (1.3) | 64 (1.3) | 52 (1.3) | 50 (1.3) | 44 (1.6) | 41 (1.3) |
| Romania | 49 (1.2) | 48 (1.1) | 49 (1.4) | 47 (1.3) | 41 (1.3) | 42 (1.3) |
| Slovenia | 67 (0.9) | 65 (0.8) | 60 (1.1) | 57 (1.0) | 50 (1.1) | 48 (1.2) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | | | |
| Denmark | 69 (1.0) | 64 (1.3) | ▲ 52 (1.0) | 47 (1.2) | 43 (1.2) | 39 (0.9) |
| Greece | 58 (1.2) | 55 (0.8) | 45 (1.0) | 41 (1.0) | 41 (1.3) | 38 (1.1) |
| Thailand | 62 (1.3) | 63 (1.4) | 50 (1.5) | 51 (1.8) | 50 (1.7) | 52 (1.9) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | | | |
| 1 Israel | 67 (1.6) | 60 (1.6) | 52 (1.9) | 46 (1.8) | 48 (2.0) | 40 (1.6) |
| South Africa | 28 (1.9) | 25 (1.1) | 20 (1.8) | 16 (1.0) | 23 (1.4) | 20 (0.9) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Eighth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

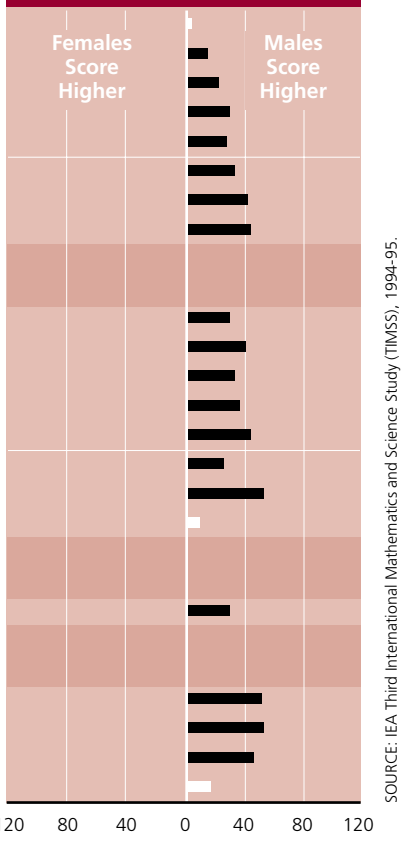
1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.5 Gender Differences in Mathematics Literacy
### Final Year of Secondary School*

| Country | Males | | Females | | Difference | TCI |
|---|---|---|---|---|---|---|
| | Percent of Students | Mean Achievement | Percent of Students | Mean Achievement | | |
| Hungary | 52 (2.5) | 485 (4.9) | 48 (2.5) | 481 (4.8) | 5 (6.9) | 65% |
| [2] Cyprus | 45 (2.1) | 454 (4.9) | 55 (2.1) | 439 (3.7) | 15 (6.1) | 48% |
| [1] Lithuania | 35 (3.0) | 485 (7.3) | 65 (3.0) | 461 (7.7) | 23 (10.6) | 43% |
| † New Zealand | 49 (1.7) | 536 (4.9) | 51 (1.7) | 507 (6.2) | 29 (7.9) | 70% |
| [2] Russian Federation | 38 (1.0) | 488 (6.5) | 62 (1.0) | 460 (6.6) | 27 (9.2) | 48% |
| Switzerland | 56 (2.5) | 555 (6.4) | 44 (2.5) | 522 (7.4) | 33 (9.8) | 82% |
| Sweden | 49 (2.5) | 573 (5.9) | 51 (2.5) | 531 (3.9) | 42 (7.0) | 71% |
| Czech Republic | 51 (5.1) | 488 (11.3) | 49 (5.1) | 443 (16.8) | 45 (20.2) | 78% |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | 42 (2.9) | 540 (10.3) | 58 (2.9) | 510 (9.3) | 30 (13.9) | 68% |
| [2] Austria | 39 (3.2) | 545 (7.2) | 61 (3.2) | 503 (5.5) | 41 (9.0) | 76% |
| Canada | 47 (1.4) | 537 (3.8) | 53 (1.4) | 504 (3.5) | 34 (5.2) | 70% |
| France | 47 (3.1) | 544 (5.6) | 53 (3.1) | 506 (5.3) | 38 (7.7) | 84% |
| Iceland | 48 (0.8) | 558 (3.4) | 52 (0.8) | 514 (2.2) | 44 (4.1) | 55% |
| [1] Italy | 46 (3.3) | 490 (7.4) | 54 (3.3) | 464 (6.0) | 26 (9.5) | 52% |
| Norway | 51 (2.0) | 555 (5.3) | 49 (2.0) | 501 (4.8) | 54 (7.1) | 84% |
| United States | 50 (1.3) | 466 (4.1) | 50 (1.3) | 456 (3.6) | 11 (5.5) | 63% |
| ***Countries With Unapproved Student Sampling (See Appendix A):*** | | | | | | |
| † Germany | 56 (5.2) | 509 (8.8) | 44 (5.2) | 480 (8.8) | 29 (12.4) | 75% |
| ***Countries With Unapproved Sampling Procedures and Low Participation Rates (See Appendix A):*** | | | | | | |
| Denmark | 45 (2.0) | 575 (4.0) | 55 (2.0) | 523 (4.0) | 52 (5.7) | 58% |
| [2] Netherlands | 52 (2.3) | 585 (5.6) | 48 (2.3) | 533 (5.9) | 53 (8.2) | 78% |
| Slovenia | 51 (3.3) | 535 (12.7) | 49 (3.3) | 490 (8.0) | 46 (15.0) | 88% |
| South Africa | 49 (1.6) | 365 (9.3) | 51 (1.6) | 348 (10.8) | 17 (14.3) | 49% |




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

**International Averages**

| Males | Females | Difference |
|---|---|---|
| 518 | 485 | 33 |

(Averages of all country means)

■ Gender difference statistically significant at .05 level
□ Gender difference not statistically significant

* See Appendix A for characteristics of students tested.
† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).
1 National Desired Population does not cover all of International Desired Population (see Appendix A ).
2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

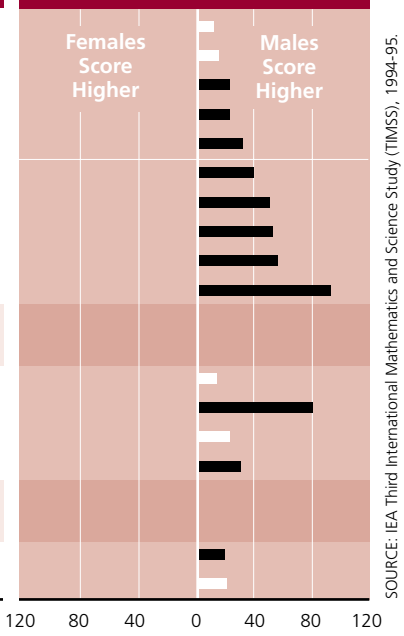
## Exhibit 1.6 Gender Differences in Advanced Mathematics Achievement
### Final Year of Secondary School*

| Country | Males | | Females | | Difference | MTCI |
|---|---|---|---|---|---|---|
| | Percent of Students | Mean Achievement | Percent of Students | Mean Achievement | | |
| † Greece | 69 (2.1) | 516 (6.6) | 31 (2.1) | 505 (10.2) | 11 (12.1) | 10% |
| 2 Cyprus | 61 (1.6) | 524 (4.4) | 39 (1.6) | 509 (6.4) | 15 (7.8) | 9% |
| Sweden | 69 (3.4) | 519 (5.9) | 31 (3.4) | 496 (5.2) | 23 (7.9) | 16% |
| France | 63 (2.0) | 567 (5.1) | 37 (2.0) | 543 (5.1) | 23 (7.2) | 20% |
| † Germany | 43 (2.4) | 484 (6.5) | 57 (2.4) | 452 (6.6) | 32 (9.2) | 26% |
| Canada | 53 (1.6) | 528 (6.4) | 47 (1.6) | 489 (4.4) | 39 (7.7) | 16% |
| 1 Lithuania | 51 (1.9) | 542 (3.7) | 49 (1.9) | 490 (5.6) | 51 (6.7) | 3% |
| 2 Russian Federation | 52 (2.4) | 568 (9.7) | 48 (2.4) | 515 (10.2) | 53 (14.1) | 2% |
| Switzerland | 54 (2.4) | 559 (5.6) | 46 (2.4) | 503 (5.7) | 56 (8.0) | 14% |
| Czech Republic | 41 (2.5) | 524 (13.0) | 59 (2.5) | 432 (8.9) | 92 (15.7) | 11% |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix B):*** | | | | | | |
| Australia | 55 (5.5) | 531 (11.4) | 45 (5.5) | 517 (15.1) | 14 (18.9) | 16% |
| 2 Austria | 38 (4.1) | 486 (7.3) | 62 (4.1) | 406 (8.6) | 80 (11.2) | 33% |
| 1 Italy | 61 (3.8) | 484 (10.6) | 39 (3.8) | 460 (14.1) | 24 (17.7) | 14% |
| United States | 51 (2.6) | 457 (7.8) | 49 (2.6) | 426 (7.1) | 31 (10.5) | 14% |
| ***Countries With Unapproved Sampling Procedures and Low Participation Rates (See Appendix B):*** | | | | | | |
| Denmark | 63 (1.8) | 529 (4.4) | 37 (1.8) | 510 (4.6) | 19 (6.3) | 21% |
| Slovenia | 50 (4.2) | 484 (11.5) | 50 (4.2) | 464 (11.0) | 20 (15.9) | 75% |

**International Averages**

| Males | Females | Difference |
|---|---|---|
| 519 | 482 | 37 |

(Averages of all country means)




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

* See Appendix A for characteristics of students tested.
† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).
1 National Desired Population does not cover all of International Desired Population (see Appendix A).
2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

## Gender Differences in Science Achievement

The results in Exhibit 1.7 reveal that fourth-grade males had significantly higher science achievement than females in about half of the TIMSS countries. The differences favoring males in science were substantially more pronounced than in the TIMSS mathematics results for the fourth grade. Statistically significant differences favoring males were found in eleven countries, and ranged from 12 points in the United States to 26 points in the Netherlands. As shown in Exhibit 1.8, the content area results revealed few significant gender differences across countries in life science or environmental issues and the nature of science, but many significant differences favoring males in earth science, and to a lesser extent in physical science.

Exhibit 1.7

Exhibit 1.8

At the eighth grade, males had significantly higher average science achievement than females in many countries, with males scoring 20 or more points higher than females in 12 countries (see Exhibit 1.9). As shown in Exhibit 1.10, the gender differences in average science achievement vary depending upon the science subject or content area. The gender differences in earth science, physics, and chemistry reflected advantages for males. Females and males had similar achievement on items covering life science and environmental issues and the nature of science.

Exhibit 1.9

Exhibit 1.10

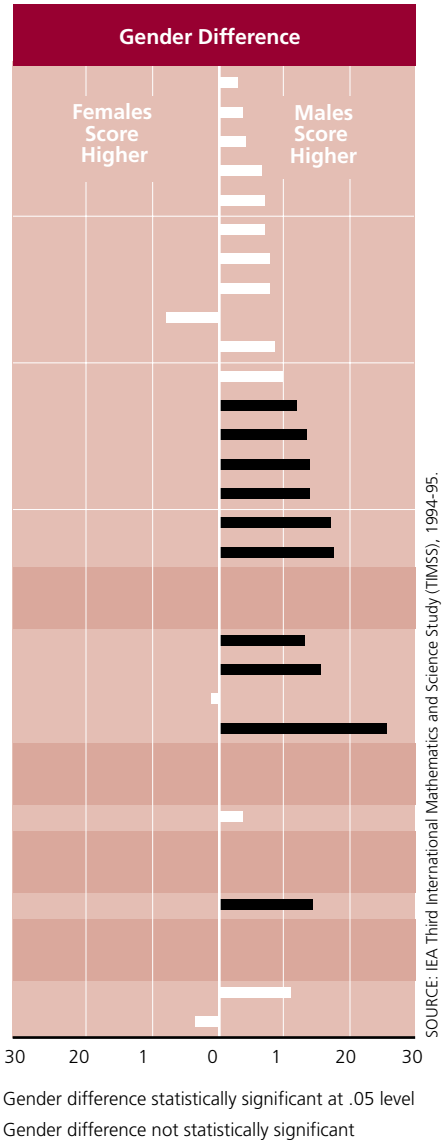
At the final year of secondary school, the male advantage in science achievement was pervasive in the TIMSS data. As shown in Exhibit 1.11, all countries except South Africa showed statistically significant gender differences in science literacy favoring males. The results presented in Exhibit 1.12 show that males had significantly higher physics achievement than females in all countries except Latvia.

Exhibit 1.11

Exhibit 1.12

## Exhibit 1.7 Gender Differences in Science Achievement
### Fourth Grade*

| Country | Males' Mean | Females' Mean | Difference Absolute Value |
|---|---|---|---|
| Portugal | 481 (4.5) | 478 (4.2) | 3 (6.2) |
| Singapore | 549 (5.4) | 545 (6.3) | 4 (8.3) |
| † Scotland | 538 (4.5) | 533 (4.3) | 4 (6.2) |
| Ireland | 543 (3.5) | 536 (4.5) | 7 (5.7) |
| Greece | 501 (4.5) | 494 (4.3) | 7 (6.2) |
| †2 England | 555 (4.0) | 548 (3.4) | 7 (5.3) |
| Canada | 553 (3.7) | 545 (3.2) | 8 (4.9) |
| Norway | 534 (4.7) | 526 (3.7) | 8 (5.9) |
| New Zealand | 527 (6.1) | 535 (4.8) | 8 (7.7) |
| Iran, Islamic Rep. | 421 (5.9) | 412 (4.7) | 9 (7.6) |
| Cyprus | 480 (4.0) | 471 (3.1) | 10 (5.1) |
| United States | 571 (3.3) | 560 (3.3) | 12 (4.6) |
| Japan | 580 (2.0) | 567 (2.0) | 14 (2.9) |
| Korea | 604 (2.2) | 590 (2.5) | 14 (3.3) |
| Hong Kong | 540 (4.1) | 526 (3.8) | 14 (5.6) |
| Czech Republic | 565 (3.4) | 548 (3.6) | 17 (5.0) |
| Iceland | 514 (4.3) | 496 (3.3) | 18 (5.4) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | |
| Australia | 569 (3.3) | 556 (3.2) | 13 (4.6) |
| Austria | 572 (3.9) | 556 (3.7) | 15 (5.3) |
| 1 Latvia (LSS) | 512 (5.4) | 513 (5.5) | 1 (7.7) |
| Netherlands | 570 (3.6) | 544 (3.5) | 26 (5.0) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | |
| Slovenia | 548 (3.3) | 544 (4.0) | 4 (5.2) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | |
| Hungary | 539 (3.8) | 525 (3.9) | 14 (5.4) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | |
| 1 Israel | 512 (4.5) | 501 (3.8) | 11 (5.9) |
| Thailand | 471 (5.9) | 474 (4.3) | 3 (7.3) |




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

**International Averages**

| Males | Females | Difference |
|---|---|---|
| 534 | 525 | 9 |

(Averages of all country means)

* Fourth grade in most countries; see Apendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%,Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.8 Average Percent Correct for Males and Females by Science Content Areas
### Fourth Grade*

| Country | Science Overall | | Earth Science | | Life Science | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Canada | 64 (0.7) | 63 (0.6) | ▲ 63 (0.9) | 60 (0.7) | 68 (0.7) | 69 (0.8) |
| Cyprus | 51 (0.7) | 50 (0.6) | ▲ 49 (0.9) | 46 (0.7) | 55 (0.7) | 54 (0.7) |
| Czech Republic | ▲ 67 (0.6) | 64 (0.7) | ▲ 67 (0.8) | 61 (0.8) | 72 (0.6) | 71 (0.7) |
| †2 England | 64 (0.8) | 63 (0.6) | ▲ 63 (0.8) | 60 (0.8) | 68 (0.7) | 68 (0.6) |
| Greece | 54 (1.0) | 53 (1.0) | 52 (1.2) | 52 (0.9) | 61 (0.9) | 61 (1.1) |
| Hong Kong | ▲ 63 (0.8) | 61 (0.7) | ▲ 63 (0.7) | 59 (0.6) | 69 (0.8) | 67 (0.7) |
| Iceland | ▲ 56 (0.8) | 54 (0.8) | ▲ 57 (1.3) | 52 (0.8) | 60 (0.9) | 60 (1.0) |
| Iran, Islamic Rep. | 41 (1.0) | 39 (0.9) | ▲ 40 (1.0) | 35 (0.7) | 44 (1.2) | 44 (0.9) |
| Ireland | 61 (0.7) | 61 (0.8) | ▲ 62 (0.9) | 59 (1.1) | 65 (0.7) | 66 (0.9) |
| Japan | ▲ 70 (0.4) | 69 (0.4) | ▲ 68 (0.5) | 65 (0.6) | 73 (0.5) | 73 (0.4) |
| Korea | ▲ 75 (0.5) | 73 (0.5) | ▲ 73 (0.6) | 70 (0.7) | 76 (0.5) | 75 (0.6) |
| New Zealand | 59 (1.2) | 61 (0.9) | 58 (1.2) | 57 (1.0) | 64 (1.2) | ▲ 68 (0.9) |
| Norway | 61 (0.8) | 60 (0.7) | ▲ 61 (1.0) | 58 (0.8) | 66 (0.9) | 67 (0.8) |
| Portugal | 50 (0.9) | 50 (0.8) | 50 (1.0) | 49 (0.8) | 53 (0.9) | 54 (0.9) |
| † Scotland | 61 (0.9) | 60 (0.8) | ▲ 60 (0.9) | 56 (0.9) | 65 (0.9) | 66 (0.9) |
| Singapore | 65 (0.9) | 64 (1.0) | 59 (0.9) | 57 (1.0) | 70 (0.9) | 69 (1.0) |
| United States | ▲ 67 (0.6) | 65 (0.6) | ▲ 65 (0.7) | 62 (0.9) | 72 (0.7) | 71 (0.6) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | ▲ 67 (0.6) | 65 (0.6) | ▲ 64 (0.7) | 59 (0.7) | 72 (0.6) | 72 (0.5) |
| Austria | ▲ 67 (0.9) | 64 (0.7) | ▲ 64 (0.9) | 60 (1.0) | 72 (0.9) | 72 (0.8) |
| 1 Latvia (LSS) | 55 (0.9) | 57 (1.0) | 56 (1.1) | 57 (1.2) | 59 (0.9) | 61 (1.2) |
| Netherlands | ▲ 70 (0.7) | 65 (0.7) | ▲ 65 (0.8) | 58 (0.8) | ▲ 75 (0.7) | 71 (0.7) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | | | |
| Slovenia | 64 (0.7) | 63 (0.8) | 65 (0.7) | 63 (0.9) | 68 (0.9) | 68 (0.8) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | | | |
| Hungary | ▲ 63 (0.8) | 60 (0.7) | ▲ 64 (0.9) | 60 (0.8) | 67 (0.8) | 66 (0.8) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | | | |
| 1 Israel | 58 (1.1) | 57 (0.8) | 53 (1.2) | 50 (1.0) | 62 (1.3) | 61 (0.9) |
| Thailand | 49 (1.2) | 49 (0.8) | 48 (1.2) | 47 (0.9) | 52 (1.0) | 53 (0.8) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.8 (Continued)

### Average Percent Correct for Males and Females by Science Content Areas
### Fourth Grade*

| Country | Physical Science | | Environmental Issues and the Nature of Science | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Canada | 63 (0.9) | 59 (0.8) | 55 (1.1) | 57 (0.7) |
| Cyprus | 51 (0.8) | 49 (0.8) | 42 (1.2) | 42 (1.1) |
| Czech Republic | ▲ 65 (0.8) | 59 (0.8) | 56 (1.2) | 56 (1.2) |
| †2 England | 62 (1.0) | 59 (0.8) | 55 (1.2) | 58 (1.2) |
| Greece | 51 (1.1) | 47 (1.1) | 43 (1.7) | 43 (1.5) |
| Hong Kong | ▲ 62 (1.0) | 58 (0.9) | 51 (1.3) | 49 (1.2) |
| Iceland | ▲ 54 (1.0) | 49 (0.8) | 48 (1.9) | 46 (1.4) |
| Iran, Islamic Rep. | 41 (1.2) | 39 (1.1) | 25 (1.2) | 26 (1.3) |
| Ireland | 58 (0.9) | 56 (0.8) | 55 (1.0) | 55 (1.3) |
| Japan | ▲ 71 (0.5) | 69 (0.6) | 62 (0.8) | 63 (0.7) |
| Korea | ▲ 76 (0.7) | 73 (0.5) | 69 (1.1) | 71 (1.0) |
| New Zealand | 57 (1.5) | 56 (1.1) | 51 (1.7) | ▲ 57 (1.3) |
| Norway | 57 (1.0) | 53 (0.9) | 53 (1.3) | 52 (1.1) |
| Portugal | 50 (1.1) | 48 (1.0) | 39 (1.3) | 40 (1.2) |
| † Scotland | 59 (1.0) | 56 (0.9) | 52 (1.5) | 55 (1.2) |
| Singapore | 65 (1.0) | 63 (1.0) | 53 (1.4) | 54 (1.4) |
| United States | ▲ 62 (0.7) | 59 (0.7) | 64 (0.9) | 66 (0.9) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | |
| Australia | ▲ 64 (0.9) | 61 (0.7) | 63 (1.0) | 63 (1.0) |
| Austria | ▲ 67 (1.1) | 60 (0.8) | ▲ 56 (1.3) | 51 (1.0) |
| 1 Latvia (LSS) | 55 (1.1) | 54 (1.0) | 45 (1.5) | 47 (1.2) |
| Netherlands | ▲ 68 (1.0) | 61 (0.8) | 61 (1.1) | 61 (1.3) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | |
| Slovenia | 63 (0.9) | 59 (0.9) | 53 (1.2) | ▲ 56 (1.1) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | |
| Hungary | ▲ 62 (1.0) | 57 (1.0) | 49 (1.2) | 51 (1.1) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | |
| 1 Israel | 56 (1.2) | 55 (0.9) | 52 (1.6) | 52 (1.4) |
| Thailand | 47 (1.4) | 46 (1.0) | 47 (1.8) | 49 (1.4) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

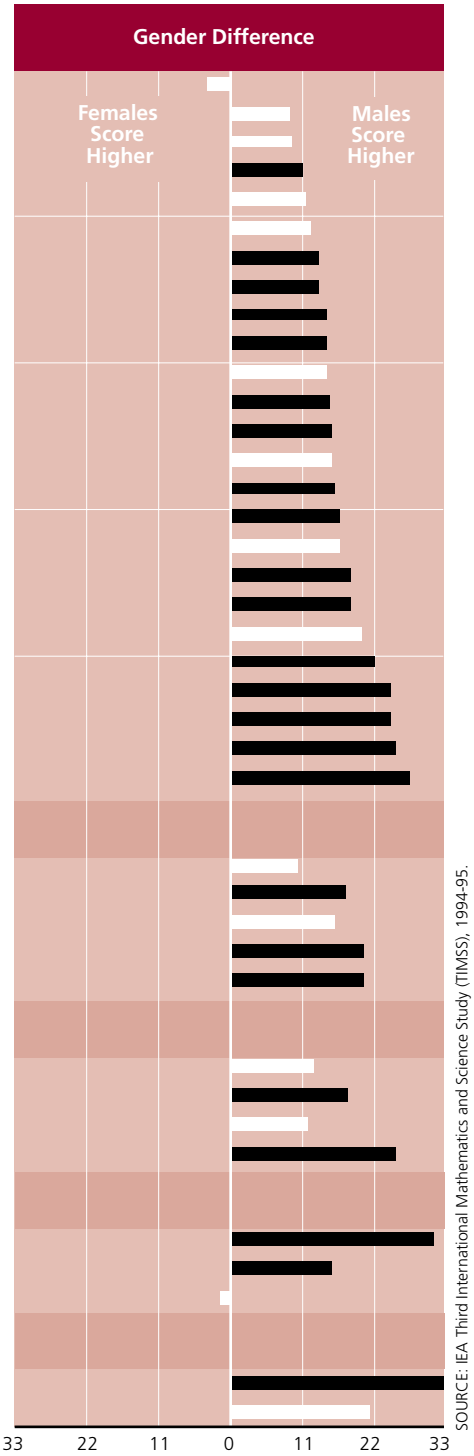
1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.9 Gender Differences in Science Achievement
### Eighth Grade*

| Country | Males' Mean | Females' Mean | Difference Absolute Value |
|---|---|---|---|
| Cyprus | 461 (2.2) | 465 (2.7) | 4 (3.0) |
| † United States | 539 (4.9) | 530 (5.2) | 9 (3.6) |
| Singapore | 612 (6.7) | 603 (7.0) | 9 (8.1) |
| Russian Federation | 544 (4.9) | 533 (3.7) | 11 (3.4) |
| Ireland | 544 (6.6) | 532 (5.2) | 12 (7.6) |
| Canada | 537 (3.1) | 525 (3.7) | 12 (4.3) |
| Norway | 534 (3.2) | 520 (2.0) | 14 (3.7) |
| 1 Lithuania | 484 (3.8) | 470 (4.0) | 14 (3.9) |
| Sweden | 543 (3.4) | 528 (3.4) | 15 (3.4) |
| 1 Latvia (LSS) | 492 (3.3) | 478 (3.2) | 15 (3.5) |
| † Belgium (Fl) | 558 (6.0) | 543 (5.8) | 15 (8.7) |
| 1 Switzerland | 529 (3.2) | 514 (3.0) | 15 (3.7) |
| Slovak Republic | 552 (3.5) | 537 (3.9) | 15 (3.6) |
| Iceland | 501 (5.1) | 486 (4.6) | 16 (5.2) |
| France | 506 (2.7) | 490 (3.3) | 16 (3.1) |
| Japan | 579 (2.4) | 562 (2.0) | 17 (3.0) |
| Iran, Islamic Rep. | 477 (3.8) | 461 (3.2) | 17 (5.2) |
| Spain | 526 (2.1) | 508 (2.3) | 18 (2.9) |
| Hungary | 563 (3.1) | 545 (3.4) | 18 (3.6) |
| †2 England | 562 (5.6) | 542 (4.2) | 20 (7.7) |
| Portugal | 490 (2.8) | 468 (2.7) | 22 (2.8) |
| Czech Republic | 586 (4.2) | 562 (5.8) | 24 (4.5) |
| Korea | 576 (2.7) | 551 (2.3) | 24 (3.8) |
| New Zealand | 538 (5.4) | 512 (5.2) | 25 (6.2) |
| Hong Kong | 535 (5.5) | 507 (5.1) | 27 (5.8) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | |
| Australia | 550 (5.2) | 540 (4.1) | 10 (5.3) |
| Austria | 566 (4.0) | 549 (4.6) | 18 (4.3) |
| Belgium (Fr) | 479 (4.8) | 463 (2.9) | 16 (5.5) |
| Netherlands | 570 (6.4) | 550 (4.9) | 20 (5.1) |
| Scotland | 527 (6.4) | 507 (4.7) | 20 (5.1) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | |
| Colombia | 418 (7.3) | 405 (4.6) | 13 (8.4) |
| †1 Germany | 542 (5.9) | 524 (4.9) | 18 (4.8) |
| Romania | 492 (5.3) | 480 (5.0) | 12 (3.8) |
| Slovenia | 573 (3.2) | 548 (3.2) | 25 (4.1) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | |
| Denmark | 494 (3.6) | 463 (3.9) | 31 (4.5) |
| Greece | 505 (2.6) | 489 (3.1) | 16 (3.3) |
| Thailand | 524 (3.9) | 526 (4.3) | 2 (3.6) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | |
| 1 Israel | 545 (6.4) | 512 (6.1) | 33 (7.1) |
| South Africa | 337 (9.5) | 315 (6.0) | 21 (8.6) |




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

**International Averages**

| Males | Females | Difference |
|---|---|---|
| 525 | 509 | 17 |

(Averages of all country means)

* Eighth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.10 Average Percent Correct for Males and Females by Science Content Areas
### Eighth Grade*

| Country | Science Overall | | Earth Science | | Life Science | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| † Belgium (Fl) | 62 (1.7) | 59 (1.5) | 64 (2.0) | 60 (1.5) | 64 (1.7) | 64 (1.5) |
| Canada | 60 (0.6) | 58 (0.6) | 59 (0.8) | 56 (0.8) | 62 (0.8) | 63 (0.8) |
| Cyprus | 46 (0.4) | 47 (0.6) | 47 (0.7) | 46 (0.9) | 47 (0.6) | ▲ 51 (0.7) |
| Czech Republic | ▲ 67 (0.8) | 61 (1.1) | 66 (1.1) | 60 (1.6) | 70 (0.9) | 67 (1.2) |
| †2 England | 63 (1.0) | 60 (0.7) | 61 (1.2) | 58 (0.9) | 65 (1.2) | 63 (1.1) |
| France | ▲ 55 (0.7) | 52 (0.7) | 57 (0.9) | 53 (1.0) | 57 (0.8) | 55 (0.9) |
| Hong Kong | ▲ 60 (1.1) | 55 (1.1) | ▲ 57 (1.2) | 51 (1.1) | 63 (1.2) | 59 (1.2) |
| Hungary | ▲ 63 (0.7) | 59 (0.7) | ▲ 62 (1.0) | 57 (0.9) | 66 (0.8) | 65 (0.8) |
| Iceland | 53 (1.2) | 51 (0.9) | 52 (1.5) | 48 (1.3) | 58 (1.2) | 58 (1.2) |
| Iran, Islamic Rep. | ▲ 49 (0.8) | 45 (0.8) | ▲ 47 (0.8) | 42 (0.9) | 50 (0.9) | 47 (0.9) |
| Ireland | 60 (1.3) | 57 (1.0) | 64 (1.4) | 59 (1.2) | 60 (1.4) | 60 (1.3) |
| Japan | ▲ 67 (0.5) | 64 (0.4) | ▲ 64 (0.5) | 58 (0.6) | 71 (0.5) | 70 (0.5) |
| Korea | ▲ 67 (0.5) | 64 (0.5) | ▲ 65 (0.7) | 60 (0.7) | 71 (0.7) | 69 (0.7) |
| 1 Latvia (LSS) | ▲ 52 (0.8) | 48 (0.6) | ▲ 51 (1.1) | 45 (1.0) | 54 (0.9) | 52 (0.8) |
| 1 Lithuania | ▲ 51 (0.8) | 47 (0.8) | ▲ 49 (1.1) | 44 (1.1) | 52 (1.0) | 52 (1.0) |
| New Zealand | 60 (1.0) | 56 (1.0) | ▲ 59 (1.1) | 52 (1.1) | 61 (1.2) | 60 (1.1) |
| Norway | 59 (0.6) | 56 (0.4) | ▲ 64 (0.8) | 59 (0.7) | 60 (0.8) | 62 (0.6) |
| Portugal | ▲ 52 (0.7) | 48 (0.6) | ▲ 53 (1.0) | 47 (0.8) | 55 (0.8) | 52 (0.8) |
| Russian Federation | 60 (0.9) | 57 (0.7) | 61 (0.9) | 57 (0.9) | 62 (0.9) | 63 (0.7) |
| Singapore | 71 (1.2) | 69 (1.1) | 66 (1.4) | 63 (1.3) | 72 (1.2) | 71 (1.2) |
| Slovak Republic | ▲ 62 (0.6) | 57 (0.7) | ▲ 62 (0.9) | 58 (0.9) | 61 (0.7) | 59 (0.8) |
| Spain | ▲ 58 (0.5) | 54 (0.5) | ▲ 59 (0.7) | 54 (0.7) | ▲ 60 (0.7) | 57 (0.6) |
| Sweden | ▲ 60 (0.6) | 57 (0.6) | 63 (0.8) | 60 (0.8) | 63 (0.7) | 63 (0.8) |
| 1 Switzerland | ▲ 58 (0.6) | 54 (0.5) | 60 (0.9) | 56 (0.7) | 59 (0.8) | 59 (0.7) |
| † United States | 59 (1.0) | 57 (1.0) | 60 (1.0) | 56 (1.1) | 63 (1.2) | 63 (1.1) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | 61 (1.0) | 59 (0.8) | 59 (1.0) | 55 (0.9) | 62 (1.0) | 64 (0.8) |
| Austria | 63 (0.8) | 60 (0.8) | ▲ 65 (0.9) | 59 (1.0) | 65 (0.8) | 64 (0.9) |
| Belgium (Fr) | 52 (1.0) | 49 (0.7) | 52 (1.3) | 48 (0.9) | 55 (1.1) | 55 (1.0) |
| Netherlands | 64 (1.2) | 60 (1.1) | 64 (1.6) | 58 (1.4) | 67 (1.4) | 66 (1.6) |
| Scotland | 57 (1.2) | 53 (0.9) | ▲ 56 (1.2) | 48 (1.0) | 58 (1.3) | 55 (1.1) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | | | |
| Colombia | 40 (1.4) | 37 (0.8) | 39 (1.4) | 35 (1.1) | 45 (1.6) | 42 (1.0) |
| †1 Germany | 59 (1.2) | 57 (1.0) | 58 (1.1) | 56 (1.3) | 63 (1.3) | 63 (1.1) |
| Romania | 51 (0.9) | 49 (0.9) | 50 (1.1) | 48 (1.1) | 55 (1.1) | 55 (1.1) |
| Slovenia | ▲ 64 (0.6) | 59 (0.7) | ▲ 67 (0.8) | 62 (0.9) | 66 (0.7) | 63 (0.8) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | | | |
| Denmark | ▲ 54 (0.6) | 48 (0.8) | ▲ 53 (0.9) | 44 (0.9) | 57 (0.9) | 55 (1.0) |
| Greece | ▲ 54 (0.6) | 50 (0.6) | ▲ 51 (0.8) | 46 (0.7) | 55 (0.7) | 53 (0.7) |
| Thailand | 57 (0.9) | 58 (1.0) | 56 (1.2) | 56 (1.1) | 65 (1.0) | 67 (1.1) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | | | |
| 1 Israel | ▲ 61 (1.2) | 54 (1.1) | ▲ 59 (1.4) | 52 (1.3) | 63 (1.5) | 59 (1.4) |
| South Africa | 28 (1.8) | 25 (1.2) | 28 (1.6) | 24 (1.0) | 29 (1.9) | 25 (1.3) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Eighth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.10 (Continued)

**Average Percent Correct for Males and Females by Science Content Areas**
**Eighth Grade***

| Country | Physics | | Chemistry | | Environmental Issues and the Nature of Science | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| † Belgium (Fl) | 63 (1.7) | 58 (1.4) | 53 (1.6) | 50 (1.8) | 59 (1.6) | 57 (2.3) |
| Canada | ▲ 61 (0.6) | 57 (0.5) | 53 (0.9) | 50 (0.9) | 62 (0.8) | 60 (1.0) |
| Cyprus | 47 (0.6) | 45 (0.7) | 45 (0.9) | 44 (0.8) | 45 (1.0) | 47 (0.9) |
| Czech Republic | ▲ 67 (0.8) | 60 (0.9) | ▲ 64 (1.2) | 56 (1.7) | ▲ 64 (1.2) | 55 (1.6) |
| †2 England | 63 (1.0) | 60 (0.8) | 57 (1.2) | 53 (1.4) | 65 (1.6) | 64 (1.2) |
| France | ▲ 57 (0.7) | 52 (0.7) | 49 (1.2) | 45 (1.2) | 54 (1.3) | 53 (1.1) |
| Hong Kong | ▲ 62 (0.9) | 54 (1.1) | ▲ 57 (1.3) | 52 (1.2) | 57 (1.6) | 53 (1.5) |
| Hungary | ▲ 63 (0.7) | 56 (0.8) | ▲ 62 (0.9) | 58 (1.0) | 55 (1.2) | 52 (1.1) |
| Iceland | 54 (1.6) | 52 (0.9) | 43 (1.1) | 41 (1.4) | 49 (1.8) | 48 (1.2) |
| Iran, Islamic Rep. | ▲ 51 (1.0) | 44 (0.8) | 53 (1.0) | 51 (1.1) | 40 (1.4) | 37 (1.5) |
| Ireland | ▲ 59 (1.3) | 54 (1.0) | 56 (1.5) | 52 (1.2) | 60 (1.6) | 60 (1.3) |
| Japan | ▲ 68 (0.5) | 65 (0.4) | ▲ 62 (0.7) | 59 (0.6) | 61 (0.9) | 58 (0.8) |
| Korea | ▲ 67 (0.7) | 62 (0.6) | 65 (0.8) | 61 (0.9) | ▲ 66 (1.0) | 61 (1.1) |
| 1 Latvia (LSS) | ▲ 55 (1.0) | 48 (0.7) | 50 (1.2) | 46 (1.1) | 48 (1.3) | 46 (1.2) |
| 1 Lithuania | ▲ 56 (0.9) | 48 (0.7) | 50 (1.1) | 45 (1.1) | 41 (1.4) | 38 (1.2) |
| New Zealand | ▲ 60 (0.8) | 55 (0.8) | ▲ 56 (1.3) | 50 (1.4) | 60 (1.5) | 58 (1.3) |
| Norway | ▲ 59 (0.6) | 55 (0.5) | ▲ 52 (0.9) | 47 (0.8) | 56 (1.0) | 55 (1.1) |
| Portugal | ▲ 52 (0.6) | 45 (0.6) | ▲ 54 (1.1) | 46 (1.0) | 45 (1.1) | 45 (1.1) |
| Russian Federation | ▲ 60 (1.0) | 55 (0.9) | 60 (1.6) | 55 (1.2) | 49 (1.1) | 50 (1.0) |
| Singapore | 71 (1.0) | 67 (1.0) | 70 (1.6) | 68 (1.5) | 74 (1.3) | 74 (1.4) |
| Slovak Republic | ▲ 65 (0.7) | 58 (0.8) | ▲ 61 (1.0) | 54 (1.0) | 55 (1.1) | 52 (1.1) |
| Spain | ▲ 58 (0.5) | 52 (0.6) | ▲ 54 (0.9) | 49 (0.8) | 53 (0.8) | 53 (1.0) |
| Sweden | ▲ 60 (0.6) | 54 (0.7) | ▲ 59 (1.0) | 52 (0.7) | 53 (1.0) | 51 (0.9) |
| 1 Switzerland | ▲ 60 (0.7) | 55 (0.6) | ▲ 53 (0.9) | 46 (0.9) | 53 (1.0) | 49 (1.0) |
| † United States | 57 (0.9) | 54 (0.9) | 55 (1.3) | 51 (1.2) | 59 (1.2) | 62 (1.2) |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | 62 (0.9) | 58 (0.8) | 56 (1.2) | 52 (1.0) | 62 (1.3) | 63 (1.1) |
| Austria | ▲ 64 (0.8) | 59 (0.9) | 61 (1.3) | 56 (1.5) | 56 (1.1) | 54 (1.3) |
| Belgium (Fr) | 53 (1.1) | 50 (0.6) | 44 (1.1) | 39 (1.1) | 47 (1.6) | 46 (1.1) |
| Netherlands | ▲ 65 (1.2) | 60 (1.0) | ▲ 56 (1.0) | 49 (1.1) | 66 (2.1) | 65 (1.9) |
| Scotland | 59 (1.0) | 55 (0.9) | ▲ 55 (1.7) | 47 (1.1) | 58 (1.7) | 56 (1.6) |
| ***Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A):*** | | | | | | |
| Colombia | 39 (1.5) | 35 (0.9) | 34 (1.6) | 30 (1.0) | 41 (2.0) | 40 (1.0) |
| †1 Germany | 60 (1.1) | 55 (1.0) | 57 (1.6) | 52 (1.6) | 50 (1.6) | 52 (1.3) |
| Romania | 51 (0.9) | 46 (1.0) | 48 (1.2) | 45 (1.1) | 42 (1.2) | 41 (1.3) |
| Slovenia | ▲ 64 (0.7) | 58 (0.8) | 59 (1.1) | 54 (1.1) | 60 (1.1) | 57 (1.1) |
| ***Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A):*** | | | | | | |
| Denmark | ▲ 57 (0.7) | 49 (0.9) | ▲ 44 (1.1) | 38 (1.1) | 50 (1.4) | 44 (1.3) |
| Greece | ▲ 55 (0.6) | 50 (0.6) | ▲ 54 (0.7) | 49 (0.7) | 51 (1.1) | 51 (1.1) |
| Thailand | 54 (0.8) | 54 (0.9) | 42 (1.2) | 44 (1.5) | 62 (1.2) | 62 (1.3) |
| ***Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A):*** | | | | | | |
| 1 Israel | ▲ 62 (1.1) | 54 (1.1) | ▲ 58 (1.7) | 50 (1.6) | 57 (2.1) | 49 (1.9) |
| South Africa | 29 (1.9) | 25 (1.3) | 28 (2.0) | 25 (1.2) | 27 (1.9) | 24 (1.5) |

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

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

* Eighth grade in most countries; see Appendix A for information about the grades tested in each country.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

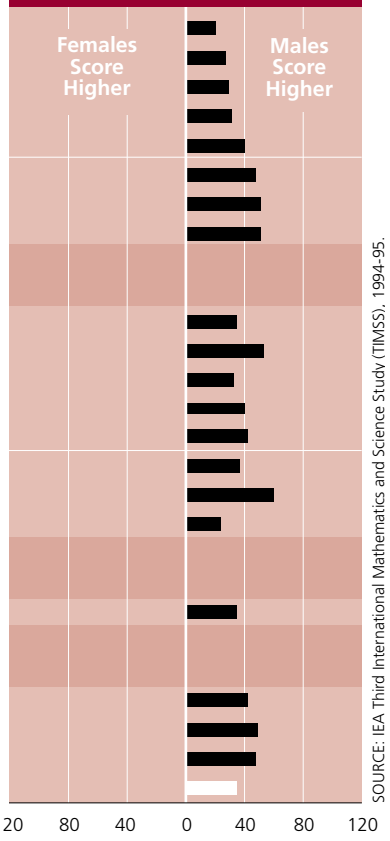
1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Exhibit 1.11 Gender Differences in Science Literacy
### Final Year of Secondary School*

| Country | Males | | Females | | Difference | TCI |
|---|---|---|---|---|---|---|
| | Percent of Students | Mean Achievement | Percent of Students | Mean Achievement | | |
| [2] Cyprus | 45 (2.1) | 459 (5.8) | 55 (2.1) | 439 (3.0) | 20 (6.5) | 48% |
| † New Zealand | 49 (1.7) | 543 (7.1) | 51 (1.7) | 515 (5.2) | 28 (8.8) | 70% |
| Hungary | 52 (2.5) | 484 (4.2) | 48 (2.5) | 455 (4.3) | 29 (6.0) | 65% |
| [1] Lithuania | 35 (3.0) | 481 (6.4) | 65 (3.0) | 450 (7.3) | 31 (9.7) | 43% |
| Switzerland | 56 (2.5) | 540 (6.1) | 44 (2.5) | 500 (7.8) | 40 (9.9) | 82% |
| [2] Russian Federation | 38 (1.0) | 510 (5.7) | 62 (1.0) | 463 (6.7) | 47 (8.8) | 48% |
| Sweden | 49 (2.5) | 585 (5.9) | 51 (2.5) | 534 (3.5) | 50 (6.8) | 71% |
| Czech Republic | 51 (5.1) | 512 (8.8) | 49 (5.1) | 460 (11.0) | 51 (14.0) | 78% |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | 42 (2.9) | 547 (11.5) | 58 (2.9) | 513 (9.4) | 34 (14.8) | 68% |
| [2] Austria | 39 (3.2) | 554 (8.7) | 61 (3.2) | 501 (5.8) | 53 (10.4) | 76% |
| Canada | 47 (1.4) | 550 (3.6) | 53 (1.4) | 518 (3.8) | 32 (5.2) | 70% |
| France | 47 (3.1) | 508 (6.7) | 53 (3.1) | 468 (4.8) | 39 (8.3) | 84% |
| Iceland | 48 (0.8) | 572 (2.7) | 52 (0.8) | 530 (2.1) | 41 (3.4) | 55% |
| [1] Italy | 46 (3.3) | 495 (6.7) | 54 (3.3) | 458 (5.6) | 37 (8.8) | 52% |
| Norway | 51 (2.0) | 574 (5.1) | 49 (2.0) | 513 (4.5) | 61 (6.8) | 84% |
| United States | 50 (1.3) | 492 (4.5) | 50 (1.3) | 469 (3.9) | 23 (5.9) | 63% |
| ***Countries With Unapproved Student Sampling (See Appendix A):*** | | | | | | |
| † Germany | 56 (5.2) | 514 (7.9) | 44 (5.2) | 478 (8.5) | 35 (11.6) | 75% |
| ***Countries With Unapproved Sampling Procedures and Low Participation Rates (See Appendix A):*** | | | | | | |
| Denmark | 45 (2.0) | 532 (5.4) | 55 (2.0) | 490 (4.1) | 41 (6.8) | 58% |
| [2] Netherlands | 52 (2.3) | 582 (5.7) | 48 (2.3) | 532 (6.2) | 49 (8.4) | 78% |
| Slovenia | 51 (3.3) | 541 (12.7) | 49 (3.3) | 494 (6.4) | 47 (14.3) | 88% |
| South Africa | 49 (1.6) | 367 (11.5) | 51 (1.6) | 333 (13.0) | 34 (17.4) | 49% |




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

**International Averages**

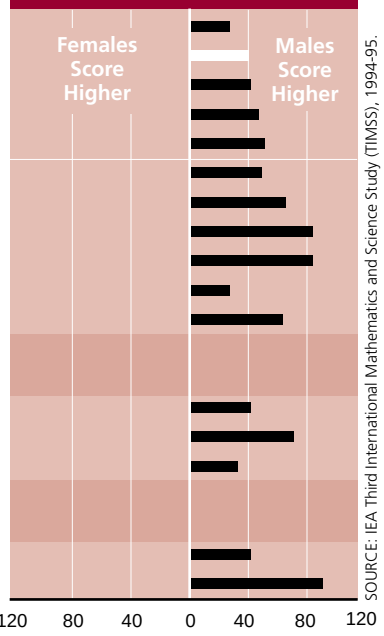
| Males | Females | Difference |
|---|---|---|
| 521 | 482 | 39 |

(Averages of All Country Means)

* See Appendix A for characteristics of students tested.
† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).
1 National Desired Population does not cover all of International Desired Population (see Appendix A).
2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

## Exhibit 1.12 Gender Differences in Physics Achievement
### Final Year of Secondary School*

| Country | Males | | Females | | Difference | PTCI |
|---|---|---|---|---|---|---|
| | Percent of Students | Mean Achievement | Percent of Students | Mean Achievement | | |
| France | 61 (2.0) | 478 (4.2) | 39 (2.0) | 450 (5.6) | 28 (7.0) | 20% |
| [2] Cyprus | 63 (2.5) | 509 (8.9) | 37 (2.5) | 470 (7.1) | 40 (11.4) | 9% |
| [1] Latvia (LSS) | 51 (3.7) | 509 (19.0) | 49 (3.7) | 467 (22.6) | 42 (29.5) | 3% |
| Canada | 57 (3.2) | 506 (6.0) | 43 (3.2) | 459 (6.3) | 47 (8.7) | 14% |
| [†] Norway | 74 (1.8) | 594 (6.3) | 26 (1.8) | 544 (9.3) | 51 (11.2) | 8% |
| Sweden | 67 (3.4) | 589 (5.1) | 33 (3.4) | 540 (5.3) | 49 (7.4) | 16% |
| [2] Russian Federation | 54 (2.0) | 575 (9.9) | 46 (2.0) | 509 (15.3) | 66 (18.2) | 2% |
| Czech Republic | 38 (2.4) | 503 (8.8) | 62 (2.4) | 419 (3.9) | 83 (9.7) | 11% |
| Switzerland | 51 (1.8) | 529 (5.2) | 49 (1.8) | 446 (3.6) | 83 (6.3) | 14% |
| [†] Greece | 68 (2.1) | 495 (6.1) | 32 (2.1) | 468 (8.1) | 28 (10.1) | 10% |
| [†] Germany | 69 (3.0) | 542 (14.3) | 31 (3.0) | 479 (9.1) | 64 (17.0) | 8% |
| ***Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A):*** | | | | | | |
| Australia | 66 (3.8) | 532 (6.7) | 34 (3.8) | 490 (8.4) | 42 (10.8) | 13% |
| [2] Austria | 38 (3.5) | 479 (8.1) | 62 (3.5) | 408 (7.4) | 71 (11.0) | 33% |
| United States | 52 (2.4) | 439 (4.3) | 48 (2.4) | 405 (3.1) | 33 (5.3) | 14% |
| ***Countries with Unapproved Sampling Procedures and Low Participation Rates (See Appendix A):*** | | | | | | |
| Denmark | 80 (2.3) | 542 (5.2) | 20 (2.3) | 500 (8.1) | 42 (9.6) | 3% |
| Slovenia | 72 (3.7) | 546 (16.3) | 28 (3.7) | 455 (18.7) | 91 (24.8) | 39% |




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

**International Averages**

| Males | Females | Difference |
|---|---|---|
| 523 | 469 | 54 |

(Averages of All Country Means)

* See Appendix A for characteristics of the students tested.

† Met guidelines for sample participation rates only after replacement schools were included (see Appendix A).

1 National Desired Population does not cover all of International Desired Population (see Appendix A). Because population coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

## Patterns Across Grades in the Gender Differences in Mathematics and Science Achievement

The TIMSS data summarized in this chapter indicate several important patterns of gender differences in average mathematics and science achievement.

- The gender differences in achievement in both curriculum areas widened at the upper grades. Thus, while males in the fourth grade had higher achievement than females in only some countries, by the final year of secondary school gender differences in performance were pervasive – with males having significantly higher achievement than females in both curriculum areas in almost every TIMSS country.

- The gender differences were more pronounced in science than in mathematics. Still, by the final year of secondary school, males had significantly higher average achievement than females in most countries in both mathematics and science.

- The data by content area for fourth and eighth grades showed that differences in performance by gender vary by content areas. For example, in mathematics males outperformed females in measurement but females exhibited a slight edge in algebra. In science, males outperformed females in earth science, physics, and chemistry, but not in life science or environmental issues.

# 2

# Gender Differences in Mathematics and Science Achievement for High-Performing Students

## Overview

The two analyses presented in Chapter 2 investigate gender differences for high- and low-performing students to determine whether patterns for the differences in mean achievement hold across the performance distributions. Although both analytic approaches are related, the first approach examines the gender composition of the top quarter of students in each country. The second analysis asks, given the 75th percentile for a given country, what percentage of males and females reach that benchmark? These analyses were conducted for the set of countries meeting the TIMSS sampling guidelines at the eighth grade.

## Exploring Gender Differences Among High-Performing Students

For each country, at each grade level, students were ranked according to mean mathematics achievement scores. The top quarter of the students were identified as "high-performing," the middle 50% as "middle-performing," and the bottom quarter as "low-performing." All students were classified as belonging to one of the three performance categories. Once students were classified, the data first were analyzed to determine the percentages of males and females within the low-, middle-, and high-performing groups, and the differences between those percentages.[5] The mean achievement by gender for each of these groups was then calculated and compared (see Appendix B).

Exhibit 2.1-2.4

Exhibits 2.1 – 2.4 show the percentages by gender of high-performing students in mathematics at the fourth and eighth grades and for students in the final year of secondary school for mathematics literacy and advanced mathematics. The data reveal a slight tendency for males to outnumber females proportionally among high-performers in several countries at the fourth grade and, somewhat more so, at the eighth grade, although the differences generally were not statistically significant. At the final year of secondary school, however, males were disproportionately represented among high performers in 10 out of 18 countries for mathematics literacy and for 7 out of 12 countries in advanced mathematics.

Exhibit 2.5-2.8

An examination of Exhibits 2.5 - 2.8 reveals an even more extreme picture for gender differences among high-performing students in science achievement. As early as fourth grade in science, males were already disproportionately represented among high-performing students in 11 of the 22 TIMSS countries included in this analysis. The pattern was similar at the eighth grade with significantly higher percentages of males being present among high-performers in 13 out of 34 countries. By the final year of secondary school, males were significantly over-represented among high-performers in nearly every country in science literacy, from 61% of the high-performing students in the United States up to 74% in Norway. Similarly, for final-year students taking the physics assessment, there were significantly higher percentages of males than females among the high-performing students in nearly all the TIMSS countries. At the low end of the range, 65% of high-performing physics students in France were male while at the high end of the range, fully 84% of high-performing students in the Czech Republic were male.

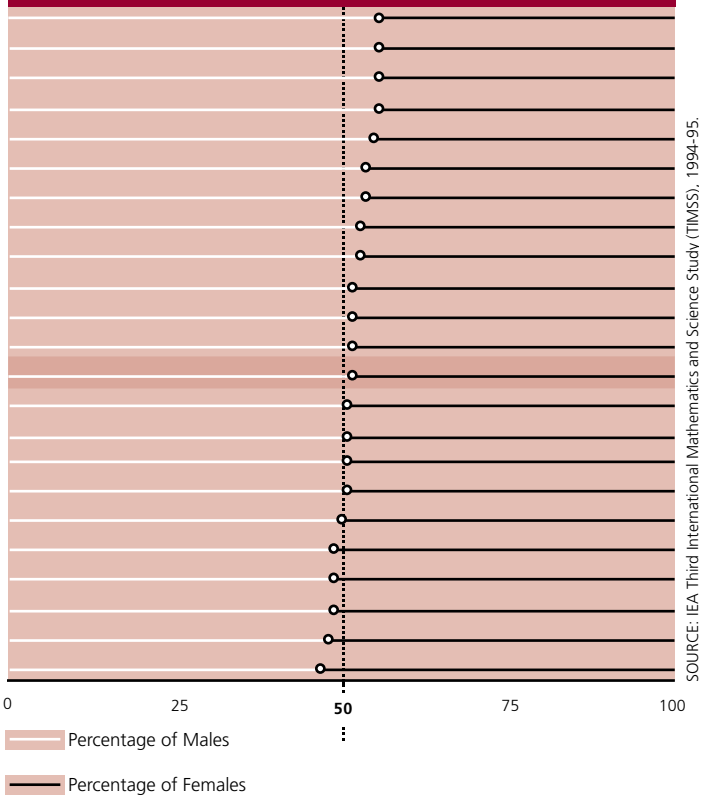
For more detail about performance by gender across the achievement distributions in mathematics and science, please see Appendix B. Appendix B presents both the percentages and the mean achievement by gender for low-, middle-, and high-performing students.

[5] These analyses took into account any overall gender imbalances found in the participating sample for each country. That is, for each country, adjustments were made to the proportions of males and females within the "low," "middle," and "high" performing classifications based on the overall unequal gender representation of the sample for that country. See Appendix A for sample sizes within each country by gender.

## Exhibit 2.1 Percentages by Gender of High-Performing Students[1] in Mathematics
### Fourth Grade*

| Country | Males | Females |
|---|---|---|
| Cyprus | ▲ 56 (1.9) | 44 (1.9) |
| Japan | ▲ 56 (1.6) | 44 (1.6) |
| Korea | 56 (2.4) | 44 (2.4) |
| Netherlands | 56 (2.0) | 44 (2.0) |
| Iran, Islamic Rep. | 55 (4.3) | 45 (4.3) |
| Austria | 54 (1.6) | 46 (1.6) |
| Norway | 54 (2.7) | 46 (2.7) |
| England | 53 (2.3) | 47 (2.3) |
| Hungary | 53 (2.5) | 47 (2.5) |
| Australia | 52 (1.8) | 48 (1.8) |
| Canada | 52 (1.7) | 48 (1.7) |
| Portugal | 52 (2.5) | 48 (2.5) |
| International Avg. | ▲ 52 (0.5) | 48 (0.5) |
| Ireland | 51 (2.6) | 49 (2.6) |
| Scotland | 51 (1.7) | 49 (1.7) |
| Slovenia | 51 (2.5) | 49 (2.5) |
| United States | 51 (1.5) | 49 (1.5) |
| Hong Kong | 50 (1.7) | 50 (1.7) |
| Czech Republic | 49 (2.2) | 51 (2.2) |
| Iceland | 49 (2.7) | 51 (2.7) |
| New Zealand | 49 (2.4) | 51 (2.4) |
| Singapore | 48 (2.0) | 52 (2.0) |
| Latvia (LSS) | 47 (2.3) | 53 (2.3) |

▲ = Gender difference statistically significant at .05 level




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

1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

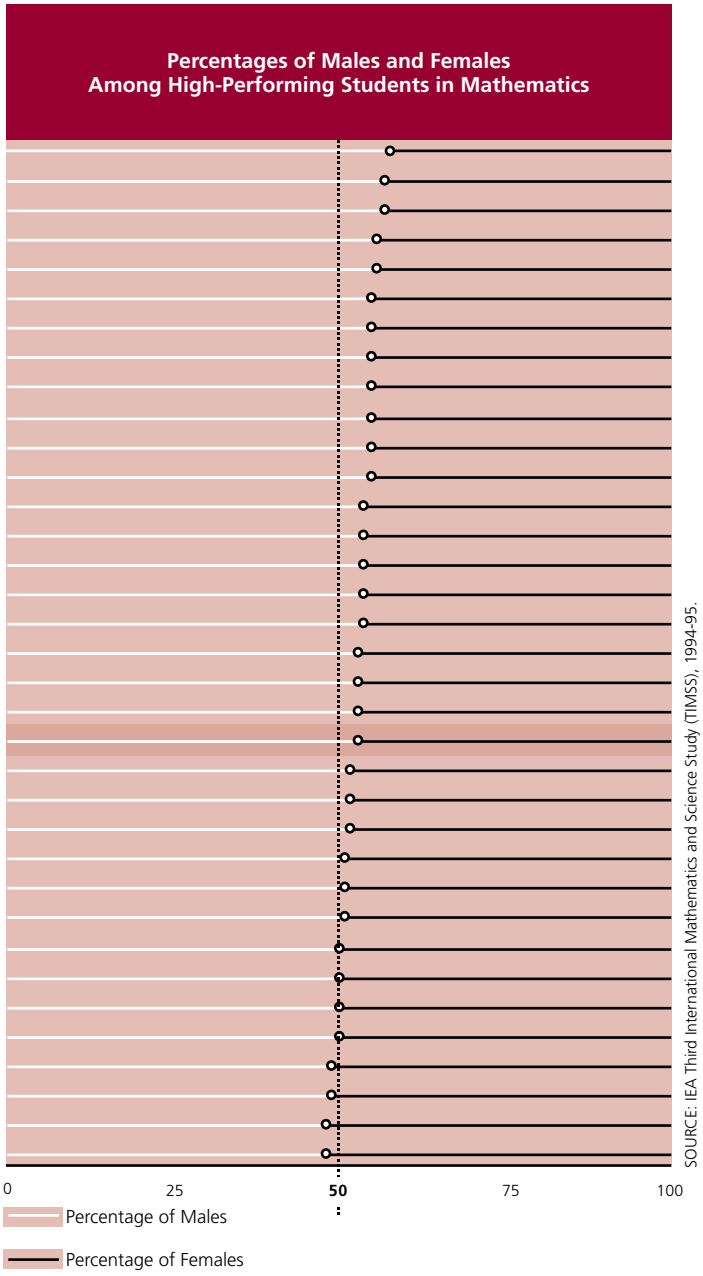
* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

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

## Exhibit 2.2 Percentages by Gender of High-Performing Students[1] in Mathematics
### Eighth Grade*

| Country | Males | Females |
|---|---|---|
| Hong Kong | 58 (3.1) | 42 (3.1) |
| Iceland | 57 (2.7) | 43 (2.7) |
| Ireland | 57 (3.3) | 43 (3.3) |
| Iran, Islamic Rep. | 56 (2.8) | 44 (2.8) |
| Scotland | 56 (2.9) | 44 (2.9) |
| England | 55 (3.1) | 45 (3.1) |
| Japan | ▲ 55 (1.5) | 45 (1.5) |
| Korea | 55 (2.2) | 45 (2.2) |
| New Zealand | 55 (3.1) | 45 (3.1) |
| Portugal | 55 (1.8) | 45 (1.8) |
| Slovak Republic | 55 (2.0) | 45 (2.0) |
| United States | ▲ 55 (1.6) | 45 (1.6) |
| Austria | 54 (1.8) | 46 (1.8) |
| Belgium (Fr) | 54 (2.6) | 46 (2.6) |
| Czech Republic | 54 (2.3) | 46 (2.3) |
| Netherlands | 54 (2.9) | 46 (2.9) |
| Spain | 54 (2.2) | 46 (2.2) |
| Latvia (LSS) | 53 (2.1) | 47 (2.1) |
| Norway | 53 (1.9) | 47 (1.9) |
| Switzerland | 53 (1.7) | 47 (1.7) |
| International Avg. | ▲ 53 (0.4) | 47 (0.4) |
| Colombia | 52 (4.6) | 48 (4.6) |
| Romania | 52 (2.2) | 48 (2.2) |
| Slovenia | 52 (2.0) | 48 (2.0) |
| France | 51 (2.2) | 49 (2.2) |
| Germany | 51 (2.3) | 49 (2.3) |
| Russian Federation | 51 (1.5) | 49 (1.5) |
| Australia | 50 (2.0) | 50 (2.0) |
| Canada | 50 (1.9) | 50 (1.9) |
| Hungary | 50 (2.0) | 50 (2.0) |
| Singapore | 50 (2.6) | 50 (2.6) |
| Belgium (Fl) | 49 (4.0) | 51 (4.0) |
| Lithuania | 49 (2.1) | 51 (2.1) |
| Cyprus | 48 (1.6) | 52 (1.6) |
| Sweden | 48 (1.7) | 52 (1.7) |

▲ = Gender difference statistically significant at .05 level




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

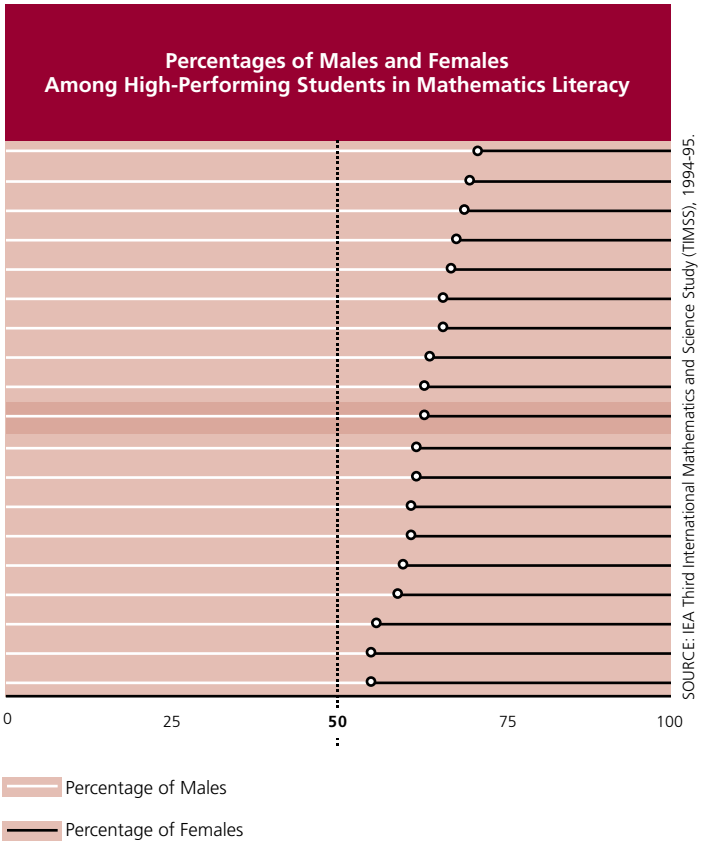
1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

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

## Exhibit 2.3 Percentages by Gender of High-Performing Students[1] in Mathematics Literacy
### Final Year of Secondary School*

| Country | Males | Females |
|---|---|---|
| Slovenia | ▲ 71 (6.0) | 29 (6.0) |
| Norway | ▲ 70 (3.4) | 30 (3.4) |
| Austria | ▲ 69 (4.4) | 31 (4.4) |
| Sweden | ▲ 68 (2.4) | 32 (2.4) |
| Iceland | ▲ 67 (2.3) | 33 (2.3) |
| France | ▲ 66 (3.6) | 34 (3.6) |
| Netherlands | ▲ 66 (3.4) | 34 (3.4) |
| Australia | ▲ 64 (4.1) | 36 (4.1) |
| Czech Republic | 63 (6.0) | 37 (6.0) |
| International Avg. | ▲ 63 (0.9) | 37 (0.9) |
| Canada | ▲ 62 (3.2) | 38 (3.2) |
| Switzerland | ▲ 62 (3.1) | 38 (3.1) |
| New Zealand | 61 (3.6) | 39 (3.6) |
| Russian Federation | 61 (3.8) | 39 (3.8) |
| Germany | 60 (4.7) | 40 (4.7) |
| Cyprus | 59 (3.2) | 41 (3.2) |
| Lithuania | 56 (4.1) | 44 (4.1) |
| Hungary | 55 (3.6) | 45 (3.6) |
| United States | 55 (2.7) | 45 (2.7) |




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

▲ = Gender difference statistically significant at .05 level

1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

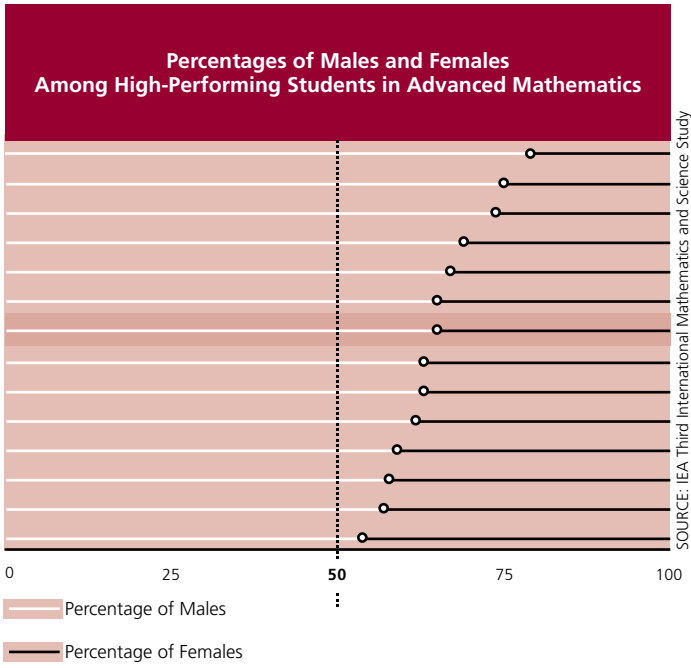
* See Appendix A for characteristics of students sampled.

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

## Exhibit 2.4 Percentages by Gender of High-Performing Students[1] in Advanced Mathematics
### Final Year of Secondary School*

| Country | Males | Females |
|---|---|---|
| Czech Republic | ▲ 79 (2.5) | 21 (2.5) |
| Austria | ▲ 75 (4.6) | 25 (4.6) |
| Switzerland | ▲ 74 (3.2) | 26 (3.2) |
| Lithuania | ▲ 69 (4.2) | 31 (4.2) |
| Russian Federation | ▲ 67 (3.2) | 33 (3.2) |
| Canada | ▲ 65 (4.6) | 35 (4.6) |
| International Avg. | ▲ 65 (1.5) | 35 (1.5) |
| France | 63 (7.1) | 37 (7.1) |
| Germany | ▲ 63 (2.9) | 37 (2.9) |
| Sweden | 62 (9.5) | 38 (9.5) |
| Cyprus | 59 (6.2) | 41 (6.2) |
| Slovenia | 58 (5.8) | 42 (5.8) |
| United States | 57 (4.5) | 43 (4.5) |
| Australia | 54 (8.3) | 46 (8.3) |

▲ = Gender difference statistically significant at .05 level



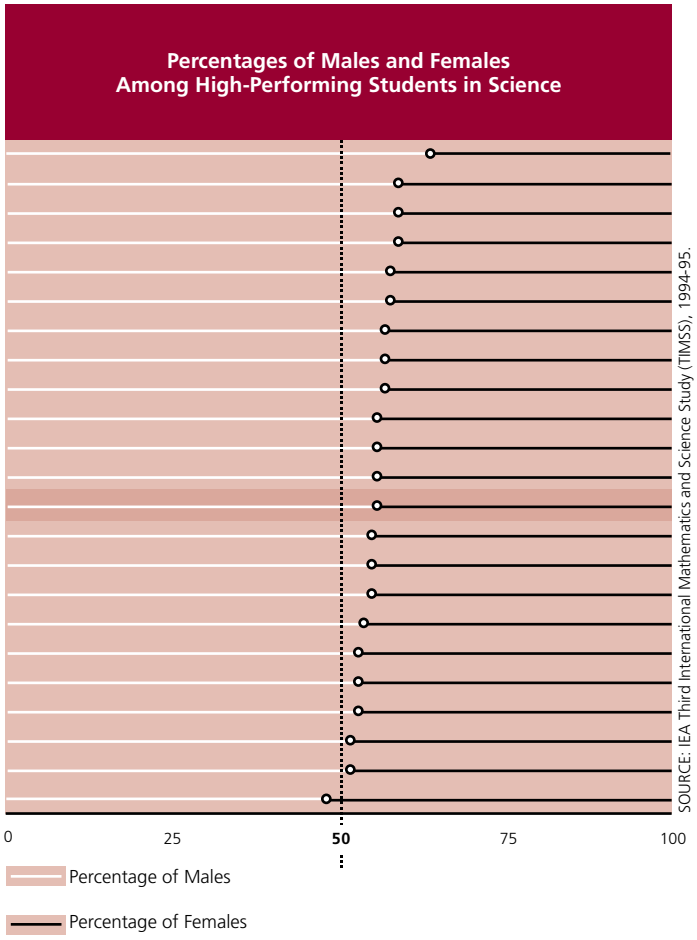

1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit 2.5 Percentages by Gender of High-Performing Students[1] in Science
### Fourth Grade*

| Country | Males | Females |
|---|---|---|
| Netherlands | ▲ 64 (2.3) | 36 (2.3) |
| Iceland | ▲ 59 (2.1) | 41 (2.1) |
| Japan | ▲ 59 (1.2) | 41 (1.2) |
| Korea | ▲ 59 (2.2) | 41 (2.2) |
| Australia | ▲ 58 (2.2) | 42 (2.2) |
| Hong Kong | ▲ 58 (2.0) | 42 (2.0) |
| Austria | 57 (3.0) | 43 (3.0) |
| Czech Republic | ▲ 57 (1.8) | 43 (1.8) |
| Hungary | ▲ 57 (1.8) | 43 (1.8) |
| Canada | ▲ 56 (1.3) | 44 (1.3) |
| Cyprus | ▲ 56 (1.7) | 44 (1.7) |
| United States | ▲ 56 (1.3) | 44 (1.3) |
| International Avg. | ▲ 56 (0.5) | 44 (0.5) |
| England | 55 (1.8) | 45 (1.8) |
| Iran, Islamic Rep. | 55 (4.1) | 45 (4.1) |
| Norway | 55 (2.9) | 45 (2.9) |
| Ireland | 54 (1.9) | 46 (1.9) |
| Portugal | 53 (2.8) | 47 (2.8) |
| Scotland | 53 (1.9) | 47 (1.9) |
| Slovenia | 53 (1.8) | 47 (1.8) |
| New Zealand | 52 (2.5) | 48 (2.5) |
| Singapore | 52 (3.3) | 48 (3.3) |
| Latvia (LSS) | 48 (2.8) | 52 (2.8) |




▲ = Gender difference statistically significant at .05 level

1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

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

## Exhibit 2.6 Percentages by Gender of High-Performing Students[1] in Science
### Eighth Grade*

| Country | Males | Females |
|---|---|---|
| Czech Republic | ▲ 62 (2.7) | 38 (2.7) |
| Slovenia | ▲ 62 (2.6) | 38 (2.6) |
| Hong Kong | ▲ 61 (2.5) | 39 (2.5) |
| Iran, Islamic Rep. | 60 (3.4) | 40 (3.4) |
| Korea | ▲ 60 (2.2) | 40 (2.2) |
| New Zealand | 60 (3.7) | 40 (3.7) |
| Portugal | ▲ 60 (1.5) | 40 (1.5) |
| Iceland | 59 (3.3) | 41 (3.3) |
| Belgium (Fr) | ▲ 58 (2.5) | 42 (2.5) |
| France | ▲ 58 (2.3) | 42 (2.3) |
| Netherlands | ▲ 58 (2.5) | 42 (2.5) |
| Spain | ▲ 58 (1.8) | 42 (1.8) |
| Belgium (Fl) | 57 (3.3) | 43 (3.3) |
| Colombia | 57 (4.0) | 43 (4.0) |
| Hungary | 57 (2.5) | 43 (2.5) |
| Japan | ▲ 57 (1.5) | 43 (1.5) |
| Lithuania | 57 (2.2) | 43 (2.2) |
| Norway | ▲ 57 (1.8) | 43 (1.8) |
| Scotland | 57 (2.6) | 43 (2.6) |
| Sweden | ▲ 57 (1.2) | 43 (1.2) |
| International Avg. | ▲ 57 (0.4) | 43 (0.4) |
| Australia | 56 (1.9) | 44 (1.9) |
| Canada | 56 (2.2) | 44 (2.2) |
| England | 56 (2.7) | 44 (2.7) |
| Germany | 56 (2.3) | 44 (2.3) |
| Latvia (LSS) | 56 (2.0) | 44 (2.0) |
| Russian Federation | 56 (2.1) | 44 (2.1) |
| Switzerland | ▲ 56 (1.8) | 44 (1.8) |
| Austria | 55 (2.4) | 45 (2.4) |
| Ireland | 55 (2.9) | 45 (2.9) |
| Romania | 55 (2.2) | 45 (2.2) |
| Slovak Republic | 54 (1.6) | 46 (1.6) |
| United States | 54 (2.1) | 46 (2.1) |
| Cyprus | 52 (1.7) | 48 (1.7) |
| Singapore | 52 (3.3) | 48 (3.3) |


▲ = Gender difference statistically significant at .05 level

1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

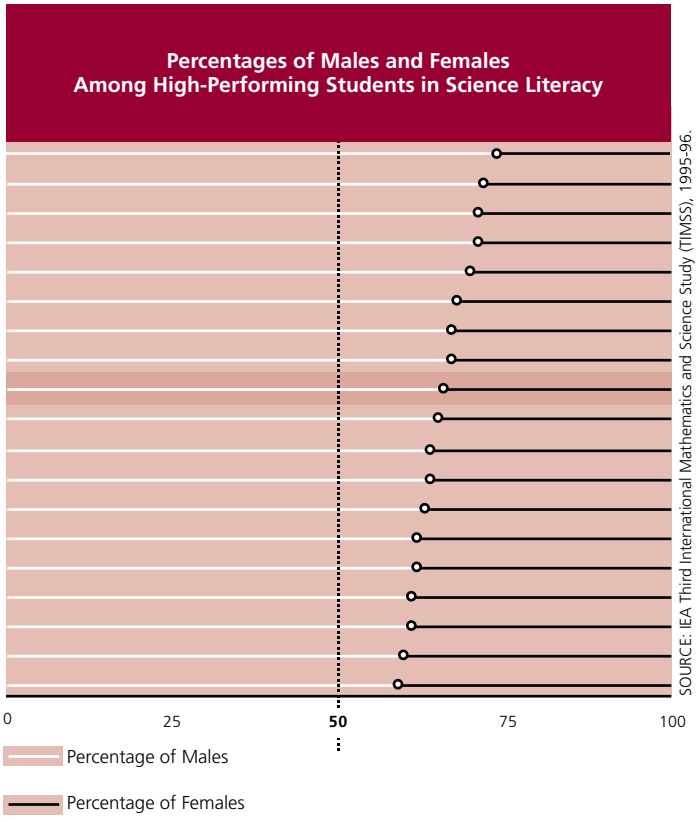
* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

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

## Exhibit 2.7 Percentages by Gender of High-Performing Students[1] in Science Literacy
### Final Year of Secondary School*

| Country | Males | Females |
|---|---|---|
| Norway | ▲ 74 (2.5) | 26 (2.5) |
| Iceland | ▲ 72 (2.0) | 28 (2.0) |
| Austria | ▲ 71 (3.5) | 29 (3.5) |
| Sweden | ▲ 71 (2.6) | 29 (2.6) |
| Slovenia | ▲ 70 (5.8) | 30 (5.8) |
| France | ▲ 68 (4.1) | 32 (4.1) |
| Czech Republic | ▲ 67 (4.8) | 33 (4.8) |
| Netherlands | ▲ 67 (3.8) | 33 (3.8) |
| International Avg. | ▲ 66 (0.9) | 34 (0.9) |
| Russian Federation | ▲ 65 (2.9) | 35 (2.9) |
| Australia | ▲ 64 (4.4) | 36 (4.4) |
| New Zealand | ▲ 64 (2.5) | 36 (2.5) |
| Hungary | ▲ 63 (2.7) | 37 (2.7) |
| Canada | ▲ 62 (3.4) | 38 (3.4) |
| Switzerland | ▲ 62 (3.8) | 38 (3.8) |
| Cyprus | ▲ 61 (3.5) | 39 (3.5) |
| United States | ▲ 61 (3.1) | 39 (3.1) |
| Germany | 60 (6.0) | 40 (6.0) |
| Lithuania | 59 (4.3) | 41 (4.3) |

▲ = Gender difference statistically significant at .05 level




1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

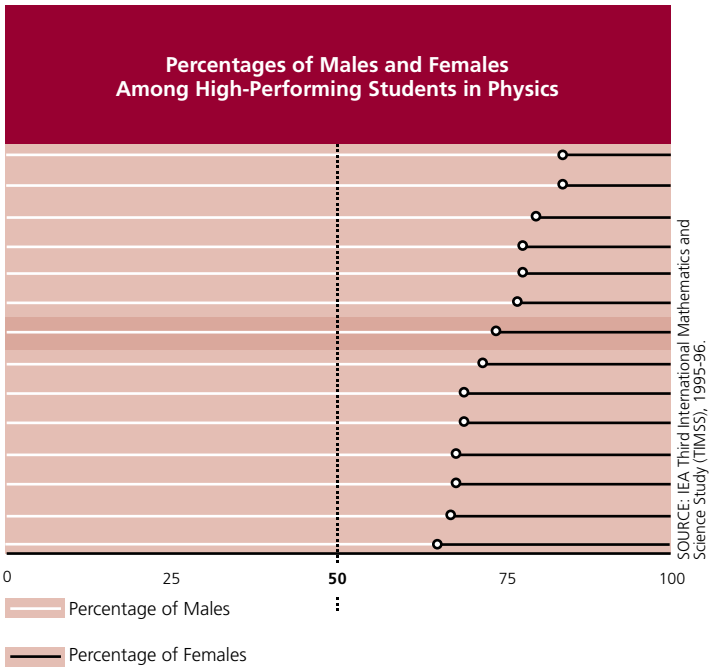
* See Appendix A for characteristics of students sampled.

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

## Exhibit 2.8 Percentages by Gender of High Performing Students[1] in Physics
### Final Year of Secondary School*

| Country | Males | Females |
|---|---|---|
| Czech Republic | ▲ 84 (2.3) | 16 (2.3) |
| Switzerland | ▲ 84 (2.4) | 16 (2.4) |
| Sweden | ▲ 80 (5.6) | 20 (5.6) |
| Austria | ▲ 78 (5.6) | 22 (5.6) |
| Slovenia | ▲ 78 (9.3) | 22 (9.3) |
| Germany | ▲ 77 (7.1) | 23 (7.1) |
| International Avg. | ▲ 74 (1.7) | 26 (1.7) |
| Canada | ▲ 72 (4.5) | 28 (4.5) |
| Norway | ▲ 69 (5.1) | 31 (5.1) |
| Russian Federation | ▲ 69 (6.4) | 31 (6.4) |
| Cyprus | 68 (8.4) | 32 (8.4) |
| United States | ▲ 68 (3.7) | 32 (3.7) |
| Australia | 67 (8.0) | 33 (8.0) |
| France | ▲ 65 (4.6) | 35 (4.6) |

▲ = Gender difference statistically significant at .05 level




1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exploring Gender Differences in the Proportion of High-Performing Students Among Test Takers

For the companion analysis presented in this chapter, the first stage entailed determining for each country, at each grade, the test scores corresponding to the 75th percentile of achievement (e.g., 563 for the United States at the eighth grade) and to the 25th percentile of achievement (e.g., 435 for the United States at the eighth grade). Once these upper and lower-quarter benchmarks were identified, the data within each country were analyzed to determine the percentages of males and females performing above or below each of the upper- and lower-quarter benchmarks.

Exhibit 2.9-2.12

The results of this analysis are presented in Exhibits 2.9 – 2.12. For mathematics, at fourth and eighth grades, only Korea had significant differences in the percentages of males and females scoring above and below their own country-specific benchmarks. At the final year of secondary school, however, a disproportionate percentage of males scored above the upper benchmark in mathematics literacy in 12 out of 18 countries while a disproportionate percentage of females scored below the lower benchmark in 8 out of 18 countries. The results for the advanced mathematics assessment showed a similar pattern with significantly greater percentages of males reaching the upper benchmark in 7 out of 13 countries and significantly greater percentages of females failing to reach the lower benchmark in 8 out of 13 countries.

Exhibit 2.13-2.16

In science, the results presented in Exhibits 2.13 – 2.16 corroborate the patterns observed in previous analyses. At both the fourth and eighth grades, significantly more males than females reached the upper benchmark in about 40% of the participating countries. Conversely, significantly more females than males performed below the lower benchmark in about 18% of the participating countries. By the final year of secondary school, significantly greater percentages of males than females scored above the country's upper benchmark in nearly every participating country for both science literacy and physics.

## Exhibit 2.9 Percentages of Males and Females at Upper and Lower Mathematics Benchmarks[2] - Fourth Grade*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 24 (1.5) | 26 (1.3) | 25 (1.7) | 25 (1.7) |
| Austria | 23 (1.6) | 27 (1.9) | 27 (1.9) | 23 (1.9) |
| Canada | 24 (2.0) | 26 (1.9) | 26 (2.1) | 24 (1.7) |
| Cyprus | 23 (1.7) | 28 (1.9) | 25 (1.8) | 25 (1.6) |
| Czech Rep. | 25 (1.8) | 25 (1.7) | 26 (1.5) | 24 (1.5) |
| England | 23 (1.9) | 27 (1.6) | 26 (1.6) | 24 (1.6) |
| Hong Kong | 24 (2.2) | 26 (2.3) | 25 (2.0) | 25 (1.9) |
| Hungary | 24 (1.8) | 27 (2.0) | 25 (1.9) | 24 (1.6) |
| Iceland | 25 (1.8) | 25 (2.3) | 25 (1.8) | 25 (1.7) |
| Iran, Islamic Rep. | 22 (2.7) | 28 (3.2) | 27 (2.5) | 23 (2.7) |
| Ireland | 25 (2.0) | 25 (1.7) | 24 (2.1) | 26 (1.9) |
| Japan | 22 (1.3) | 28 (1.5) | 26 (1.2) | 24 (1.2) |
| Korea | 22 (1.6) | 28 (1.5) | 28 (1.5) | 22 (1.4) |
| Latvia (LSS) | 27 (2.6) | 23 (2.3) | 23 (2.2) | 27 (1.9) |
| Netherlands | 22 (1.8) | 28 (2.1) | 28 (1.9) | 22 (2.1) |
| New Zealand | 25 (2.0) | 25 (2.0) | 22 (1.9) | 28 (2.7) |
| Norway | 23 (1.9) | 27 (1.9) | 25 (1.9) | 25 (1.9) |
| Portugal | 24 (1.6) | 26 (1.7) | 25 (1.8) | 25 (2.0) |
| Scotland | 25 (1.8) | 25 (1.8) | 24 (1.7) | 26 (1.9) |
| Singapore | 26 (2.7) | 24 (2.0) | 23 (1.7) | 26 (1.7) |
| Slovenia | 25 (1.8) | 25 (1.7) | 25 (2.2) | 25 (1.7) |
| United States | 24 (1.6) | 26 (1.3) | 25 (1.3) | 25 (1.3) |
| International Avg. | 24 (0.4) | ▲ 26 (0.4) | 25 (0.4) | 25 (0.4) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 2.10 Percentages of Males and Females at Upper and Lower Mathematics Benchmarks[2] - Eighth Grade*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 25 (1.7) | 25 (2.0) | 23 (1.7) | 27 (1.7) |
| Austria | 23 (1.7) | 27 (1.6) | 25 (2.0) | 25 (1.6) |
| Belgium (FL) | 25 (2.3) | 25 (2.5) | 24 (4.3) | 26 (3.6) |
| Belgium (FR) | 24 (1.8) | 26 (2.2) | 25 (1.8) | 25 (2.3) |
| Canada | 25 (1.5) | 26 (1.5) | 24 (1.2) | 26 (1.6) |
| Columbia | 23 (2.4) | 27 (3.6) | 26 (2.1) | 25 (4.0) |
| Cyprus | 25 (1.3) | 25 (1.3) | 23 (1.5) | 26 (1.4) |
| Czech Rep. | 22 (2.6) | 28 (2.2) | 27 (2.3) | 23 (1.6) |
| England | 22 (1.5) | 27 (2.4) | 24 (2.0) | 26 (2.0) |
| France | 25 (2.1) | 26 (1.6) | 27 (1.8) | 23 (1.6) |
| Germany | 25 (2.2) | 26 (2.3) | 24 (2.2) | 25 (2.2) |
| Hong Kong | 21 (2.4) | 29 (2.6) | 29 (3.3) | 22 (2.8) |
| Hungary | 25 (1.7) | 25 (1.4) | 25 (1.6) | 25 (1.8) |
| Iceland | 23 (2.9) | 27 (3.0) | 23 (2.3) | 27 (3.3) |
| Iran, Islamic Rep. | 21 (1.9) | 28 (1.9) | 29 (2.6) | 22 (1.8) |
| Ireland | 22 (2.4) | 29 (2.6) | 27 (2.4) | 23 (2.8) |
| Japan | 22 (1.0) | ▲ 28 (1.0) | 26 (1.0) | 25 (1.0) |
| Korea | 22 (1.3) | 28 (1.5) | 28 (1.4) | 22 (1.3) |
| Latvia (LSS) | 23 (1.7) | 27 (1.9) | 26 (1.7) | 24 (2.0) |
| Lithuania | 25 (2.0) | 25 (1.7) | 25 (2.0) | 25 (2.1) |
| Netherlands | 23 (2.8) | 27 (2.9) | 27 (3.2) | 24 (3.1) |
| New Zealand | 23 (2.2) | 27 (2.6) | 26 (2.0) | 24 (2.0) |
| Norway | 24 (1.3) | 26 (1.5) | 24 (1.4) | 26 (1.3) |
| Portugal | 23 (1.8) | 27 (1.8) | 27 (1.6) | 23 (1.7) |
| Romania | 24 (1.7) | 26 (2.1) | 25 (1.7) | 26 (2.0) |
| Russian Federation | 25 (2.2) | 26 (2.2) | 23 (2.0) | 27 (2.6) |
| Scotland | 22 (2.3) | 28 (3.2) | 28 (2.3) | 23 (2.0) |
| Singapore | 25 (2.4) | 25 (2.5) | 25 (2.3) | 25 (2.7) |
| Slovak Rep. | 24 (1.6) | 27 (1.7) | 25 (1.5) | 25 (1.6) |
| Slovenia | 24 (1.4) | 26 (1.8) | 27 (1.6) | 23 (1.5) |
| Spain | 23 (1.5) | 27 (1.6) | 27 (1.5) | 23 (1.3) |
| Sweden | 26 (1.7) | 25 (1.5) | 26 (1.4) | 24 (1.6) |
| Switzerland | 23 (1.3) | 27 (1.5) | 26 (1.5) | 25 (1.7) |
| United States | 23 (2.0) | 27 (2.0) | 25 (1.7) | 25 (1.9) |
| International Avg. | 24 (0.3) | ▲ 26 (0.4) | 26 (0.3) | 25 (0.4) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 2.11 Percentages of Males and Females at Upper and Lower Mathematics Literacy Benchmarks[2] - Final Year of Secondary School*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 19 (2.7) | ▲ 34 (4.8) | 28 (3.8) | 21 (4.1) |
| Austria | 18 (2.1) | ▲ 38 (3.7) | ▲ 30 (3.1) | 16 (2.5) |
| Canada | 19 (2.1) | ▲ 32 (1.7) | ▲ 30 (2.0) | 19 (2.0) |
| Cyprus | 21 (1.7) | 30 (3.2) | 27 (2.9) | 23 (3.2) |
| Czech Rep. | 18 (4.6) | 32 (5.0) | 33 (7.4) | 18 (2.9) |
| France | 18 (2.5) | ▲ 34 (3.5) | ▲ 31 (3.2) | 18 (2.2) |
| Germany | 20 (2.6) | 30 (3.4) | 30 (4.1) | 21 (3.3) |
| Hungary | 23 (1.7) | 27 (2.1) | 23 (2.3) | 27 (1.7) |
| Iceland | 17 (1.4) | ▲ 34 (1.5) | ▲ 31 (1.5) | 17 (1.7) |
| Lithuania | 23 (2.9) | 29 (3.6) | 29 (3.4) | 17 (2.7) |
| Netherlands | 17 (2.1) | ▲ 33 (2.8) | ▲ 37 (3.1) | 14 (2.2) |
| New Zealand | 20 (2.4) | ▲ 30 (2.3) | 28 (2.7) | 22 (2.3) |
| Norway | 15 (1.8) | ▲ 35 (2.0) | ▲ 33 (2.3) | 17 (1.8) |
| Russian Federation | 21 (2.7) | ▲ 32 (3.5) | ▲ 28 (2.6) | 20 (2.0) |
| Slovenia | 15 (3.4) | ▲ 35 (5.4) | 32 (4.0) | 17 (5.6) |
| Sweden | 16 (1.2) | ▲ 34 (2.4) | ▲ 30 (1.9) | 20 (1.9) |
| Switzerland | 18 (2.0) | ▲ 30 (2.4) | 31 (3.7) | 20 (3.6) |
| United States | 23 (1.6) | 28 (1.9) | 25 (1.6) | 25 (1.7) |
| International Avg. | 22 (0.5) | ▲ 35 (0.7) | ▲ 29 (0.7) | 19 (0.6) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 2.12 Percentages of Males and Females at Upper and Lower Advanced Mathematics Benchmarks[2] - Final Year of Secondary School*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 23 (6.2) | 27 (3.8) | 28 (5.7) | 23 (4.3) |
| Austria | 14 (3.1) | ▲ 43 (4.3) | ▲ 36 (4.3) | 7 (2.5) |
| Canada | 17 (2.6) | ▲ 32 (3.1) | ▲ 30 (2.1) | 20 (2.0) |
| Cyprus | 20 (3.2) | 28 (2.9) | 29 (3.5) | 23 (2.2) |
| Czech Rep. | 12 (2.4) | ▲ 44 (4.5) | ▲ 36 (3.9) | 9 (2.5) |
| France | 18 (3.2) | 30 (3.2) | 31 (3.6) | 20 (2.4) |
| Germany | 20 (3.2) | ▲ 33 (3.2) | ▲ 29 (2.7) | 18 (2.6) |
| Lithuania | 15 (2.6) | ▲ 35 (2.0) | ▲ 36 (2.8) | 14 (2.1) |
| Russian Federation | 16 (2.7) | ▲ 33 (3.8) | ▲ 32 (3.9) | 19 (2.8) |
| Slovenia | 21 (3.7) | 29 (5.6) | 27 (4.9) | 23 (3.6) |
| Sweden | 18 (3.2) | 28 (2.7) | 29 (3.1) | 23 (2.7) |
| Switzerland | 13 (2.0) | ▲ 36 (2.1) | ▲ 33 (2.9) | 18 (1.8) |
| United States | 22 (2.7) | 28 (3.1) | ▲ 33 (2.7) | 18 (2.6) |
| International Avg. | 18 (0.8) | ▲ 32 (0.9) | ▲ 31 (0.9) | 19 (0.7) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 2.13 Percentages of Males and Females at Upper and Lower Science Benchmarks[2]
### Fourth Grade*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 21 (1.2) | ▲ 29 (1.4) | 26 (1.7) | 24 (1.4) |
| Austria | 21 (1.8) | 29 (2.0) | 28 (2.0) | 23 (1.9) |
| Canada | 23 (1.7) | 27 (1.8) | 26 (1.7) | 24 (1.7) |
| Cyprus | 22 (1.6) | ▲ 28 (1.8) | 27 (1.6) | 23 (2.0) |
| Czech Rep. | 21 (1.7) | ▲ 29 (1.9) | ▲ 29 (1.8) | 21 (1.5) |
| England | 23 (1.5) | 28 (1.8) | 24 (1.5) | 26 (1.7) |
| Hong Kong | 21 (1.8) | ▲ 29 (1.9) | 28 (2.3) | 22 (1.9) |
| Hungary | 21 (1.5) | ▲ 29 (1.9) | 27 (1.9) | 22 (1.7) |
| Iceland | 21 (1.5) | 29 (2.0) | 27 (2.0) | 23 (2.2) |
| Iran, Islamic Rep. | 23 (2.6) | 27 (3.0) | 26 (2.3) | 24 (2.4) |
| Ireland | 24 (1.9) | 27 (1.6) | 26 (2.0) | 24 (1.7) |
| Japan | 21 (1.1) | ▲ 29 (1.3) | ▲ 28 (1.2) | 22 (1.1) |
| Korea | 20 (1.8) | ▲ 30 (1.7) | ▲ 28 (1.5) | 22 (1.3) |
| Latvia (LSS) | 25 (2.9) | 25 (2.2) | 24 (2.1) | 26 (2.0) |
| Netherlands | 18 (2.1) | ▲ 33 (2.0) | ▲ 31 (2.3) | 19 (2.3) |
| New Zealand | 24 (1.8) | 26 (2.1) | 22 (2.1) | 28 (2.4) |
| Norway | 21 (2.1) | 28 (1.9) | 26 (1.9) | 24 (1.9) |
| Portugal | 23 (1.8) | 27 (1.8) | 25 (1.9) | 25 (2.0) |
| Scotland | 23 (1.9) | 27 (1.7) | 25 (1.8) | 25 (1.9) |
| Singapore | 23 (2.8) | 27 (2.3) | 25 (2.0) | 25 (1.6) |
| Slovenia | 23 (1.7) | 27 (1.8) | 25 (2.2) | 25 (1.9) |
| United States | 22 (1.4) | ▲ 28 (1.4) | 27 (1.5) | 23 (1.3) |
| International Avg. | 23 (0.4) | ▲ 28 (0.4) | ▲ 26 (0.4) | 24 (0.4) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* Fourth Grade in most countries; see Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 2.14 Percentages of Males and Females at Upper and Lower Science Benchmarks[2]

### Eighth Grade*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 22 (1.4) | 28 (1.9) | 26 (1.5) | 25 (1.7) |
| Austria | 22 (1.6) | 28 (1.6) | 28 (2.1) | 22 (1.7) |
| Belgium (FL) | 21 (2.4) | 29 (2.0) | 27 (2.4) | 23 (3.1) |
| Belgium (FR) | 22 (1.8) | 29 (2.4) | 26 (2.1) | 23 (2.2) |
| Canada | 23 (1.3) | 28 (1.4) | 26 (1.7) | 24 (1.4) |
| Columbia | 22 (2.9) | 29 (2.7) | 28 (2.1) | 22 (3.8) |
| Cyprus | 24 (1.2) | 26 (1.3) | 23 (1.2) | 27 (1.3) |
| Czech Rep. | 20 (2.4) | ▲ 30 (2.1) | 29 (2.6) | 21 (1.9) |
| England | 21 (1.8) | 28 (2.2) | 27 (1.9) | 23 (1.9) |
| France | 22 (1.8) | ▲ 29 (1.5) | 28 (1.7) | 22 (1.6) |
| Germany | 23 (1.7) | 28 (2.2) | 26 (2.2) | 23 (2.1) |
| Hong Kong | 19 (1.7) | ▲ 30 (2.1) | ▲ 30 (2.3) | 20 (2.2) |
| Hungary | 21 (1.5) | 29 (1.7) | 28 (1.8) | 22 (1.4) |
| Iceland | 20 (2.5) | 29 (2.9) | 26 (3.0) | 24 (2.6) |
| Iran, Islamic Rep. | 20 (1.8) | 29 (2.4) | 29 (1.9) | 22 (1.8) |
| Ireland | 22 (2.1) | 28 (2.2) | 27 (2.1) | 23 (2.7) |
| Japan | 21 (1.1) | ▲ 28 (1.4) | ▲ 27 (1.1) | 23 (0.9) |
| Korea | 20 (1.0) | ▲ 29 (1.3) | ▲ 30 (1.4) | 21 (1.2) |
| Latvia (LSS) | 21 (1.5) | ▲ 29 (1.7) | 28 (1.8) | 22 (1.6) |
| Lithuania | 22 (1.9) | 29 (1.9) | 28 (2.1) | 22 (2.1) |
| Netherlands | 20 (2.6) | 30 (2.5) | 29 (2.5) | 21 (3.0) |
| New Zealand | 20 (1.9) | ▲ 30 (2.1) | 28 (2.1) | 22 (1.9) |
| Norway | 21 (1.2) | ▲ 29 (1.5) | 26 (1.1) | 24 (1.3) |
| Portugal | 20 (1.4) | ▲ 30 (1.6) | ▲ 30 (1.3) | 20 (1.4) |
| Romania | 23 (2.1) | 27 (2.4) | 27 (2.0) | 23 (1.8) |
| Russian Federation | 23 (1.4) | 28 (2.1) | 26 (2.1) | 24 (2.0) |
| Scotland | 20 (1.9) | ▲ 30 (2.9) | 28 (1.9) | 22 (1.8) |
| Singapore | 23 (2.7) | 27 (3.0) | 27 (2.5) | 23 (2.1) |
| Slovak Rep. | 22 (2.1) | 29 (2.0) | 28 (1.7) | 22 (1.7) |
| Slovenia | 20 (1.6) | ▲ 30 (1.9) | ▲ 29 (1.6) | 21 (1.3) |
| Spain | 21 (1.3) | ▲ 29 (1.2) | ▲ 29 (1.3) | 21 (1.3) |
| Sweden | 22 (1.2) | ▲ 28 (1.6) | 27 (1.8) | 23 (1.7) |
| Switzerland | 21 (1.3) | ▲ 29 (1.6) | 27 (1.6) | 23 (1.5) |
| United States | 22 (1.8) | 28 (1.7) | 26 (1.9) | 24 (1.8) |
| International Avg. | 22 (0.3) | ▲ 28 (0.3) | ▲ 27 (0.3) | 23 (0.3) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* Eighth Grade in most countries; see Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 2.15 Percentages of Males and Females at Upper and Lower Science Literacy Benchmarks[2]

### Final Year of Secondary School*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 19 (3.2) | ▲ 34 (4.0) | 28 (4.1) | 21 (5.2) |
| Austria | 16 (2.0) | ▲ 40 (3.4) | 30 (3.3) | 16 (3.1) |
| Canada | 19 (1.7) | ▲ 32 (2.0) | ▲ 30 (2.5) | 19 (1.8) |
| Cyprus | 20 (1.9) | ▲ 31 (2.5) | 27 (2.6) | 22 (2.9) |
| Czech Rep. | 16 (2.8) | ▲ 33 (4.5) | ▲ 35 (5.7) | 16 (2.1) |
| France | 16 (2.6) | ▲ 35 (4.0) | ▲ 32 (3.1) | 18 (2.6) |
| Germany | 20 (3.0) | 30 (3.7) | 31 (4.5) | 19 (3.7) |
| Hungary | 18 (1.6) | ▲ 31 (1.8) | 29 (2.2) | 21 (1.6) |
| Iceland | 15 (1.2) | ▲ 37 (2.0) | ▲ 31 (1.5) | 17 (1.5) |
| Lithuania | 22 (2.9) | 31 (3.5) | ▲ 30 (3.4) | 16 (2.8) |
| Netherlands | 17 (2.9) | ▲ 33 (2.7) | ▲ 37 (3.4) | 14 (2.0) |
| New Zealand | 18 (1.7) | ▲ 32 (2.2) | 28 (2.6) | 22 (3.6) |
| Norway | 13 (1.7) | ▲ 37 (1.9) | ▲ 35 (2.3) | 15 (2.0) |
| Russian Federation | 19 (2.6) | ▲ 35 (3.6) | ▲ 32 (2.6) | 14 (1.7) |
| Slovenia | 15 (3.3) | ▲ 35 (5.4) | 32 (3.7) | 17 (4.9) |
| Sweden | 15 (1.2) | ▲ 36 (2.6) | ▲ 32 (1.8) | 18 (2.0) |
| Switzerland | 18 (2.5) | ▲ 30 (2.6) | ▲ 33 (3.3) | 19 (2.6) |
| United States | 20 (1.9) | ▲ 30 (2.1) | 28 (1.8) | 22 (1.5) |
| International Avg. | 21 (0.5) | ▲ 36 (0.7) | ▲ 30 (0.7) | 17 (0.6) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 2.16 Percentages of Males and Females at Upper and Lower Physics Benchmarks[2]

### Final Year of Secondary School*

| Country | Upper Quarter | | Lower Quarter | |
|---|---|---|---|---|
| | Percentage of Females At or Above Country's Upper Benchmark | Percentage of Males At or Above Country's Upper Benchmark | Percentage of Females At or Below Country's Lower Benchmark | Percentage of Males At or Below Country's Lower Benchmark |
| Australia | 15 (3.4) | 30 (4.3) | 36 (5.6) | 20 (2.9) |
| Austria | 13 (3.6) | ▲ 46 (4.4) | ▲ 34 (4.1) | 9 (2.5) |
| Canada | 13 (2.3) | ▲ 34 (2.3) | 33 (4.7) | 19 (3.6) |
| Cyprus | 15 (3.3) | 32 (3.9) | 31 (4.2) | 21 (3.1) |
| Czech Rep. | 10 (1.6) | ▲ 50 (4.4) | ▲ 36 (2.7) | 7 (1.6) |
| France | 17 (3.2) | ▲ 31 (2.3) | 33 (4.2) | 19 (3.0) |
| Germany | 10 (2.6) | ▲ 32 (4.6) | ▲ 39 (5.7) | 19 (5.9) |
| Norway | 13 (2.4) | ▲ 29 (2.7) | ▲ 39 (5.2) | 20 (2.3) |
| Russian Federation | 15 (4.0) | ▲ 33 (4.2) | ▲ 38 (5.4) | 17 (2.6) |
| Slovenia | 9 (5.0) | 31 (7.8) | ▲ 50 (8.4) | 16 (3.6) |
| Sweden | 9 (2.6) | ▲ 33 (2.7) | 34 (3.4) | 21 (2.5) |
| Switzerland | 8 (1.1) | ▲ 42 (2.8) | ▲ 40 (2.9) | 11 (2.1) |
| United States | 16 (2.1) | ▲ 34 (3.0) | ▲ 33 (2.4) | 17 (2.3) |
| International Avg. | 13 (0.9) | ▲ 34 (1.0) | ▲ 36 (1.3) | 18 (0.8) |

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-1995.

▲ = Gender difference statistically significant at .05 level

2 The upper benchmark is defined as the country's 75th percentile. The lower benchmark is defined as the country's 25th percentile.

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Summary

The analysis of the gender composition of top-quarter students in each country showed that for mathematics, the over-representation of males among high-performing students increased most notably between the eighth grade and the final year of secondary school. In contrast for science, a number of countries had significantly more males than females among high-performing students in the earlier grades. By the final year of secondary school, most countries had a significantly greater percentage of males than females among high-performing students in both mathematics and science.

As would be anticipated, similar results were found based on an analysis comparing the percentages of males and females reaching the 75th and 25th percentile benchmarks (upper and lower quarters) in each country. For mathematics at the fourth and eighth grades, roughly equal proportions of females and males performed at the top and bottom quarters within each of the TIMSS countries. This pattern indicates that any given student scoring at or above the top quartile for the country was just as likely to be a female as male. By the final year of secondary school, however, a different pattern emerged and there were significantly greater percentages of males than females performing at or above the upper benchmarks in both mathematics and science. For most of the TIMSS countries in both mathematics and science, a disproportionate number of males had achievement at or above the top quartile while a disproportionate number of females had achievement at or below the bottom quartile.

# 3

# Examining Item Content and Type by Gender

## Overview

Chapter 3 takes a closer look at gender differences in mathematics and science achievement by focusing on performance at the item level. In the first part of this chapter, several examples of items on which there were substantial gaps in performance by gender are presented and the characteristics of these items are discussed. The next section of this chapter presents the results of an analysis of the small set of items given as part of both the fourth and eighth grade assessments and of the items common to both the eighth grade and literacy assessments. In the final two sections of this chapter, gender differences in performance are examined according to item content and format.

## Using a Measure of Gender Difference

To estimate the extent of gender differences in performance on individual items in both mathematics and science, TIMSS employed an index known as the Gender Difference Index (GDI). Essentially based on standardizing the differences in the percentages of males and females correctly answering each item (see Appendix A for details), the GDI was used to conduct item-by-item analyses across the TIMSS countries at the fourth and eighth grades and the final year of secondary school. Based on these analyses, an average GDI internationally was determined for each item at each grade.

For each of the mathematics and science assessments at each of the grades, the international averages from the GDI analyses were used to classify items into three categories: 1) items on which males did particularly well compared to females (male higher-performing items), 2) items on which females did particularly well compared to males (female higher-performing items), and 3) items on which neither gender exhibited consistently higher performance (neutral items). Across the assessments, the male higher-performing items and female higher-performing items with the largest GDIs (approximately a dozen or so) were given to panels of mathematics and science education experts for review (see Appendix C for a complete listing of these items). The panelists discussed student performance on the sets of items with the largest GDIs in terms of the demands required, including content knowledge, cognitive demand, and format.

Exhibit 3.1-3.2

Exhibits 3.1 and 3.2 contain a summary of the results from the GDI analysis for mathematics and science, respectively. As would be expected given the findings presented in the previous chapters, the results show the male edge in achievement increasing at higher grade levels and that the gender differences in achievement were more pronounced for science than for mathematics.

In mathematics at the fourth grade, performance differences were relatively equivalent among the items. On average internationally, males outperformed females on 33% of the items, females outperformed males on 26% of the items, and the remaining items were "neutral" with males and females performing similarly. By the final year of secondary school, males outperformed females on more than four-fifths (87%) of the mathematics literacy items and on three-fourths (76%) of the items in advanced mathematics. Females did not outperform males on any items in either part of the mathematics assessment at the final year of secondary school.

In science, fourth-grade males outperformed females on 44% of the items and eighth-grade males outperformed their female classmates on 67% of the items. At the final year of secondary school, males outperformed females on 74% of the items in both the science literacy and physics components of the testing. In contrast, females outperformed males on 26% of the items at fourth grade, on 17% of the items at eighth grade, and on 5% and 1% of the items, respectively, on the science literacy and physics assessments given at the secondary level.

## Exhibit 3.1 Summary of International Gender Difference Index (GDI) for Mathematics

| Test | Number and Percentage of Test Items | | | Total Number of Items |
|---|---|---|---|---|
| | Male Higher-Performance Items | Female Higher-Performance Items | Neutral Items | |
| Fourth Grade Mathematics Test | 35 (33%) | 28 (26%) | 44 (41%) | 107 |
| Eighth Grade Mathematics Test | 68 (44%) | 43 (28%) | 44 (28%) | 155 |
| Final Year of Secondary School Mathematics Literacy Test | 33 (87%) | 0 (0%) | 5 (13%) | 38 |
| Final Year of Secondary School Advanced Mathematics Test | 52 (76%) | 0 (0%) | 16 (24%) | 68 |

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

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

## Exhibit 3.2 Summary of International Gender Difference Index (GDI) for Science

| Test | Number and Percentage of Test Items | | | Total Number of Items |
|---|---|---|---|---|
| | Male Higher-Performance Items | Female Higher-Performance Items | Neutral Items | |
| Fourth Grade Science Test | 43 (44%) | 26 (27%) | 29 (30%) | 98 |
| Eighth Grade Science Test | 92 (67%) | 17 (12%) | 29 (21%) | 138 |
| Final Year of Secondary School Science Literacy Test | 20 (74%) | 5 (19%) | 2 (7%) | 27 |
| Final Year of Secondary School Physics Test | 48 (74%) | 1 (2%) | 16 (25%) | 65 |

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

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

## Characteristics of Mathematics Items with Large Gender Differences Internationally

Scrutiny of the mathematics items with the largest GDIs favoring males internationally, revealed that a number of these two dozen items at fourth and eighth grades involved employing specific problem solving techniques and strategies (see Appendix C for a complete listing of the items with the largest GDIs). Examples 1 and 2 (see Exhibits 3.3 and 3.4) show the types of word problems that frequently seemed to be solved more successfully by males than by females. Both items were set in contextual formats (taking a walk or running laps) and required students to use a specific approach or strategy to solve the problem.

Exhibit 3.3-3.4

In contrast, about half of the items where fourth- and eighth-grade females generally outperformed males involved computation with common algorithms or solving problems using standard routine mathematics. As typified by Example 3 involving subtraction with decimals (see Exhibit 3.5), these items usually involved arithmetic computations with whole numbers, decimals, or fractions. Consistent with the results for the different content areas within mathematics (see Chapter 1), some of the items where females outperformed males internationally contained algebraic concepts (see Exhibit 3.6 involving a linear expression based on a word problem).

Exhibit 3.5

Exhibit 3.6

For the assessments given in secondary school, there were no mathematics items where the international gender difference indices favored females. The review of the 12 mathematics literacy items with the largest differences favoring males internationally revealed that these involved percentages, spatial reasoning, reading maps and diagrams, and calculating area. To illustrate, the item shown as Example 5 (Exhibit 3.7) required students to interpret information from a graph, use reasoning skills, and make a judgment based on previous knowledge. Example 6 about the rate of filling a water tank (Exhibit 3.8) involved proportional reasoning and understanding time.

Exhibit 3.7-3.8

The items from the advanced mathematics assessment with the largest male GDIs had characteristics similar to those in the literacy assessment. The panel noted that, in general, the advanced mathematics items with the largest male advantage internationally required understanding of probability, proportionality, spatial reasoning, and problem-solving concepts. Most of these items (10 out 14) were open-ended. One of these items, which required application of the Pythagorean theorem based on a diagram, is shown as Example 7 (see Exhibit 3.9). The TIMSS findings on such items may have been anticipated, since these results are consistent with a body of research connecting a male advantage in spatial reasoning to higher achievement in mathematics.[6]

Exhibit 3.9

[6] Tartre, L.A. (1990). "Spatial Skills, Gender, and Mathematics" in E. Fennema and G.C. Leder (Eds.), *Mathematics and Gender.* New York: Teachers College Press.

## Exhibit 3.3 Example 1 - Male Higher-Performance Item - Mathematics
### Fourth Grade*

| Country | Percent Correct | | Example 1 |
|---|---|---|---|
| | Males | Females | |
| Australia | 65 (2.9) | 58 (2.8) | Mr. Brown goes for a walk and returns to where he started at 07:00. If his walk took 1 hour and 30 minutes, at what time did he start his walk?<br><br>Answer: 5:30 |
| Austria | 70 (2.8) | 60 (3.1) | |
| Canada | 48 (3.2) | 42 (2.2) | |
| Cyprus | ▲ 50 (3.2) | 30 (2.5) | |
| Czech Republic | 67 (2.6) | 61 (2.5) | |
| England | 53 (2.6) | 45 (2.9) | |
| Hong Kong | 36 (3.1) | 28 (2.4) | |
| Hungary | 58 (2.9) | 48 (2.9) | |
| Iceland | 43 (3.0) | 44 (3.9) | |
| Iran, Islamic Rep. | 12 (1.9) | 5 (1.5) | |
| Ireland | ▲ 64 (2.9) | 50 (3.2) | |
| Japan | ▲ 65 (2.0) | 55 (2.0) | |
| Korea | 78 (2.5) | 69 (2.8) | |
| Latvia (LSS) | ▲ 67 (3.2) | 52 (3.6) | |
| Netherlands | ▲ 79 (2.1) | 64 (3.6) | |
| New Zealand | 46 (3.5) | 45 (3.5) | |
| Norway | 62 (3.0) | 56 (3.5) | |
| Portugal | 19 (2.0) | 13 (2.2) | |
| Scotland | 57 (3.1) | 50 (2.7) | |
| Singapore | 55 (2.2) | 46 (2.9) | |
| Slovenia | 64 (2.8) | 54 (3.3) | |
| United States | 54 (2.3) | 44 (2.3) | |
| International Avg. | ▲ 55 (0.6) | 46 (0.6) | |

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

▲ = Gender difference statistically significant at .05 level

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.4 Example 2 - Male Higher-Performance Item - Mathematics
### Eighth Grade*

| Country | Percent Correct | | Example 2 |
|---|---|---|---|
| | Males | Females | |
| Australia | 67 (3.3) | 63 (2.6) | Luis exercises by running 5 km each day. The course he runs is $\frac{1}{4}$ km long. How many times through the course does he run each day? |
| Austria | 72 (3.5) | 63 (3.8) | |
| Belgium (Fl) | 76 (5.1) | 73 (4.6) | |
| Belgium (Fr) | 70 (6.3) | 63 (5.1) | |
| Bulgaria | 41 (4.8) | 46 (5.5) | |
| Canada | 62 (3.7) | 49 (3.6) | |
| Colombia | 21 (3.4) | 10 (2.5) | Answer: 20 |
| Cyprus | 45 (5.1) | 30 (3.4) | |
| Czech Republic | 60 (4.5) | 54 (3.3) | |
| England | 55 (5.9) | 50 (5.0) | |
| France | 59 (4.4) | 44 (3.8) | |
| Germany | 67 (4.3) | 49 (5.0) | |
| Hong Kong | 78 (3.3) | 60 (4.5) | |
| Hungary | ▲ 60 (3.4) | 42 (4.3) | |
| Iceland | 54 (6.3) | 41 (7.3) | |
| Iran, Islamic Rep. | 26 (3.2) | 17 (2.7) | |
| Ireland | 76 (3.7) | 64 (3.6) | |
| Japan | 57 (2.8) | 52 (2.9) | |
| Korea | 65 (4.5) | 47 (3.8) | |
| Latvia (LSS) | 47 (4.3) | 38 (4.2) | |
| Lithuania | 40 (4.8) | 26 (3.9) | |
| Netherlands | 84 (4.7) | 66 (4.5) | |
| New Zealand | 66 (3.6) | 53 (3.7) | |
| Norway | 56 (3.5) | 40 (4.3) | |
| Portugal | 30 (3.3) | 22 (3.6) | |
| Romania | 42 (3.8) | 41 (3.7) | |
| Russian Federation | 46 (4.3) | 48 (3.6) | |
| Scotland | 68 (3.9) | 55 (4.7) | |
| Singapore | 84 (2.4) | 84 (2.2) | |
| Slovak Republic | 55 (4.9) | 48 (3.8) | |
| Slovenia | ▲ 60 (3.9) | 41 (4.1) | |
| Spain | 45 (3.6) | 36 (3.6) | |
| Sweden | 52 (3.1) | 54 (3.6) | |
| Switzerland | 77 (3.6) | 68 (3.3) | |
| United States | 58 (3.3) | 42 (4.3) | |
| International Avg. | ▲ 58 (0.7) | 48 (0.7) | |

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

▲ = Gender difference statistically significant at .05 level

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.5 Example 3 - Female Higher-Performance Item - Mathematics
### Eighth Grade*

| Country | Percent Correct | | Example 3 |
|---|---|---|---|
| | Males | Females | |
| Australia | 60 (2.4) | ▲ 75 (2.3) | Subtract: 2.201 - 0.753 = |
| Austria | 81 (3.5) | 85 (2.9) | |
| Belgium (Fl) | 72 (3.5) | ▲ 91 (2.1) | Ⓐ 1.448 |
| Belgium (Fr) | 71 (4.4) | 84 (3.3) | B. 1.458 |
| Bulgaria | 67 (4.4) | 71 (3.7) | |
| Canada | 75 (2.7) | 87 (2.6) | C. 1.548 |
| Colombia | 47 (5.8) | 63 (4.1) | |
| Cyprus | 58 (4.3) | 70 (3.3) | D. 1.558 |
| Czech Republic | 90 (2.5) | 90 (2.7) | |
| England | 49 (4.6) | 57 (4.9) | |
| France | 87 (3.0) | 90 (2.3) | |
| Germany | 69 (3.9) | 74 (3.7) | |
| Hong Kong | 83 (3.0) | 88 (3.1) | |
| Hungary | 84 (3.1) | 95 (1.7) | |
| Iceland | 74 (6.7) | 77 (3.8) | |
| Iran, Islamic Rep. | 61 (4.8) | 65 (4.9) | |
| Ireland | 79 (3.5) | 91 (2.1) | |
| Japan | 82 (2.4) | 87 (1.7) | |
| Korea | 84 (2.4) | 88 (2.3) | |
| Latvia (LSS) | 68 (4.2) | 78 (3.5) | |
| Lithuania | 79 (3.9) | 88 (3.1) | |
| Netherlands | 59 (5.9) | 59 (4.9) | |
| New Zealand | 50 (3.8) | 55 (3.3) | |
| Norway | 68 (3.2) | ▲ 83 (2.7) | |
| Portugal | 71 (3.2) | 77 (3.3) | |
| Romania | 67 (3.7) | 67 (3.5) | |
| Russian Federation | 85 (2.8) | 90 (2.2) | |
| Scotland | 53 (4.6) | 62 (4.7) | |
| Singapore | 85 (2.0) | 91 (1.8) | |
| Slovak Republic | 85 (2.9) | 91 (2.0) | |
| Slovenia | 83 (3.4) | 87 (3.1) | |
| Spain | 82 (2.7) | 90 (2.1) | |
| Sweden | 73 (2.7) | 81 (1.9) | |
| Switzerland | 80 (3.3) | 81 (3.3) | |
| United States | 72 (2.4) | 76 (2.2) | |
| International Avg. | 72 (0.6) | ▲ 80 (0.5) | |

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

▲ = Gender difference statistically significant at .05 level

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.6 Example 4 - Female Higher-Performance Item - Mathematics
### Eighth Grade*

| Country | Percent Correct | |
|---|---|---|
| | Males | Females |
| Australia | 43 (2.9) | 47 (2.8) |
| Austria | 42 (4.3) | 59 (4.2) |
| Belgium (Fl) | 44 (4.4) | 62 (5.6) |
| Belgium (Fr) | 41 (4.8) | 51 (4.1) |
| Bulgaria | 60 (4.9) | 67 (5.0) |
| Canada | 39 (3.5) | 52 (3.8) |
| Colombia | 36 (4.1) | 30 (5.1) |
| Cyprus | 47 (4.0) | 47 (4.2) |
| Czech Republic | 66 (4.4) | 74 (4.3) |
| England | 27 (4.4) | ▲ 49 (4.6) |
| France | 55 (4.0) | 53 (3.7) |
| Germany | 39 (4.0) | 43 (4.4) |
| Hong Kong | 64 (3.9) | 67 (4.6) |
| Hungary | 55 (3.9) | 58 (4.0) |
| Iceland | 8 (2.9) | 20 (6.2) |
| Iran, Islamic Rep. | 32 (6.3) | 45 (4.1) |
| Ireland | 50 (4.1) | 52 (3.6) |
| Japan | 55 (2.9) | 59 (3.1) |
| Korea | 63 (3.8) | 65 (3.9) |
| Latvia (LSS) | 38 (4.5) | 46 (4.5) |
| Lithuania | 49 (5.3) | 43 (4.1) |
| Netherlands | 40 (5.8) | 47 (5.5) |
| New Zealand | 38 (4.0) | 39 (3.7) |
| Norway | 22 (3.0) | 25 (3.1) |
| Portugal | 45 (3.4) | 39 (3.8) |
| Romania | 48 (3.9) | 56 (3.6) |
| Russian Federation | 60 (5.8) | 56 (3.7) |
| Scotland | 34 (4.6) | 38 (3.8) |
| Singapore | 82 (2.6) | 89 (2.0) |
| Slovak Republic | 60 (3.5) | 70 (3.3) |
| Slovenia | 57 (4.2) | 52 (4.0) |
| Spain | 60 (3.3) | 63 (3.6) |
| Sweden | 21 (2.9) | 20 (2.7) |
| Switzerland | 37 (4.3) | 43 (4.0) |
| United States | 46 (2.9) | 52 (3.3) |
| International Avg. | 46 (0.7) | ▲ 51 (0.7) |

**Example 4**

Juan has 5 fewer hats than Maria, and Clarissa has 3 times as many hats as Juan. If Maria has n hats, which of these represents the number of hats that Clarissa has?

A. $5 - 3n$

B. $3n$

C. $n - 5$

D. $3n - 5$

E. $3(n - 5)$

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

▲ = Gender difference statistically significant at .05 level

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

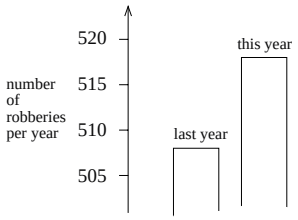
## Exhibit 3.7 Example 5 - Male Higher-Performance Item - Mathematics Literacy
### Final Year of Secondary School*

| Country | Percent Correct | |
|---|---|---|
| | Males | Females |
| Australia | ▲ 37 (5.3) | 19 (2.8) |
| Austria | 26 (4.1) | 15 (2.8) |
| Canada | ▲ 29 (2.8) | 17 (1.5) |
| Cyprus | 6 (3.0) | 5 (1.9) |
| Czech Republic | 7 (1.6) | 4 (1.2) |
| France | ▲ 29 (4.3) | 15 (1.8) |
| Germany | 24 (3.6) | 17 (3.1) |
| Hungary | 5 (0.9) | 3 (0.6) |
| Iceland | 42 (2.6) | 35 (2.4) |
| Italy | 16 (3.1) | 10 (2.2) |
| Lithuania | 4 (1.0) | 1 (0.5) |
| Netherlands | 34 (3.6) | 25 (3.1) |
| New Zealand | 37 (4.9) | 30 (2.7) |
| Norway | ▲ 43 (2.2) | 25 (1.8) |
| Russian Federation | 9 (2.1) | 5 (2.1) |
| Slovenia | ▲ 10 (2.7) | 1 (0.6) |
| Sweden | ▲ 48 (3.5) | 28 (1.8) |
| Switzerland | 26 (2.4) | 20 (2.2) |
| United States | 14 (1.8) | 15 (2.0) |
| International Avg. | ▲ 24 (0.7) | 15 (0.5) |

**Example 5**

A TV reporter showed this graph and said:

"There's been a huge increase in the number of robberies this year."




Do you consider the reporter's statement to be a reasonable interpretation of the graph? Briefly explain.

I don't think it is a reasonable interpretation of the graph because if they were to show the whole graph you would see that there is only a slight increase in robberies.

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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.8 Example 6 - Male Higher-Performance Item - Mathematics Literacy
### Final Year of Secondary School*

| Country | Percent Correct | |
|---|---|---|
| | Males | Females |
| Australia | 76 (2.6) | 68 (2.8) |
| Austria | 78 (3.2) | 74 (2.8) |
| Canada | ▲ 75 (2.2) | 62 (3.1) |
| Cyprus | 42 (5.8) | 46 (4.3) |
| Czech Republic | 59 (3.3) | 49 (8.2) |
| France | 78 (3.1) | 67 (4.1) |
| Germany | ▲ 80 (3.2) | 60 (3.7) |
| Hungary | 56 (2.0) | 55 (2.1) |
| Iceland | ▲ 78 (1.9) | 65 (1.9) |
| Italy | 62 (3.5) | 52 (4.0) |
| Lithuania | 52 (3.5) | 47 (4.3) |
| Netherlands | 85 (2.0) | 76 (2.4) |
| New Zealand | 75 (4.8) | 67 (3.2) |
| Norway | ▲ 78 (1.9) | 66 (2.7) |
| Russian Federation | 57 (3.1) | 46 (3.3) |
| Slovenia | ▲ 79 (4.3) | 58 (4.7) |
| Sweden | ▲ 85 (1.6) | 73 (1.8) |
| Switzerland | 83 (2.1) | 72 (3.8) |
| United States | 62 (2.2) | 59 (2.3) |
| International Avg. | ▲ 71 (0.7) | 61 (0.9) |

**Example 6**

A 45 000-litre water tank is to be filled at the rate of 220 liters per minute.

Estimate, to the nearest half an hour, how long it will take to fill the tank.

A. 4 hours

Ⓑ $3\frac{1}{2}$ hours

C. 3 hours

D. $2\frac{1}{2}$ hours

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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.

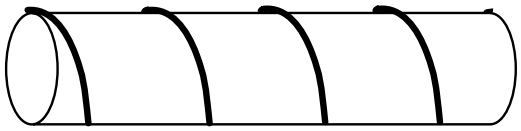
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.9 Example 7 - Male Higher-Performance Item - Advanced Mathematics
### Final Year of Secondary School*

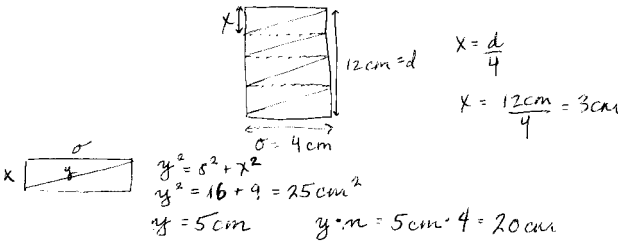
| Country | Percent Correct | |
|---|---|---|
| | Males | Females |
| Australia | 14 (3.4) | 13 (5.4) |
| Austria | 17 (5.6) | 3 (2.4) |
| Canada | 17 (2.7) | 7 (2.3) |
| Cyprus | 0 (0.0) | 0 (0.0) |
| Czech Republic | ▲ 15 (3.5) | 3 (1.5) |
| France | 6 (2.6) | 2 (1.2) |
| Germany | ▲ 15 (3.7) | 2 (0.7) |
| Italy | 10 (5.5) | 0 (0.0) |
| Lithuania | ▲ 28 (3.7) | 7 (1.4) |
| Russian Federation | 16 (3.6) | 9 (3.3) |
| Slovenia | 7 (2.4) | 2 (1.1) |
| Sweden | 26 (5.5) | 17 (4.3) |
| Switzerland | ▲ 27 (5.2) | 4 (2.3) |
| United States | 6 (1.9) | 1 (0.5) |
| International Avg. | ▲ 15 (1.0) | 5 (0.6) |

**Example 7**

A string is wound symmetrically around a circular rod. The string goes exactly 4 times around the rod. The circumference of the rod is 4 cm and its length is 12 cm.



Find the length of the string. Show all your work.




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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Characteristics of Science Items with Large Gender Differences Internationally

In science at the fourth and eighth grades, the GDIs for male higher-performing items were larger than for female higher-performing items. Still, there were items where females outperformed males internationally. Most notably, and congruent with previous studies, the female items involved life science and environmental issues. Recognizing that young females generally have a greater interest in reading than do males, the science panel was drawn to the notion that these items reflected content about the care, health, and survival of living things – subjects perhaps found in the materials read by young girls. As an example, several of these items involved nutrition as illustrated by Example 8 (see Exhibit 3.10).

Exhibit 3.10

In contrast, males internationally had higher achievement than females on items involving earth science and the physical sciences. At the eighth grade, about half of the male higher-performance items involved diagrams (e.g., weights on a seesaw, the solar system) compared to only one of the female higher-performance items. Typical of many of the items where males outperformed females, Example 9 (see Exhibit 3.11) involved a diagram and content from the physical sciences (in this case electricity).

Exhibit 3.11

By secondary school, the patterns discerned at the eighth grade appeared to grow even stronger. In the science literacy assessment, the few items favoring females again primarily involved health and nutrition as typified by Example 10 about catching the flu (see Exhibit 3.12). Many items had large GDIs favoring males, and these were predominantly physical science items often involving abstract thinking and spatial relationships as in Example 11 about the comparative impact of a stone versus a tennis ball hitting a window (see Exhibit 3.13). Given previous studies and knowing that males outperformed females in the TIMSS physics assessment, it was not surprising to find that large number of items had a male advantage internationally. It was interesting to panelists, however, to discover that most of these items involved the use of diagrams to convey concepts and pose questions as shown in Example 12 depicting the trajectory of a bouncing ball and asking about points of acceleration (see Exhibit 3.14).

Exhibit 3.12

Exhibit 3.13

Exhibit 3.14

## Exhibit 3.10 Example 8 - Female Higher-Performance Item - Science
### Eighth Grade*

| Country | Percent Correct | |
|---|---|---|
| | Males | Females |
| Australia | 61 (2.6) | ▲ 74 (2.2) |
| Austria | 90 (2.6) | 96 (1.5) |
| Belgium (Fl) | 84 (3.9) | 95 (1.6) |
| Belgium (Fr) | 67 (4.3) | 70 (5.2) |
| Bulgaria | 83 (3.6) | 85 (3.0) |
| Canada | 66 (3.5) | 71 (3.1) |
| Colombia | 46 (6.2) | 50 (6.3) |
| Cyprus | 43 (3.7) | 34 (3.9) |
| Czech Republic | 89 (2.6) | 96 (1.6) |
| England | 63 (4.4) | 69 (4.4) |
| France | 63 (4.2) | 57 (4.5) |
| Germany | 81 (3.5) | ▲ 94 (1.9) |
| Hong Kong | 63 (3.6) | 72 (3.2) |
| Hungary | 91 (2.5) | 95 (1.6) |
| Iceland | 90 (4.3) | 90 (3.4) |
| Iran, Islamic Rep. | 55 (3.6) | 64 (3.5) |
| Ireland | 63 (3.2) | 68 (3.5) |
| Japan | 87 (1.9) | 88 (1.7) |
| Korea | 79 (3.2) | 84 (3.7) |
| Latvia (LSS) | 84 (3.1) | 89 (2.9) |
| Lithuania | 77 (3.8) | 75 (3.8) |
| Netherlands | 79 (5.6) | 90 (3.3) |
| New Zealand | 70 (2.8) | 70 (2.8) |
| Norway | 76 (3.7) | 86 (2.5) |
| Portugal | 68 (3.6) | 65 (4.1) |
| Romania | 74 (3.8) | 83 (2.9) |
| Russian Federation | 91 (1.8) | 95 (1.3) |
| Scotland | 61 (4.2) | 67 (4.1) |
| Singapore | 87 (2.1) | 87 (2.0) |
| Slovak Republic | 86 (3.0) | 92 (2.0) |
| Slovenia | 96 (1.7) | 96 (1.6) |
| Spain | 66 (3.4) | 57 (3.6) |
| Sweden | 85 (2.1) | 85 (2.5) |
| Switzerland | 85 (2.6) | 86 (2.2) |
| United States | 67 (2.3) | 74 (2.8) |
| International Avg. | 75 (0.6) | ▲ 78 (0.5) |

**Example 8**

What is the BEST reason for including fruits and leafy vegetables in a healthy diet?

A. They have a high water content.

B. They are the best source of protein.

C. They are rich in minerals and vitamins.

D. They are the best source of carbohydrates.

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

▲ = Gender difference statistically significant at .05 level

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

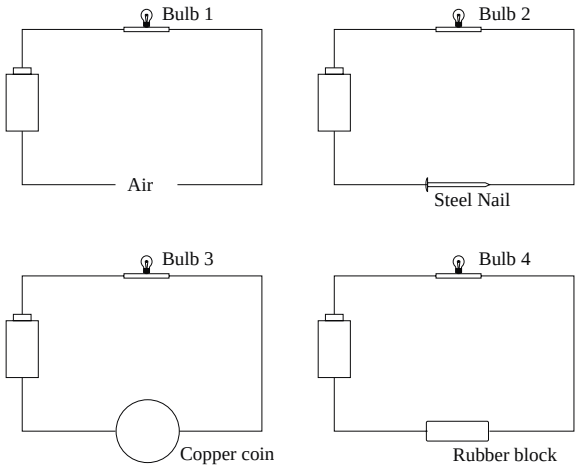
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.11 Example 9 - Male Higher-Performance Item - Science
### Eighth Grade*

| Country | Percent Correct | |
|---|---|---|
| | Males | Females |
| Australia | ▲ 88 (1.8) | 78 (2.2) |
| Austria | 93 (2.3) | 89 (3.0) |
| Belgium (Fl) | 91 (2.5) | 82 (4.2) |
| Belgium (Fr) | 71 (4.1) | 55 (3.5) |
| Bulgaria | 76 (3.7) | 75 (4.2) |
| Canada | ▲ 86 (2.3) | 73 (2.8) |
| Colombia | 71 (4.2) | 55 (5.1) |
| Cyprus | 78 (3.2) | 69 (3.6) |
| Czech Republic | 93 (1.9) | 85 (2.4) |
| England | 91 (2.8) | 90 (3.1) |
| France | 79 (3.3) | 79 (3.2) |
| Germany | 87 (4.0) | 80 (3.3) |
| Hong Kong | 92 (1.9) | 84 (2.6) |
| Hungary | 91 (2.1) | 80 (3.2) |
| Iceland | 68 (8.9) | 64 (4.5) |
| Iran, Islamic Rep. | ▲ 69 (5.0) | 48 (3.3) |
| Ireland | ▲ 81 (3.0) | 58 (4.0) |
| Japan | 93 (1.5) | 91 (1.6) |
| Korea | 96 (1.4) | 88 (2.4) |
| Latvia (LSS) | ▲ 80 (3.8) | 44 (4.7) |
| Lithuania | ▲ 84 (3.3) | 47 (4.2) |
| Netherlands | 85 (4.9) | 77 (4.6) |
| New Zealand | 85 (2.2) | 78 (2.8) |
| Norway | ▲ 85 (2.7) | 63 (3.3) |
| Portugal | ▲ 82 (2.7) | 65 (3.4) |
| Romania | 72 (3.3) | 66 (3.6) |
| Russian Federation | ▲ 85 (2.5) | 66 (3.3) |
| Scotland | 84 (3.0) | 79 (3.5) |
| Singapore | 98 (0.8) | 96 (1.1) |
| Slovak Republic | 95 (1.8) | 87 (2.5) |
| Slovenia | 91 (2.2) | 86 (2.6) |
| Spain | 85 (2.2) | 79 (2.9) |
| Sweden | 91 (1.7) | 85 (2.9) |
| Switzerland | ▲ 87 (1.8) | 68 (3.6) |
| United States | 79 (2.9) | 77 (2.7) |
| International Avg. | ▲ 85 (0.5) | 74 (0.6) |

**Example 9**

The following diagrams show a flashlight battery and a bulb connected by wires to various substances.




Which of the bulbs will light?

A. 1 and 2 only

B. 2 and 3 only

C. 3 and 4 only

D. 1, 2, and 3 only

E. 2, 3, and 4 only

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

▲ = Gender difference statistically significant at .05 level

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.12 Example 10 - Female Higher-Performance Item - Science Literacy
### Final Year of Secondary School*

| Country | Percent Correct | | Example 10 |
|---|---|---|---|
| | Males | Females | |
| Australia | 57 (4.9) | 63 (3.2) | José caught influenza. Write down one way he could have caught it. |
| Austria | 76 (3.3) | 85 (1.8) | |
| Canada | 67 (2.1) | 63 (3.2) | If a friend in school has a cold and if he is sneezing on him and coughing on him. |
| Cyprus | 15 (3.7) | 23 (4.2) | |
| Czech Republic | 63 (4.0) | 71 (2.9) | |
| France | 66 (4.5) | 71 (3.6) | |
| Germany | 63 (3.6) | 70 (3.0) | |
| Hungary | 66 (1.6) | 69 (1.8) | |
| Iceland | 91 (1.8) | 92 (1.8) | |
| Italy | 52 (3.5) | 52 (3.2) | |
| Lithuania | 53 (3.2) | 55 (2.5) | |
| Netherlands | 69 (2.9) | ▲ 83 (1.7) | |
| New Zealand | 67 (4.7) | 80 (2.1) | |
| Norway | 85 (1.6) | ▲ 91 (1.2) | |
| Russian Federation | 75 (3.2) | 77 (2.1) | |
| Slovenia | 77 (4.3) | 79 (3.2) | |
| Sweden | 86 (1.8) | 89 (1.2) | |
| Switzerland | 74 (3.0) | 82 (2.1) | |
| United States | 54 (2.9) | 64 (2.4) | |
| International Avg. | 66 (0.8) | ▲ 72 (0.6) | |

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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for information about the grades tested in each country.

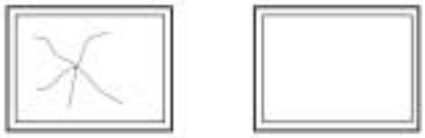
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.13 Example 11 - Male Higher-Performance Item - Science Literacy
### Final Year of Secondary School*

| Country | Percent Correct | |
|---|---|---|
| | Males | Females |
| Australia | ▲ 83 (2.4) | 65 (2.7) |
| Austria | ▲ 78 (3.1) | 56 (2.9) |
| Canada | 72 (2.5) | 63 (2.4) |
| Cyprus | 37 (5.5) | 19 (4.0) |
| Czech Republic | ▲ 75 (3.0) | 49 (3.9) |
| France | ▲ 61 (5.0) | 36 (2.6) |
| Germany | ▲ 75 (3.1) | 54 (3.4) |
| Hungary | ▲ 65 (1.8) | 42 (1.6) |
| Iceland | ▲ 81 (2.0) | 66 (2.4) |
| Italy | ▲ 53 (3.5) | 38 (2.9) |
| Lithuania | ▲ 46 (3.5) | 32 (2.5) |
| Netherlands | ▲ 73 (2.8) | 59 (3.7) |
| New Zealand | 82 (2.6) | 71 (2.7) |
| Norway | ▲ 74 (1.9) | 56 (2.1) |
| Russian Federation | ▲ 48 (2.9) | 27 (2.5) |
| Slovenia | ▲ 67 (3.6) | 45 (3.6) |
| Sweden | ▲ 76 (2.2) | 59 (1.9) |
| Switzerland | ▲ 67 (3.4) | 52 (2.8) |
| United States | 58 (1.8) | 51 (2.2) |
| International Avg. | ▲ 67 (0.7) | 49 (0.7) |

**Example 11**

The sketch below shows two windows. The left window has been cracked by a flying stone. A tennis ball, with the same mass and speed as the stone, strikes the adjacent, similar window, but does not crack it.



What is one important reason why the impact of the stone cracks the window but the impact of the tennis ball does not?

The tennis ball has air or a hollow inside give it some leeway when it hits the window but the rock is solid and just hits with full force.

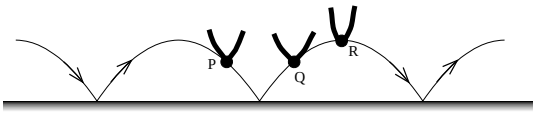
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.14 Example 12 - Male Higher-Performance Item - Physics
### Final Year of Secondary School*

| Country | Percent Correct | | Example 12 |
|---|---|---|---|
| | Males | Females | |
| Australia | 35 (7.1) | 22 (3.3) | The figure shows the trajectory of a ball bouncing on a floor, with negligible air resistance.   Draw arrows on the figure showing the direction of the acceleration of the ball at points P, Q and R. |
| Austria | 4 (1.8) | 4 (3.4) | |
| Canada | 17 (2.7) | 15 (4.6) | |
| Cyprus | ▲ 17 (4.6) | 0 (0.0) | |
| Czech Republic | 8 (3.5) | 1 (0.9) | |
| France | 19 (2.9) | 14 (4.0) | |
| Germany | 7 (2.9) | 8 (5.2) | |
| Norway | ▲ 52 (3.2) | 26 (4.3) | |
| Russian Federation | 25 (3.5) | 20 (4.4) | |
| Slovenia | 17 (4.7) | 8 (4.5) | |
| Sweden | ▲ 29 (4.8) | 9 (3.4) | |
| Switzerland | 16 (3.2) | 8 (5.0) | |
| United States | ▲ 10 (2.1) | 2 (1.1) | |
| International Avg. | ▲ 20 (1.1) | 11 (1.0) | |

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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exploring the Results of Linked Items

In order to link performance across the primary, middle, and secondary school levels, TIMSS included a small subset of items that would appear across assessments for more than one group of students. For example, a small number of identical items were included on both the fourth grade and the eighth grade assessments in mathematics and science. Exhibit 3.15 shows the average percent correct for each of the two grades by gender on these common (link) items in the area of mathematics. Not surprisingly, the results show that achievement on the same items increases between the fourth and the eighth grades for both males and females. Interestingly, however, whereas no statistically significant gender differences in performance were observed at the fourth grade, significant gender differences in the average percent correct appeared in several countries in favor of males at the eighth grade on these same items.

Exhibit 3.15

A different subset of identical items was included on both the eighth grade mathematics assessment and the mathematics literacy assessment given to students in the final-year of secondary school. The mean achievement on these items for the eighth-grade and secondary-school students is presented in Exhibit 3.16. Again, the results show no significant gender differences at the eighth grade, however, significant gender differences in mathematics literacy achievement appeared on the same items at the final year of secondary school in several countries.

Exhibit 3.16

In science, the mean achievement for the same items given at the fourth and eighth grades is shown in Exhibit 3.17. In general, the slight male advantage shown in many countries at the fourth grade tends to be similar at the eighth grade, even though statistical significance is not always the same between the two grades. Interestingly, the several countries showing increased gender gaps in the eighth grade favoring males included Iran and Portugal which corresponds to the mathematics results.

Exhibit 3.17

Exhibit 3.18 presents the performance results for the set of the same science items given at eighth grade and as part of the science literacy assessment of secondary school students. Most interestingly, given the general male advantage in science, there were no statistically significant gender differences on these items at the eighth grade. Significant gender differences in achievement favoring males appeared in five countries by the final year of secondary school, including three Scandinavian countries (Iceland, Norway, and Sweden).

Exhibit 3.18

Across both the TIMSS mathematics and science assessments the results for the identical items administered to successively older groups of students show a tendency for gender differences to emerge for older students that were less noticeable for younger students. This suggests that students' different gender related experiences, whether it be inclinations to engage more often in particular types of activities or study different subjects in school, may influence their academic achievement in mathematics and science.

## Exhibit 3.15 Average Percent Correct by Gender on Mathematics Link Items[1]
### Fourth and Eighth Grades*

| Country | Percent Correct - Fourth Grade | | Percent Correct - Eighth Grade | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Australia | 55 (1.0) | 56 (1.0) | 79 (1.0) | 81 (0.9) |
| Austria | 64 (1.2) | 63 (1.2) | 82 (0.8) | 83 (1.4) |
| Canada | 55 (1.3) | 54 (1.4) | 80 (0.9) | 80 (0.6) |
| Cyprus | 50 (1.0) | 50 (0.9) | 68 (1.1) | 69 (0.9) |
| Czech Republic | 62 (1.0) | 61 (1.0) | 85 (0.9) | 84 (0.8) |
| England | 52 (1.0) | 51 (1.0) | 78 (1.2) | 79 (1.2) |
| Hong Kong | 68 (1.0) | 68 (0.9) | 82 (1.5) | 80 (1.5) |
| Hungary | 60 (1.0) | 59 (1.1) | 78 (0.9) | 79 (0.9) |
| Iceland | 44 (1.5) | 45 (1.1) | 76 (1.9) | 80 (1.1) |
| Iran, Islamic Rep. | 35 (1.2) | 33 (1.1) | ▲ 59 (1.0) | 54 (1.0) |
| Ireland | 61 (1.1) | 60 (1.1) | 81 (1.4) | 81 (1.1) |
| Japan | 69 (0.8) | 68 (0.8) | 87 (0.6) | 86 (0.5) |
| Korea | 69 (0.7) | 67 (0.7) | ▲ 84 (0.8) | 79 (1.0) |
| Latvia (LSS) | 56 (1.5) | 55 (1.3) | 74 (1.3) | 76 (0.9) |
| Netherlands | 66 (1.2) | 65 (1.1) | 83 (1.3) | 81 (1.7) |
| New Zealand | 48 (1.3) | 50 (1.1) | 78 (1.2) | 78 (1.1) |
| Norway | 49 (1.2) | 50 (1.0) | 76 (1.0) | 79 (0.9) |
| Portugal | 41 (1.0) | 40 (0.9) | ▲ 70 (0.9) | 66 (0.9) |
| Scotland | 51 (1.1) | 54 (1.0) | 78 (1.1) | 76 (1.3) |
| Singapore | 69 (0.9) | 69 (1.2) | 89 (0.8) | 89 (0.8) |
| Slovenia | 61 (1.0) | 60 (1.0) | 82 (0.7) | 81 (0.7) |
| United States | 57 (0.8) | 58 (0.8) | 75 (1.2) | 75 (0.9) |
| International Avg. | 56 (0.3) | 56 (0.2) | 78 (0.3) | 78 (0.2) |

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

▲ = Gender difference statistically significant at .05 level

* Fourth and Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

1 Link items are identical items given to students in both the fourth and eighth grade mathematics assessments.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.16 Average Percent Correct by Gender on Mathematics Link Items[1] Eighth Grade and Final Year of Secondary School*

| Country | Percent Correct - Eighth Grade | | Percent Correct - Final Year of Secondary School | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Australia | 54 (1.3) | 56 (1.2) | 69 (2.7) | 68 (2.1) |
| Austria | 60 (1.4) | 59 (1.5) | 71 (1.5) | 67 (1.2) |
| Canada | 54 (1.1) | 56 (1.1) | 69 (1.2) | 65 (1.4) |
| Cyprus | 45 (1.1) | 46 (1.1) | 48 (1.5) | 49 (1.4) |
| Czech Republic | 67 (1.3) | 64 (1.5) | 56 (1.6) | 51 (4.7) |
| France | 51 (1.1) | 50 (1.2) | 67 (1.2) | 62 (1.4) |
| Germany | 53 (1.6) | 52 (1.5) | 63 (1.9) | 56 (2.2) |
| Hungary | 51 (1.1) | 53 (1.2) | 51 (1.1) | 54 (0.9) |
| Iceland | 51 (1.1) | 46 (1.7) | ▲ 74 (1.1) | 68 (1.1) |
| Lithuania | 37 (1.2) | 37 (1.3) | 50 (2.1) | 53 (2.4) |
| Netherlands | 64 (1.7) | 58 (2.0) | ▲ 80 (1.1) | 70 (1.4) |
| New Zealand | 54 (1.4) | 54 (1.4) | 73 (1.3) | 69 (1.7) |
| Norway | 53 (1.2) | 53 (1.1) | ▲ 74 (1.2) | 65 (1.2) |
| Russian Federation | 50 (1.3) | 51 (1.3) | 59 (1.4) | 56 (1.5) |
| Slovenia | 58 (1.1) | 55 (1.1) | 76 (2.2) | 69 (1.9) |
| Sweden | 58 (1.2) | 56 (1.1) | ▲ 78 (1.1) | 73 (0.8) |
| Switzerland | 59 (1.2) | 62 (1.0) | 70 (1.9) | 67 (1.6) |
| United States | 50 (1.6) | 47 (1.3) | 56 (1.4) | 53 (1.3) |
| International Avg. | 54 (0.3) | 53 (0.3) | ▲ 66 (0.4) | 62 (0.4) |

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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for information about the grades tested in each country.

1 Link items are identical items given to students in both the eighth grade mathematics and the final year of secondary school mathematics literacy assessments.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.17 Average Percent Correct by Gender on Science Link Items[1]
### Fourth and Eighth Grades*

| Country | Percent Correct - Fourth Grade | | Percent Correct - Eighth Grade | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Australia | ▲ 58 (0.9) | 54 (0.8) | 78 (0.9) | 74 (0.9) |
| Austria | ▲ 63 (1.4) | 56 (1.0) | 80 (1.1) | 78 (1.0) |
| Canada | 56 (1.1) | 53 (0.8) | 76 (0.7) | 74 (0.7) |
| Cyprus | 41 (0.9) | 38 (0.9) | 61 (0.9) | 59 (1.1) |
| Czech Republic | ▲ 62 (0.9) | 56 (0.9) | 84 (0.9) | 80 (1.0) |
| England | 58 (1.0) | 56 (1.0) | 81 (1.0) | 78 (1.0) |
| Hong Kong | 59 (1.1) | 55 (0.8) | ▲ 79 (1.1) | 73 (1.3) |
| Hungary | ▲ 61 (0.9) | 56 (1.0) | ▲ 81 (0.8) | 76 (0.8) |
| Iceland | 46 (1.4) | 44 (1.2) | 72 (1.3) | 67 (1.4) |
| Iran, Islamic Rep. | 32 (1.1) | 30 (1.2) | ▲ 64 (1.1) | 56 (1.0) |
| Ireland | 53 (0.9) | 50 (1.1) | 76 (1.3) | 71 (1.1) |
| Japan | 57 (0.7) | 55 (0.7) | 80 (0.4) | 78 (0.6) |
| Korea | 68 (0.8) | 65 (0.8) | ▲ 79 (0.7) | 75 (0.8) |
| Latvia (LSS) | 48 (1.3) | 48 (1.5) | ▲ 72 (1.0) | 65 (1.2) |
| Netherlands | ▲ 63 (1.0) | 57 (1.2) | 81 (1.8) | 78 (1.0) |
| New Zealand | 52 (1.3) | 52 (1.0) | ▲ 80 (0.9) | 74 (1.0) |
| Norway | 56 (1.3) | 53 (0.9) | 78 (0.8) | 76 (0.7) |
| Portugal | 41 (1.1) | 42 (1.1) | ▲ 69 (0.8) | 63 (0.8) |
| Scotland | 54 (1.0) | 52 (1.1) | 74 (1.0) | 70 (1.0) |
| Singapore | 61 (1.0) | 60 (1.0) | 87 (0.8) | 85 (0.8) |
| Slovenia | 60 (1.1) | 57 (0.9) | ▲ 81 (0.8) | 76 (0.8) |
| United States | ▲ 58 (0.8) | 54 (0.9) | 75 (0.9) | 72 (1.0) |
| International Avg. | ▲ 55 (0.2) | 52 (0.2) | ▲ 77 (0.2) | 73 (0.2) |

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

▲ = Gender difference statistically significant at .05 level

* Fourth and Eighth Grades in most countries; see Appendix A for information about the grades tested in each country.

1 Link items are identical items given to students in both the fourth and eighth grade science assessments.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.18 Average Percent Correct by Gender on Science Link Items[1]
### Eighth Grade and Final Year of Secondary School*

| Country | Percent Correct - Eight Grade | | Percent Correct - Final Year of Secondary School | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Australia | 58 (1.3) | 57 (1.0) | 71 (2.5) | 67 (2.1) |
| Austria | 64 (1.3) | 61 (1.3) | 73 (1.5) | 68 (1.1) |
| Canada | 57 (0.8) | 57 (0.9) | 71 (0.9) | 67 (1.2) |
| Cyprus | 38 (1.2) | 37 (1.2) | 43 (1.3) | 45 (1.2) |
| Czech Republic | 62 (1.2) | 59 (1.6) | 66 (1.6) | 58 (2.7) |
| France | 50 (1.3) | 49 (1.2) | 62 (2.0) | 57 (1.7) |
| Germany | 59 (1.5) | 57 (1.5) | 68 (1.6) | 63 (1.5) |
| Hungary | 61 (1.0) | 59 (1.2) | 59 (0.9) | 56 (0.8) |
| Iceland | 58 (1.3) | 55 (1.5) | ▲ 73 (0.9) | 69 (0.8) |
| Lithuania | 43 (1.2) | 41 (1.2) | 56 (1.6) | 54 (1.2) |
| Netherlands | 64 (2.5) | 63 (1.7) | ▲ 81 (0.9) | 76 (0.9) |
| New Zealand | 57 (1.3) | 54 (1.1) | 71 (1.4) | 69 (1.1) |
| Norway | 63 (1.2) | 63 (0.9) | ▲ 75 (1.0) | 69 (0.9) |
| Russian Federation | 58 (1.5) | 58 (1.3) | ▲ 68 (1.2) | 61 (1.3) |
| Slovenia | 64 (1.3) | 62 (1.1) | 72 (2.1) | 67 (1.4) |
| Sweden | 60 (1.0) | 60 (1.1) | ▲ 78 (0.8) | 73 (0.7) |
| Switzerland | 60 (1.2) | 56 (0.9) | 72 (1.4) | 66 (1.5) |
| United States | 58 (1.2) | 58 (1.1) | 64 (0.9) | 61 (1.0) |
| International Avg. | ▲ 57 (0.3) | 56 (0.3) | ▲ 68 (0.3) | 64 (0.3) |

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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for information about the grades tested in each country.

1 Link items are identical items given to students in both the eighth grade science and final year of secondary school science literacy assessments.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Gender Differences by Cognitive Demand

The next set of analyses presented in this chapter look at achievement by gender based upon the cognitive process demanded in providing complete solutions or explanations to the TIMSS items. As well as describing the content areas within mathematics and science, the TIMSS Curriculum Frameworks[7] described performance expectations – behaviors that might be expected of students in school mathematics or science – that were used to classify each of the TIMSS items. For example, in mathematics at the eighth grade, the items were spread relatively equally across the performance expectations of knowing, performing routine procedures, using complex procedures, and solving problems. Yet, for the different assessments at the different grades within mathematics and science the numbers of items available in various performance expectation categories was often quite small and some collapsing of categories was done for the analyses presented in this chapter. In mathematics, to maintain a large enough set of items in categories that could be used across the grades assessed, the performance expectations were combined so that items were classified into two categories of cognitive processing: knowing and procedures, and reasoning and problem solving. In science, a similar procedure was used to combine performance expectations and items also were placed into two categories of cognitive processing: knowing and procedures, and analyzing and investigating.

Parallel to the overall findings, the analysis of gender differences by cognitive demand in mathematics revealed few significant differences by gender at the fourth and eighth grades (see Exhibits 3.19 and 3.20). At the final year of secondary school, differences by cognitive demand tended to appear concurrently with overall differences in achievement. In Germany, New Zealand, and Slovenia, statistically significant differences in mathematics literacy were found in favor of males on reasoning and problem solving items while there were no significant differences on knowing and procedure items (see Exhibits 3.21 and 3.22).

Exhibit 3.19-3.20

Exhibit 3.21-3.22

In science, there were few significant differences by cognitive demand at the fourth grade (see Exhibit 3.23). By eighth grade, however, significant gender differences by cognitive demand were seen. Statistically significant differences in favor of males on understanding and procedures items appeared in approximately half of the countries while significant differences favoring males on items requiring analyzing and investigating appeared in a smaller subset of those same countries (see Exhibit 3.24).

Exhibit 3.23

Exhibit 3.24

Curiously, the results by cognitive demand reveal a pattern in the opposite direction for the science literacy assessment given at the final year of secondary school. Statistically significant differences for the items involving understanding and procedures appeared in one-third of the countries while differences favoring males on items requiring analyzing and investigating were found in those and even a larger set of countries, including more than three-quarters of the participating countries (see Exhibit 3.25). Exhibit 3.26 shows the average percent-correct by cognitive demand for students taking the physics assessment. In physics, the gender differences by both cognitive demands showed a significant male advantage about equally pervasively across participating countries for the two types of cognitive processes.

Exhibit 3.25-3.26

[7] Robitaille, D.F., McKnight, C.C., Schmidt, W.H., Brittton, E.D., Raizen, S.A. and Nicol, C. (1993). *TIMSS Monograph No. 1: TIMSS Curriculum Frameworks for Mathematics and Science.* Vancouver, B.C.: Pacific Educational Press.

## Exhibit 3.19 Average Percent Correct by Cognitive Demand and Gender - Mathematics
### Fourth Grade*

| Country | Overall (107 Items) | | Knowing and Procedures (78 Items) | | Reasoning and Problem Solving (29 Items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 63 (0.8) | 63 (0.8) | 66 (0.7) | 66 (0.8) | 56 (0.9) | 56 (0.9) |
| Austria | 66 (0.9) | 64 (0.8) | 71 (0.8) | 68 (0.8) | 56 (1.3) | 55 (1.2) |
| Canada | 61 (1.1) | 60 (1.2) | 64 (1.0) | 63 (1.1) | 54 (1.2) | 54 (1.6) |
| Cyprus | 55 (0.8) | 53 (0.7) | 59 (0.8) | 57 (0.7) | 45 (0.9) | 44 (0.8) |
| Czech Republic | 67 (0.7) | 66 (0.7) | 70 (0.7) | 69 (0.6) | 58 (1.0) | 57 (1.0) |
| England | 57 (0.8) | 56 (0.9) | 60 (0.8) | 59 (0.8) | 51 (1.0) | 49 (1.1) |
| Hong Kong | 73 (1.1) | 73 (0.8) | 76 (1.0) | 75 (0.7) | 65 (1.3) | 67 (1.0) |
| Hungary | 64 (0.8) | 64 (0.9) | 68 (0.8) | 67 (0.9) | 56 (1.1) | 56 (1.1) |
| Iceland | 50 (1.0) | 49 (0.9) | 53 (1.0) | 53 (0.9) | 43 (1.3) | 41 (1.1) |
| Iran, Islamic Rep. | 39 (1.4) | 37 (1.1) | 42 (1.4) | 41 (1.1) | 32 (1.5) | 29 (1.3) |
| Ireland | 63 (0.9) | 64 (0.9) | 67 (0.9) | 67 (1.0) | 56 (1.1) | 57 (1.0) |
| Japan | 75 (0.5) | 74 (0.5) | 78 (0.5) | 76 (0.5) | 68 (0.6) | 67 (0.6) |
| Korea | ▲ 78 (0.4) | 76 (0.5) | ▲ 79 (0.4) | 77 (0.5) | 73 (0.6) | 72 (0.8) |
| Latvia (LSS) | 58 (1.2) | 60 (1.1) | 62 (1.1) | 63 (1.0) | 49 (1.4) | 51 (1.4) |
| Netherlands | 71 (0.8) | 68 (0.8) | ▲ 73 (0.7) | 70 (0.8) | 65 (1.0) | 65 (1.2) |
| New Zealand | 52 (1.3) | 54 (0.9) | 55 (1.3) | 57 (0.9) | 44 (1.4) | 48 (1.1) |
| Norway | 54 (0.9) | 53 (0.8) | 58 (0.8) | 56 (0.7) | 45 (1.2) | 45 (1.1) |
| Portugal | 48 (0.8) | 48 (0.8) | 53 (0.8) | 52 (0.9) | 38 (0.9) | 38 (0.8) |
| Scotland | 58 (0.9) | 58 (0.9) | 61 (0.8) | 61 (0.9) | 51 (1.2) | 52 (1.1) |
| Singapore | 75 (0.9) | 76 (1.0) | 77 (0.8) | 78 (0.9) | 70 (1.0) | 72 (1.2) |
| Slovenia | 64 (0.7) | 65 (0.9) | 68 (0.7) | 68 (0.8) | 55 (1.1) | 57 (1.1) |
| United States | 63 (0.7) | 62 (0.7) | 66 (0.7) | 65 (0.7) | 55 (0.8) | 55 (0.7) |
| International Avg. | 61 (0.2) | 61 (0.2) | 65 (0.2) | 64 (0.2) | 54 (0.2) | 54 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.20 Average Percent Correct by Cognitive Demand and Gender - Mathematics Eighth Grade*

| Country | Overall (158 Items) | | Knowing and Procedures (98 Items) | | Reasoning and Problem Solving (60 Items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 57 (1.2) | 59 (1.1) | 61 (1.1) | 62 (1.0) | 52 (1.3) | 53 (1.2) |
| Austria | 63 (0.8) | 61 (1.2) | 65 (0.8) | 65 (1.1) | 58 (0.9) | 56 (1.4) |
| Belgium (Fl) | 65 (2.0) | 66 (1.9) | 69 (2.0) | 70 (1.7) | 59 (2.0) | 60 (2.3) |
| Belgium (Fr) | 59 (1.1) | 58 (0.9) | 63 (1.1) | 62 (0.9) | 53 (1.3) | 52 (1.1) |
| Canada | 59 (0.7) | 59 (0.6) | 62 (0.8) | 63 (0.6) | 53 (0.9) | 54 (0.7) |
| Colombia | 30 (1.6) | 29 (0.9) | 33 (1.7) | 32 (0.9) | 25 (1.4) | 23 (1.3) |
| Cyprus | 47 (0.6) | 48 (0.6) | 50 (0.7) | 52 (0.6) | 42 (0.9) | 42 (0.8) |
| Czech Republic | 67 (1.0) | 64 (1.3) | 71 (1.0) | 69 (1.1) | 59 (1.2) | 57 (1.7) |
| England | 53 (1.3) | 53 (0.9) | 56 (1.2) | 56 (0.9) | 49 (1.5) | 48 (1.1) |
| France | 62 (0.8) | 61 (0.9) | 67 (0.7) | 66 (0.9) | 54 (1.0) | 52 (1.1) |
| Germany | 54 (1.3) | 54 (1.2) | 59 (1.2) | 59 (1.2) | 46 (1.5) | 46 (1.3) |
| Hong Kong | 72 (1.7) | 68 (1.7) | 75 (1.6) | 71 (1.7) | 66 (1.9) | 62 (1.9) |
| Hungary | 61 (0.8) | 62 (0.8) | 66 (0.9) | 67 (0.8) | 53 (0.9) | 53 (1.0) |
| Iceland | 49 (1.3) | 50 (1.3) | 53 (1.1) | 54 (1.3) | 44 (1.7) | 44 (1.4) |
| Iran, Islamic Rep. | 39 (0.8) | 36 (0.8) | 43 (0.9) | 40 (0.9) | 33 (0.8) | 30 (0.9) |
| Ireland | 60 (1.6) | 58 (1.4) | 62 (1.6) | 60 (1.3) | 56 (1.8) | 54 (1.6) |
| Japan | 74 (0.5) | 73 (0.4) | 78 (0.5) | 76 (0.4) | 67 (0.6) | 67 (0.5) |
| Korea | ▲ 73 (0.6) | 70 (0.7) | 77 (0.6) | 74 (0.7) | ▲ 67 (0.8) | 63 (0.9) |
| Latvia (LSS) | 52 (1.0) | 51 (0.8) | 56 (1.0) | 56 (0.9) | 45 (1.1) | 43 (1.0) |
| Lithuania | 48 (1.1) | 49 (1.0) | 53 (1.1) | 54 (1.1) | 40 (1.2) | 40 (1.1) |
| Netherlands | 61 (1.8) | 59 (1.6) | 64 (1.6) | 61 (1.5) | 55 (2.3) | 54 (1.8) |
| New Zealand | 55 (1.4) | 53 (1.3) | 58 (1.3) | 56 (1.2) | 49 (1.5) | 48 (1.4) |
| Norway | 54 (0.6) | 53 (0.6) | 56 (0.6) | 57 (0.6) | 49 (0.7) | 48 (0.7) |
| Portugal | 44 (0.8) | 42 (0.7) | 48 (0.9) | 46 (0.8) | 37 (0.8) | 35 (0.7) |
| Romania | 49 (1.1) | 49 (1.0) | 53 (1.2) | 53 (1.0) | 43 (1.2) | 43 (1.1) |
| Russian Federation | 59 (1.4) | 61 (1.3) | 64 (1.5) | 66 (1.1) | 52 (1.3) | 52 (1.6) |
| Scotland | 53 (1.7) | 50 (1.3) | 56 (1.6) | 53 (1.2) | 49 (2.0) | 46 (1.5) |
| Singapore | 79 (1.1) | 80 (1.0) | 80 (1.0) | 81 (0.9) | 76 (1.2) | 77 (1.2) |
| Slovak Republic | 63 (0.9) | 62 (0.8) | 68 (0.9) | 67 (0.8) | 54 (0.9) | 54 (1.0) |
| Slovenia | 62 (0.8) | 60 (0.7) | 67 (0.8) | 65 (0.8) | 54 (1.0) | 52 (0.8) |
| Spain | 52 (0.7) | 50 (0.7) | 57 (0.7) | 54 (0.7) | 45 (0.9) | 43 (0.8) |
| Sweden | 56 (0.8) | 56 (0.8) | 58 (0.7) | 58 (0.7) | 51 (1.0) | 52 (1.0) |
| Switzerland | 63 (0.8) | 61 (0.7) | 65 (0.8) | 64 (0.7) | 59 (1.0) | 57 (0.8) |
| United States | 53 (1.2) | 53 (1.1) | 58 (1.2) | 57 (1.1) | 46 (1.2) | 45 (1.2) |
| International Avg. | ▲ 57 (0.2) | 56 (0.2) | 61 (0.2) | 60 (0.2) | ▲ 51 (0.2) | 50 (0.2) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.21 Average Percent Correct by Cognitive Demand and Gender - Mathematics Literacy
### Final Year of Secondary School*

| Country | Overall (45 Items) | | Knowing and Procedures (26 Items) | | Reasoning and Problem Solving (19 Items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 65 (2.4) | 59 (2.2) | 67 (2.8) | 63 (2.2) | 61 (2.0) | 54 (2.3) |
| Austria | ▲ 66 (1.5) | 57 (1.2) | ▲ 68 (1.5) | 60 (1.2) | ▲ 63 (1.8) | 52 (1.4) |
| Canada | ▲ 64 (1.1) | 56 (0.9) | ▲ 67 (1.1) | 60 (0.9) | ▲ 58 (1.2) | 51 (1.1) |
| Cyprus | 43 (1.5) | 41 (1.1) | 47 (1.7) | 45 (1.2) | 38 (1.5) | 34 (1.2) |
| Czech Republic | 51 (2.3) | 42 (4.1) | 53 (2.3) | 43 (4.8) | 47 (2.4) | 39 (3.2) |
| France | ▲ 64 (1.2) | 56 (1.3) | ▲ 68 (1.2) | 61 (1.3) | ▲ 59 (1.3) | 48 (1.3) |
| Germany | 58 (1.9) | 51 (2.0) | 60 (1.8) | 54 (2.0) | ▲ 54 (2.0) | 45 (2.2) |
| Hungary | 49 (1.1) | 48 (1.0) | 52 (1.1) | 51 (1.0) | 45 (1.2) | 44 (1.1) |
| Iceland | ▲ 68 (0.8) | 58 (0.7) | ▲ 71 (0.8) | 62 (0.7) | ▲ 64 (1.0) | 53 (0.8) |
| Lithuania | 49 (2.0) | 47 (2.1) | 51 (2.2) | 50 (2.1) | 46 (1.9) | 42 (2.1) |
| Netherlands | ▲ 75 (1.0) | 63 (1.4) | ▲ 76 (1.0) | 65 (1.3) | ▲ 73 (1.2) | 58 (1.6) |
| New Zealand | ▲ 65 (1.1) | 59 (1.4) | 68 (1.4) | 63 (1.3) | ▲ 61 (1.0) | 54 (1.6) |
| Norway | ▲ 67 (1.1) | 54 (1.1) | ▲ 70 (1.0) | 58 (1.1) | ▲ 61 (1.2) | 49 (1.2) |
| Russian Federation | 52 (1.7) | 47 (1.6) | 53 (1.8) | 48 (1.6) | 50 (1.7) | 45 (1.7) |
| Slovenia | 66 (2.7) | 56 (2.0) | 65 (2.6) | 57 (1.9) | ▲ 66 (2.9) | 54 (2.4) |
| Sweden | ▲ 70 (1.1) | 62 (0.8) | ▲ 72 (1.0) | 65 (0.8) | ▲ 68 (1.3) | 59 (0.9) |
| Switzerland | 67 (1.7) | 60 (1.7) | 69 (1.5) | 62 (1.7) | 64 (2.1) | 56 (1.7) |
| United States | 50 (1.1) | 47 (1.0) | 55 (0.9) | 52 (1.0) | 42 (1.6) | 39 (1.0) |
| International Avg. | ▲ 60 (0.4) | 53 (0.3) | ▲ 63 (0.4) | 56 (0.4) | ▲ 56 (0.4) | 48 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.22 Average Percent Correct by Cognitive Demand and Gender - Advanced Mathematics
### Final Year of Secondary School*

| Country | Overall (65 Items) | | Knowing and Procedures (40 Items) | | Reasoning and Problem Solving (25 Items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 53 (2.6) | 50 (2.6) | 55 (2.6) | 53 (2.3) | 50 (2.8) | 48 (3.1) |
| Austria | ▲ 43 (1.5) | 30 (1.4) | ▲ 48 (1.7) | 36 (1.4) | ▲ 38 (1.9) | 25 (1.6) |
| Canada | ▲ 50 (1.2) | 43 (0.8) | ▲ 55 (1.3) | 49 (0.8) | ▲ 44 (1.3) | 37 (1.1) |
| Cyprus | 50 (0.9) | 47 (1.8) | 57 (0.9) | 52 (1.6) | 44 (1.2) | 40 (2.4) |
| Czech Republic | ▲ 49 (2.4) | 34 (1.4) | ▲ 52 (2.4) | 39 (1.3) | ▲ 45 (2.5) | 28 (1.7) |
| France | 59 (1.4) | 55 (1.3) | 65 (0.9) | 63 (1.1) | 53 (2.0) | 48 (2.0) |
| Germany | ▲ 42 (1.2) | 35 (1.2) | ▲ 47 (1.1) | 42 (1.0) | ▲ 36 (1.6) | 28 (1.5) |
| Lithuania | ▲ 52 (0.7) | 42 (1.0) | ▲ 56 (0.7) | 47 (1.1) | ▲ 48 (1.0) | 36 (1.0) |
| Russian Federation | ▲ 56 (2.0) | 48 (1.8) | ▲ 62 (1.9) | 54 (1.6) | ▲ 51 (2.2) | 41 (2.0) |
| Slovenia | 41 (2.0) | 38 (1.9) | 47 (1.8) | 44 (1.8) | 35 (2.3) | 30 (2.2) |
| Sweden | 48 (1.3) | 46 (1.2) | 52 (1.1) | 50 (0.9) | 45 (1.6) | 41 (1.9) |
| Switzerland | ▲ 54 (0.9) | 45 (1.2) | ▲ 59 (1.0) | 51 (1.1) | ▲ 50 (1.0) | 38 (1.5) |
| United States | 37 (1.2) | 32 (1.3) | 43 (1.4) | 38 (1.3) | ▲ 32 (1.1) | 26 (1.4) |
| International Avg. | ▲ 48 (0.5) | 42 (0.4) | ▲ 53 (0.5) | 47 (0.4) | ▲ 43 (0.6) | 36 (0.5) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.23 Average Percent Correct by Cognitive Demand and Gender - Science
### Fourth Grade*

| Country | Overall (105 items) | | Understanding and Procedures (84 items) | | Analyzing and Investigating (21 items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 67 (0.7) | 65 (0.6) | 69 (0.6) | 67 (0.6) | 59 (0.9) | 58 (0.8) |
| Austria | 67 (0.9) | 64 (0.7) | 69 (0.9) | 67 (0.7) | ▲ 59 (1.1) | 53 (1.1) |
| Canada | 64 (0.7) | 63 (0.6) | 66 (0.7) | 65 (0.7) | 58 (1.0) | 56 (0.7) |
| Cyprus | 51 (0.7) | 50 (0.6) | 53 (0.7) | 52 (0.6) | 45 (0.9) | 42 (0.9) |
| Czech Republic | ▲ 67 (0.6) | 64 (0.7) | ▲ 69 (0.6) | 66 (0.7) | 58 (1.0) | 56 (1.0) |
| England | 64 (0.8) | 63 (0.6) | 65 (0.7) | 65 (0.6) | 57 (1.0) | 56 (0.8) |
| Hong Kong | 63 (0.8) | 61 (0.7) | 65 (0.8) | 62 (0.7) | 56 (1.0) | 55 (0.9) |
| Hungary | 62 (0.8) | 60 (0.7) | 65 (0.7) | 62 (0.7) | 54 (1.0) | 51 (1.1) |
| Iceland | 56 (0.9) | 54 (0.8) | 59 (0.8) | 56 (0.8) | 46 (1.4) | 45 (1.2) |
| Iran, Islamic Rep. | 41 (1.0) | 39 (0.9) | 42 (1.0) | 41 (0.9) | 33 (1.1) | 32 (0.9) |
| Ireland | 61 (0.7) | 61 (0.8) | 63 (0.7) | 62 (0.8) | 54 (0.8) | 53 (1.0) |
| Japan | 70 (0.4) | 69 (0.4) | 71 (0.4) | 70 (0.4) | 66 (0.6) | 66 (0.7) |
| Korea | 75 (0.5) | 73 (0.5) | 75 (0.5) | 73 (0.5) | 75 (0.8) | 73 (0.7) |
| Latvia (LSS) | 55 (0.9) | 57 (1.0) | 57 (0.9) | 59 (1.0) | 48 (1.3) | 49 (1.2) |
| Netherlands | ▲ 70 (0.7) | 65 (0.7) | ▲ 71 (0.7) | 66 (0.7) | ▲ 64 (1.0) | 59 (1.1) |
| New Zealand | 59 (1.2) | 61 (0.9) | 61 (1.2) | 63 (0.9) | 53 (1.5) | 54 (1.2) |
| Norway | 61 (0.8) | 60 (0.7) | 63 (0.8) | 62 (0.7) | 53 (1.1) | 51 (1.0) |
| Portugal | 50 (0.9) | 50 (0.8) | 53 (0.9) | 53 (0.8) | 41 (1.2) | 40 (1.0) |
| Scotland | 61 (0.9) | 60 (0.8) | 62 (0.9) | 62 (0.8) | 55 (1.2) | 53 (1.1) |
| Singapore | 65 (0.9) | 64 (1.0) | 66 (0.9) | 65 (1.0) | 61 (1.1) | 61 (1.2) |
| Slovenia | 64 (0.7) | 63 (0.8) | 66 (0.7) | 65 (0.8) | 58 (1.0) | 57 (1.0) |
| United States | 67 (0.6) | 65 (0.6) | 69 (0.6) | 67 (0.6) | 60 (0.6) | 57 (0.8) |
| International Avg. | ▲ 62 (0.2) | 60 (0.1) | ▲ 64 (0.2) | 62 (0.2) | ▲ 55 (0.2) | 54 (0.2) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.24 Average Percent Correct by Cognitive Demand and Gender - Science
### Eighth Grade*

| Country | Overall (146 items) | | Understanding and Procedures (104 items) | | Analyzing and Investigating (42 items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 61 (1.0) | 59 (0.8) | 64 (0.9) | 62 (0.7) | 53 (1.1) | 53 (1.0) |
| Austria | 63 (0.8) | 60 (0.8) | 67 (0.8) | 63 (0.8) | 54 (0.9) | 51 (1.0) |
| Belgium (Fl) | 62 (1.7) | 59 (1.5) | 63 (1.6) | 59 (1.5) | 59 (2.1) | 58 (1.6) |
| Belgium (Fr) | 52 (0.0) | 49 (0.7) | 54 (1.0) | 51 (0.6) | 46 (1.2) | 44 (1.0) |
| Canada | 60 (0.6) | 58 (0.6) | 62 (0.6) | 60 (0.6) | 54 (0.8) | 52 (0.7) |
| Colombia | 40 (1.4) | 37 (0.8) | 44 (1.4) | 41 (0.8) | 30 (1.7) | 28 (0.9) |
| Cyprus | 46 (0.4) | 47 (0.6) | 49 (0.4) | 50 (0.6) | 39 (0.9) | 40 (0.8) |
| Czech Republic | ▲ 67 (0.8) | 61 (1.1) | ▲ 71 (0.8) | 66 (1.1) | ▲ 57 (1.1) | 50 (1.4) |
| England | 63 (1.0) | 60 (0.7) | 65 (1.0) | 61 (0.7) | 58 (1.2) | 56 (1.0) |
| France | ▲ 55 (0.6) | 52 (0.8) | ▲ 58 (0.6) | 54 (0.8) | 50 (1.0) | 48 (0.9) |
| Germany | 59 (1.2) | 57 (1.0) | 63 (1.1) | 60 (0.9) | 50 (1.5) | 49 (1.5) |
| Hong Kong | ▲ 60 (1.1) | 55 (1.1) | ▲ 65 (1.0) | 59 (0.9) | 49 (1.5) | 44 (1.5) |
| Hungary | ▲ 63 (0.7) | 59 (0.7) | ▲ 67 (0.6) | 63 (0.6) | ▲ 53 (0.9) | 49 (0.9) |
| Iceland | 53 (1.2) | 51 (0.9) | 55 (1.2) | 54 (0.9) | 47 (1.3) | 44 (1.2) |
| Iran, Islamic Rep. | ▲ 49 (0.8) | 45 (0.8) | ▲ 52 (0.8) | 48 (0.7) | ▲ 43 (1.0) | 37 (1.1) |
| Ireland | 60 (1.3) | 57 (1.0) | 62 (1.2) | 59 (1.0) | 54 (1.6) | 52 (1.1) |
| Japan | ▲ 67 (0.5) | 64 (0.4) | ▲ 70 (0.4) | 66 (0.4) | 60 (0.6) | 57 (0.5) |
| Korea | ▲ 67 (0.5) | 64 (0.5) | ▲ 70 (0.5) | 67 (0.5) | ▲ 59 (0.7) | 56 (0.8) |
| Latvia (LSS) | ▲ 52 (0.8) | 48 (0.6) | ▲ 56 (0.8) | 52 (0.6) | ▲ 44 (1.0) | 38 (0.8) |
| Lithuania | ▲ 51 (0.8) | 47 (0.8) | ▲ 56 (0.8) | 52 (0.8) | ▲ 40 (1.1) | 35 (1.0) |
| Netherlands | 64 (1.2) | 60 (1.1) | 66 (1.2) | 62 (0.9) | 60 (1.6) | 56 (1.8) |
| New Zealand | 60 (1.0) | 56 (1.0) | ▲ 62 (1.0) | 57 (0.9) | 55 (1.1) | 52 (1.2) |
| Norway | 59 (0.6) | 56 (0.4) | ▲ 61 (0.6) | 58 (0.4) | 53 (0.8) | 51 (0.7) |
| Portugal | ▲ 52 (0.7) | 48 (0.6) | ▲ 57 (0.7) | 51 (0.6) | ▲ 42 (0.7) | 38 (0.7) |
| Romania | 51 (0.9) | 49 (0.9) | 55 (1.0) | 54 (0.9) | 39 (1.0) | 36 (1.0) |
| Russian Federation | 60 (0.9) | 57 (0.7) | 64 (1.0) | 62 (0.6) | 49 (1.0) | 46 (1.0) |
| Scotland | 58 (1.2) | 53 (0.9) | 59 (1.2) | 55 (0.9) | 53 (1.3) | 48 (1.2) |
| Singapore | 71 (1.2) | 69 (1.1) | 73 (1.2) | 70 (1.1) | 66 (1.3) | 64 (1.3) |
| Slovak Republic | ▲ 62 (0.6) | 57 (0.7) | ▲ 66 (0.6) | 61 (0.7) | ▲ 52 (0.9) | 47 (0.9) |
| Slovenia | ▲ 64 (0.6) | 59 (0.7) | ▲ 67 (0.6) | 63 (0.7) | ▲ 55 (1.0) | 50 (0.9) |
| Spain | ▲ 58 (0.5) | 54 (0.5) | ▲ 61 (0.5) | 57 (0.5) | ▲ 49 (0.6) | 46 (0.7) |
| Sweden | ▲ 60 (0.6) | 57 (0.6) | ▲ 63 (0.7) | 59 (0.6) | 54 (0.7) | 52 (0.8) |
| Switzerland | ▲ 58 (0.6) | 54 (0.5) | ▲ 60 (0.6) | 56 (0.5) | 53 (0.9) | 50 (0.7) |
| United States | 59 (1.0) | 57 (1.0) | 63 (1.0) | 60 (0.9) | 51 (1.1) | 50 (1.2) |
| International Avg. | ▲ 58 (0.1) | 55 (0.1) | ▲ 62 (0.1) | 58 (0.1) | ▲ 51 (0.2) | 48 (0.2) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.25 Average Percent Correct by Cognitive Demand and Gender - Science Literacy
### Final Year of Secondary School*

| Country | Overall (30 items) | | Understanding and Procedures (17 items) | | Analyzing and Investigating (13 items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 62 (2.3) | 57 (1.7) | 61 (2.3) | 58 (1.5) | 64 (2.5) | 55 (2.2) |
| Austria | ▲ 63 (1.4) | 55 (1.0) | ▲ 66 (1.4) | 59 (1.0) | ▲ 60 (1.7) | 50 (1.3) |
| Canada | ▲ 62 (0.8) | 58 (0.8) | 61 (0.8) | 59 (0.7) | ▲ 63 (1.0) | 56 (1.2) |
| Cyprus | 44 (1.4) | 41 (0.8) | 45 (1.4) | 43 (0.9) | 42 (1.8) | 38 (1.2) |
| Czech Republic | ▲ 56 (1.7) | 46 (1.8) | ▲ 58 (1.8) | 49 (1.8) | ▲ 54 (1.7) | 41 (1.8) |
| France | ▲ 57 (1.9) | 50 (1.3) | 60 (1.9) | 54 (1.2) | ▲ 53 (2.1) | 44 (1.7) |
| Germany | 57 (1.4) | 51 (1.5) | 57 (1.1) | 53 (1.4) | 57 (1.9) | 50 (1.8) |
| Hungary | ▲ 51 (0.9) | 46 (0.8) | 54 (0.9) | 51 (0.8) | ▲ 48 (1.0) | 40 (0.8) |
| Iceland | ▲ 65 (0.6) | 58 (0.7) | ▲ 68 (0.6) | 63 (0.6) | ▲ 62 (0.8) | 52 (0.9) |
| Lithuania | 51 (1.6) | 48 (1.5) | 54 (1.3) | 51 (1.6) | 48 (2.0) | 44 (1.5) |
| Netherlands | ▲ 68 (1.0) | 60 (1.0) | ▲ 65 (1.0) | 58 (1.0) | ▲ 73 (1.1) | 62 (1.3) |
| New Zealand | 61 (1.4) | 58 (1.0) | 59 (1.5) | 58 (0.9) | ▲ 64 (1.5) | 58 (1.4) |
| Norway | ▲ 67 (1.0) | 57 (0.9) | ▲ 67 (0.9) | 59 (1.0) | ▲ 68 (1.2) | 56 (0.9) |
| Russian Federation | ▲ 58 (1.2) | 51 (1.2) | 59 (1.3) | 54 (1.2) | ▲ 57 (1.4) | 46 (1.5) |
| Slovenia | 61 (2.0) | 54 (1.5) | 65 (1.9) | 59 (1.6) | ▲ 56 (2.3) | 47 (1.7) |
| Sweden | ▲ 68 (0.9) | 60 (0.7) | ▲ 67 (0.9) | 60 (0.7) | ▲ 70 (1.0) | 61 (0.8) |
| Switzerland | ▲ 61 (1.3) | 55 (1.4) | 61 (1.4) | 57 (1.4) | ▲ 62 (1.4) | 52 (1.6) |
| United States | ▲ 55 (0.7) | 51 (0.8) | 57 (0.8) | 54 (0.9) | ▲ 53 (0.8) | 47 (0.9) |
| International Avg. | ▲ 59 (0.3) | 53 (0.3) | ▲ 60 (0.3) | 55 (0.3) | ▲ 58 (0.4) | 50 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.26 Average Percent Correct by Cognitive Demand and Gender - Physics
### Final Year of Secondary School*

| Country | Overall (80 items) | | Understanding and Procedures (25 items) | | Analyzing and Investigating (55 items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | ▲ 39 (1.3) | 33 (1.1) | ▲ 45 (1.6) | 36 (1.8) | 37 (1.3) | 32 (1.6) |
| Austria | ▲ 30 (1.2) | 22 (1.1) | ▲ 40 (1.4) | 32 (1.4) | ▲ 26 (1.3) | 18 (1.1) |
| Canada | ▲ 34 (0.8) | 28 (1.3) | ▲ 39 (0.9) | 33 (1.3) | ▲ 32 (0.9) | 25 (1.4) |
| Cyprus | ▲ 39 (1.3) | 32 (1.3) | 41 (1.8) | 34 (1.7) | ▲ 38 (1.4) | 32 (1.6) |
| Czech Republic | ▲ 35 (1.6) | 23 (0.6) | ▲ 42 (1.5) | 33 (0.9) | ▲ 32 (1.8) | 18 (0.6) |
| France | 31 (0.7) | 28 (1.0) | 42 (1.0) | 40 (1.0) | 26 (0.8) | 23 (1.1) |
| Germany | ▲ 42 (2.2) | 31 (1.6) | ▲ 46 (2.2) | 37 (1.8) | ▲ 41 (2.4) | 29 (2.0) |
| Norway | ▲ 51 (1.1) | 43 (1.8) | ▲ 56 (1.2) | 50 (1.6) | ▲ 48 (1.1) | 40 (1.9) |
| Russian Federation | ▲ 46 (1.7) | 37 (2.5) | 50 (1.4) | 44 (2.4) | ▲ 45 (1.9) | 33 (2.7) |
| Slovenia | 43 (2.8) | 35 (3.1) | 47 (2.2) | 41 (3.1) | 42 (3.2) | 32 (3.5) |
| Sweden | ▲ 50 (1.0) | 41 (1.1) | ▲ 55 (1.1) | 46 (1.3) | ▲ 47 (1.1) | 39 (1.1) |
| Switzerland | ▲ 37 (1.0) | 27 (0.7) | ▲ 43 (1.2) | 34 (1.2) | ▲ 35 (1.1) | 23 (0.8) |
| United States | ▲ 25 (0.6) | 21 (0.4) | ▲ 32 (0.9) | 29 (0.6) | ▲ 21 (0.6) | 17 (0.5) |
| International Avg. | ▲ 39 (0.4) | 31 (0.4) | ▲ 45 (0.5) | 38 (0.4) | ▲ 36 (0.5) | 28 (0.5) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Gender Differences by Item Format

The TIMSS assessments in mathematics and science included a variety of different item formats. The majority of the items were in the multiple-choice format, however, approximately one-fourth of the questions were in the free-response format, requiring students to generate and write or diagram their answers. The free-response questions were allotted approximately one-third of the testing time. Some of the free-response items required short answers and others required more extended responses that were scored using procedures that permitted partial credit. Consequently, this section examines the extent to which there are gender differences in achievement by three different types of item format – multiple-choice, short-answer, and extended-response.

In mathematics at the fourth and eighth grades, there were few significant gender differences in achievement by item format (see Exhibits 3.27 and 3.28). At the final year of secondary school, the mathematics literacy assessment had only two types of items – multiple-choice and short-answer. As shown in Exhibit 3.29, significant gender differences in achievement by item type usually followed in countries where males had significantly higher achievement overall than females. Interestingly, however, a slightly larger set of countries (four more) showed differences on the short-answer items than did on the multiple-choice items. As shown in Exhibit 3.30, males outperformed females on the advanced mathematics assessment in most countries and their advantage appeared to be approximately the same across all three item types.

Exhibit 3.27-3.28

Exhibit 3.29

Exhibit 3.30

In science, different patterns in gender differences by item format were observed for the different assessments. The results for fourth grade presented in Exhibit 3.31 show few significant gender differences in performance by item type. It is interesting to note, however, that where differences by item type did occur, they were more frequently observed in favor of males on the short-answer items. In contrast, the male advantage in science at the eighth grade was more often reflected on the multiple-choice items (see Exhibit 3.32). Males had higher average achievement than females on the multiple-choice items in well over half of the participating countries compared to only about one-quarter of the countries for the short-answer items and almost no countries for the extended-response items.

Exhibit 3.31

Exhibit 3.32

It is interesting to note that the patterns for gender differences by item type found at the eighth grade also were evidenced for the science literacy assessment given at the secondary level. As shown in Exhibit 3.33, males exhibited significantly higher achievement on multiple-choice items in most countries and on the short-answer items in a slightly smaller subset of those countries. There were no countries in which males had significantly higher achievement on the extended response items. This same trend was not observed for the students taking the physics assessment, however. In fact, the results in Exhibit 3.34 reveal that males had significantly higher achievement on multiple-choice and extended-response items in almost every participating country, but only 5 out of 13 countries had gender differences for the short-answer items in physics.

Exhibit 3.33

Exhibit 3.34

## Exhibit 3.27 Average Percent Correct by Item Format and Gender - Mathematics
### Fourth Grade*

| Country | Overall Items (107 Items) | | Multiple-Choice (79 Items) | | Short-Answer (15 Items) | | Extended-Response (13 Items) | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Australia | 63 (0.8) | 63 (0.8) | 66 (0.7) | 66 (0.7) | 62 (1.2) | 61 (1.2) | 49 (1.0) | 51 (1.2) |
| Austria | 66 (0.9) | 64 (0.8) | 71 (0.7) | 69 (0.7) | 62 (1.7) | 61 (1.4) | 51 (1.5) | 50 (1.4) |
| Canada | 61 (1.1) | 60 (1.2) | 65 (0.9) | 63 (1.0) | 55 (1.6) | 55 (1.9) | 49 (1.4) | 51 (1.8) |
| Cyprus | 55 (0.8) | 53 (0.7) | 59 (0.8) | 57 (0.7) | 50 (1.0) | 47 (1.1) | 40 (1.1) | 40 (1.2) |
| Czech Republic | 67 (0.7) | 66 (0.7) | 70 (0.6) | 70 (0.6) | 64 (1.3) | 61 (1.1) | 52 (1.3) | 52 (1.2) |
| England | 57 (0.8) | 56 (0.9) | 60 (0.7) | 59 (0.8) | 55 (1.2) | 50 (1.2) | 47 (1.2) | 46 (1.3) |
| Hong Kong | 73 (1.0) | 73 (0.8) | 77 (0.9) | 77 (0.7) | 67 (1.3) | 66 (1.2) | 60 (1.5) | 62 (1.1) |
| Hungary | 64 (0.8) | 64 (0.9) | 68 (0.8) | 68 (0.8) | 62 (1.1) | 60 (1.4) | 49 (1.2) | 50 (1.5) |
| Iceland | 50 (1.0) | 49 (0.9) | 54 (0.8) | 53 (0.8) | 43 (1.8) | 40 (1.5) | 40 (1.6) | 38 (1.4) |
| Iran, Islamic Rep. | 39 (1.4) | 37 (1.1) | 46 (1.4) | 44 (1.1) | 29 (1.5) | 27 (1.5) | 19 (1.4) | 18 (1.2) |
| Ireland | 63 (0.9) | 64 (0.9) | 67 (0.9) | 67 (0.9) | 62 (1.2) | 61 (1.4) | 49 (1.2) | 51 (1.2) |
| Japan | 75 (0.5) | 74 (0.5) | 77 (0.5) | 76 (0.5) | ▲ 75 (0.8) | 70 (0.7) | 66 (0.8) | 66 (0.7) |
| Korea | ▲ 78 (0.4) | 76 (0.5) | ▲ 79 (0.4) | 77 (0.5) | ▲ 79 (0.8) | 75 (0.8) | 71 (0.8) | 71 (0.9) |
| Latvia (LSS) | 58 (1.2) | 60 (1.1) | 63 (1.1) | 65 (0.9) | 53 (1.8) | 54 (1.7) | 39 (1.6) | 42 (1.7) |
| Netherlands | 71 (0.8) | 68 (0.8) | ▲ 74 (0.7) | 71 (0.7) | 67 (1.3) | 63 (1.6) | 61 (1.3) | 61 (1.4) |
| New Zealand | 52 (1.3) | 54 (0.9) | 56 (1.2) | 58 (0.9) | 47 (2.0) | 48 (1.4) | 40 (1.6) | 44 (1.2) |
| Norway | 54 (0.9) | 53 (0.8) | 58 (0.7) | 57 (0.7) | 47 (1.5) | 45 (1.5) | 41 (1.5) | 42 (1.3) |
| Portugal | 48 (0.8) | 48 (0.8) | 55 (0.8) | 54 (0.8) | 35 (1.2) | 34 (1.2) | 32 (1.1) | 33 (1.0) |
| Scotland | 58 (0.9) | 58 (0.9) | 61 (0.8) | 61 (0.8) | 55 (1.4) | 54 (1.2) | 47 (1.2) | 50 (1.2) |
| Singapore | 75 (0.9) | 76 (1.0) | 77 (0.8) | 78 (0.9) | 70 (1.2) | 72 (1.2) | 69 (1.1) | 72 (1.2) |
| Slovenia | 64 (0.7) | 65 (0.9) | 69 (0.6) | 68 (0.8) | 59 (1.1) | 61 (1.2) | 50 (1.3) | 52 (1.5) |
| United States | 63 (0.7) | 62 (0.7) | 66 (0.6) | 66 (0.6) | 59 (1.2) | 55 (1.1) | 52 (1.0) | 53 (0.9) |
| International Avg. | 61 (0.2) | 61 (0.2) | 65 (0.2) | 65 (0.2) | ▲ 57 (0.3) | 56 (0.3) | 49 (0.3) | 50 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.28 Average Percent Correct by Item Format and Gender - Mathematics
### Eighth Grade*

| Country | Overall Items (158 Items) | | Multiple-Choice (124 Items) | | Short-Answer (18 Items) | | Extended-Response (16 Items) | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Australia | 57 (1.2) | 59 (1.1) | 62 (1.1) | 63 (1.0) | 51 (1.6) | 53 (1.4) | 34 (1.5) | 37 (1.4) |
| Austria | 63 (0.8) | 61 (1.2) | 66 (0.8) | 64 (1.0) | 62 (1.1) | 63 (1.5) | 43 (1.3) | 41 (2.2) |
| Belgium (Fl) | 65 (2.0) | 66 (1.9) | 70 (1.9) | 71 (1.7) | 60 (3.2) | 61 (3.2) | 41 (2.0) | 41 (2.4) |
| Belgium (Fr) | 59 (1.1) | 58 (0.9) | 64 (1.0) | 63 (0.9) | 54 (1.9) | 53 (1.4) | 35 (1.6) | 34 (1.4) |
| Canada | 59 (0.7) | 59 (0.6) | 63 (0.7) | 63 (0.6) | 53 (1.1) | 53 (0.9) | 35 (1.3) | 38 (1.2) |
| Colombia | 30 (1.6) | 29 (1.0) | 34 (1.7) | 33 (0.9) | 21 (1.8) | 20 (0.9) | 8 (1.1) | 9 (2.3) |
| Cyprus | 47 (0.6) | 48 (0.6) | 51 (0.6) | 52 (0.6) | 44 (1.1) | 47 (1.2) | 26 (1.5) | 28 (1.2) |
| Czech Republic | 67 (1.0) | 64 (1.3) | 71 (0.9) | 68 (1.2) | 64 (1.5) | 64 (1.6) | 43 (1.9) | 42 (2.4) |
| England | 53 (1.3) | 53 (0.9) | 58 (1.2) | 57 (0.9) | 44 (1.5) | 43 (1.4) | 35 (2.0) | 33 (1.5) |
| France | 62 (0.8) | 61 (0.9) | 68 (0.8) | 66 (0.9) | 57 (1.2) | 55 (1.3) | 33 (1.5) | 32 (1.6) |
| Germany | 54 (1.3) | 54 (1.2) | 59 (1.2) | 58 (1.2) | 50 (1.7) | 49 (1.8) | 28 (1.9) | 29 (1.4) |
| Hong Kong | 72 (1.7) | 68 (1.7) | 75 (1.5) | 71 (1.6) | 71 (2.0) | 66 (2.5) | 52 (2.3) | 47 (2.4) |
| Hungary | 61 (0.8) | 62 (0.8) | 65 (0.8) | 65 (0.8) | 61 (1.4) | 64 (1.2) | 37 (1.2) | 37 (1.4) |
| Iceland | 49 (1.3) | 50 (1.3) | 55 (1.2) | 55 (1.2) | 39 (1.8) | 41 (1.9) | 26 (1.8) | 27 (2.3) |
| Iran, Islamic Rep. | 39 (0.8) | 36 (0.8) | 44 (0.9) | 40 (0.8) | 34 (1.7) | 31 (1.3) | 16 (1.3) | 15 (1.3) |
| Ireland | 60 (1.6) | 58 (1.4) | 63 (1.6) | 60 (1.3) | 58 (2.0) | 59 (1.8) | 40 (2.1) | 38 (2.2) |
| Japan | 74 (0.5) | 73 (0.4) | 77 (0.5) | 76 (0.4) | 73 (0.7) | 72 (0.8) | 58 (1.2) | 57 (1.0) |
| Korea | ▲ 73 (0.6) | 70 (0.7) | ▲ 77 (0.6) | 73 (0.7) | 72 (0.9) | 70 (1.1) | ▲ 54 (1.3) | 47 (1.5) |
| Latvia (LSS) | 52 (1.0) | 51 (0.8) | 57 (1.0) | 56 (0.8) | 46 (1.5) | 47 (1.2) | 27 (1.5) | 23 (1.3) |
| Lithuania | 48 (1.1) | 49 (1.0) | 53 (1.1) | 53 (1.0) | 44 (1.6) | 45 (1.6) | 21 (1.4) | 22 (1.4) |
| Netherlands | 61 (1.8) | 59 (1.6) | 66 (1.6) | 63 (1.6) | 50 (2.4) | 48 (1.9) | 38 (2.9) | 38 (2.0) |
| New Zealand | 55 (1.4) | 53 (1.3) | 59 (1.3) | 58 (1.2) | 47 (1.6) | 44 (1.6) | 32 (2.0) | 32 (1.7) |
| Norway | 54 (0.6) | 53 (0.6) | 58 (0.6) | 57 (0.6) | 47 (1.0) | 49 (1.2) | 35 (1.1) | 32 (1.0) |
| Portugal | 44 (0.8) | 42 (0.7) | 50 (0.8) | 47 (0.7) | 34 (1.2) | 34 (1.1) | 18 (0.9) | 16 (0.9) |
| Romania | 49 (1.2) | 49 (1.0) | 53 (1.1) | 52 (0.9) | 47 (1.5) | 48 (1.5) | 28 (1.6) | 29 (1.5) |
| Russian Federation | 59 (1.4) | 61 (1.3) | 63 (1.5) | 64 (1.1) | 57 (1.7) | 60 (1.3) | 36 (1.4) | 38 (2.5) |
| Scotland | 53 (1.7) | 50 (1.3) | 58 (1.6) | 54 (1.2) | 45 (2.0) | 42 (1.6) | 33 (2.4) | 31 (1.8) |
| Singapore | 79 (1.1) | 80 (1.0) | 80 (1.0) | 81 (0.9) | 82 (1.3) | 84 (1.0) | 68 (1.7) | 68 (1.7) |
| Slovak Republic | 63 (0.9) | 62 (0.8) | 67 (0.9) | 66 (0.8) | 61 (1.1) | 62 (1.1) | 37 (1.4) | 38 (1.4) |
| Slovenia | 62 (0.8) | 60 (0.7) | 67 (0.7) | 64 (0.7) | 58 (1.2) | 57 (1.1) | 37 (1.6) | 36 (1.3) |
| Spain | 52 (0.7) | 50 (0.7) | 56 (0.6) | 54 (0.7) | 49 (1.1) | 46 (1.2) | 28 (1.4) | 26 (0.9) |
| Sweden | 56 (0.8) | 56 (0.8) | 60 (0.8) | 60 (0.7) | 45 (1.1) | 47 (0.9) | 35 (1.4) | 36 (1.5) |
| Switzerland | 63 (0.8) | 61 (0.7) | 67 (0.8) | 66 (0.7) | 57 (1.0) | 56 (1.0) | 42 (1.5) | 38 (1.1) |
| United States | 53 (1.2) | 53 (1.1) | 58 (1.1) | 57 (1.0) | 47 (1.5) | 47 (1.5) | 29 (1.3) | 29 (1.3) |
| International Avg. | ▲ 57 (0.2) | 56 (0.2) | ▲ 61 (0.2) | 61 (0.2) | 52 (0.2) | 52 (0.2) | 35 (0.3) | 34 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.29 Average Percent Correct by Item Format and Gender - Mathematics Literacy
### Final Year of Secondary School*

| Country | Overall Items (45 Items) | | Multiple-Choice (33 Items) | | Short-Answer (12 Items) | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 65 (2.4) | 59 (2.2) | 69 (2.6) | 64 (2.1) | 54 (2.4) | 45 (2.6) |
| Austria | ▲ 66 (1.5) | 57 (1.2) | ▲ 72 (1.5) | 63 (1.1) | ▲ 49 (1.9) | 40 (1.6) |
| Canada | ▲ 64 (1.1) | 56 (0.9) | ▲ 68 (1.1) | 62 (0.9) | ▲ 51 (1.4) | 41 (1.3) |
| Cyprus | 43 (1.5) | 41 (1.1) | 51 (1.6) | 49 (1.3) | 23 (1.8) | 20 (1.2) |
| Czech Republic | 51 (2.3) | 42 (4.1) | 58 (2.3) | 47 (5.0) | 32 (2.3) | 26 (1.9) |
| France | ▲ 64 (1.2) | 56 (1.3) | ▲ 71 (1.1) | 63 (1.2) | ▲ 47 (1.9) | 36 (1.5) |
| Germany | 58 (1.9) | 51 (2.0) | 63 (1.9) | 57 (2.0) | ▲ 43 (1.9) | 33 (2.2) |
| Hungary | 49 (1.1) | 48 (1.0) | 56 (1.1) | 56 (1.1) | 29 (1.3) | 26 (1.0) |
| Iceland | ▲ 68 (0.8) | 58 (0.7) | ▲ 74 (0.7) | 64 (0.6) | ▲ 53 (1.4) | 42 (1.2) |
| Lithuania | 49 (2.0) | 47 (2.1) | 57 (2.2) | 56 (2.4) | 28 (1.8) | 23 (1.8) |
| Netherlands | ▲ 75 (1.0) | 63 (1.4) | ▲ 80 (1.0) | 69 (1.4) | ▲ 60 (1.4) | 45 (1.7) |
| New Zealand | ▲ 65 (1.1) | 59 (1.4) | 69 (1.1) | 64 (1.4) | ▲ 55 (1.3) | 48 (1.6) |
| Norway | ▲ 67 (1.1) | 54 (1.1) | ▲ 71 (1.0) | 60 (1.1) | ▲ 55 (1.4) | 40 (1.2) |
| Russian Federation | 52 (1.7) | 47 (1.6) | 58 (1.7) | 53 (1.5) | 34 (1.9) | 29 (2.1) |
| Slovenia | 66 (2.7) | 56 (2.0) | 72 (2.9) | 62 (2.1) | ▲ 50 (2.7) | 38 (2.0) |
| Sweden | ▲ 70 (1.1) | 62 (0.8) | ▲ 74 (0.9) | 67 (0.8) | ▲ 61 (1.7) | 50 (1.0) |
| Switzerland | 67 (1.7) | 60 (1.7) | 72 (1.6) | 66 (1.7) | ▲ 51 (2.0) | 43 (1.7) |
| United States | 50 (1.1) | 47 (1.0) | 54 (1.0) | 51 (1.0) | 37 (1.4) | 34 (1.0) |
| International Avg. | ▲ 60 (0.4) | 53 (0.3) | ▲ 66 (0.4) | 59 (0.4) | ▲ 45 (0.4) | 36 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.30 Average Percent Correct by Item Format and Gender - Advanced Mathematics
### Final Year of Secondary School*

| Country | Overall (65 Items) | | Multiple-Choice (45 Items) | | Short-Answer (13 Items) | | Extended-Response (7 Items) | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Australia | 53 (2.6) | 50 (2.6) | 57 (2.3) | 55 (2.3) | 50 (3.3) | 48 (3.0) | 40 (3.0) | 39 (4.1) |
| Austria | ▲ 43 (1.5) | 31 (1.4) | ▲ 48 (1.4) | 37 (1.3) | ▲ 44 (2.4) | 27 (2.1) | ▲ 25 (2.5) | ▲ 15 (1.7) |
| Canada | ▲ 50 (1.2) | 43 (0.8) | ▲ 56 (1.1) | 50 (0.7) | ▲ 44 (1.6) | 36 (1.2) | ▲ 39 (1.7) | ▲ 30 (1.3) |
| Cyprus | 50 (0.9) | 47 (1.8) | 59 (1.0) | 55 (1.7) | 39 (1.1) | 35 (2.9) | 36 (1.9) | 34 (2.4) |
| Czech Republic | ▲ 49 (2.4) | 34 (1.4) | ▲ 54 (2.2) | 40 (1.3) | ▲ 41 (2.7) | 24 (1.4) | ▲ 41 (3.3) | ▲ 25 (2.6) |
| France | 59 (1.4) | 55 (1.3) | 63 (0.9) | 60 (1.2) | 63 (1.9) | 56 (2.2) | 40 (2.6) | 39 (2.1) |
| Germany | ▲ 42 (1.2) | 35 (1.2) | ▲ 48 (1.1) | 43 (1.0) | ▲ 38 (1.6) | 31 (1.9) | ▲ 25 (1.9) | ▲ 18 (1.5) |
| Lithuania | ▲ 52 (0.7) | 42 (1.0) | ▲ 59 (0.9) | 51 (0.9) | ▲ 39 (1.3) | 26 (1.6) | ▲ 46 (1.3) | ▲ 34 (1.3) |
| Russian Federation | ▲ 56 (2.0) | 48 (1.8) | ▲ 62 (1.8) | 54 (1.8) | ▲ 49 (2.3) | 39 (2.0) | 49 (3.2) | 40 (2.5) |
| Slovenia | 41 (2.0) | 38 (1.9) | 47 (1.9) | 45 (1.8) | 34 (2.1) | 28 (2.0) | 31 (3.1) | 28 (2.5) |
| Sweden | 48 (1.3) | 46 (1.3) | 57 (1.1) | 53 (1.0) | 39 (2.1) | 37 (2.0) | 34 (2.0) | 32 (4.7) |
| Switzerland | ▲ 54 (0.9) | 45 (1.2) | ▲ 61 (1.0) | 52 (1.3) | ▲ 49 (1.4) | 39 (1.9) | ▲ 41 (1.7) | ▲ 31 (2.2) |
| United States | 37 (1.2) | 32 (1.3) | 45 (1.3) | 41 (1.3) | 30 (1.5) | 24 (1.8) | ▲ 22 (1.4) | ▲ 16 (1.1) |
| International Avg. | ▲ 48 (0.5) | 42 (0.4) | ▲ 55 (0.5) | 49 (0.4) | ▲ 42 (0.6) | 34 (0.6) | ▲ 35 (0.7) | ▲ 29 (0.7) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.31 Average Percent Correct by Item Format and Gender - Science
### Fourth Grade*

| Country | Overall (105 items) | | Multiple-Choice (74 items) | | Short-Answer (13 items) | | Extended-Response (18 items) | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Australia | 67 (0.6) | 65 (0.6) | 70 (0.6) | 67 (0.5) | 61 (1.0) | 58 (0.8) | 62 (1.0) | 63 (0.9) |
| Austria | 67 (0.9) | 64 (0.7) | 71 (0.8) | 69 (0.7) | ▲ 61 (1.4) | 53 (1.1) | 57 (1.3) | 53 (1.1) |
| Canada | 64 (0.7) | 63 (0.6) | 67 (0.7) | 66 (0.7) | ▲ 57 (1.1) | 52 (0.8) | 56 (1.0) | 57 (0.8) |
| Cyprus | 51 (0.7) | 50 (0.6) | 56 (0.6) | 54 (0.5) | 40 (1.1) | 39 (1.2) | 41 (1.2) | 39 (1.0) |
| Czech Republic | ▲ 67 (0.6) | 64 (0.7) | ▲ 72 (0.5) | 69 (0.6) | 60 (1.1) | 57 (1.0) | 51 (1.1) | 50 (1.1) |
| England | 64 (0.8) | 63 (0.6) | 66 (0.7) | 65 (0.6) | 59 (1.2) | 58 (0.9) | 56 (1.1) | 57 (1.0) |
| Hong Kong | 63 (0.8) | 61 (0.7) | ▲ 67 (0.7) | 64 (0.7) | 57 (1.2) | 53 (1.2) | 52 (1.1) | 52 (1.2) |
| Hungary | 62 (0.8) | 60 (0.7) | 66 (0.7) | 64 (0.7) | 56 (1.2) | 52 (1.2) | 51 (1.1) | 49 (1.1) |
| Iceland | 56 (0.8) | 54 (0.8) | 61 (0.7) | 58 (0.8) | 48 (1.6) | 47 (1.3) | 43 (1.7) | 41 (1.3) |
| Iran, Islamic Rep. | 41 (1.0) | 39 (0.9) | 47 (0.9) | 45 (0.8) | 28 (1.7) | 26 (1.6) | 25 (1.2) | 24 (0.9) |
| Ireland | 61 (0.7) | 61 (0.8) | 64 (0.7) | 63 (0.7) | 54 (1.1) | 52 (1.2) | 56 (1.0) | 55 (1.3) |
| Japan | 70 (0.4) | 69 (0.4) | 73 (0.4) | 72 (0.4) | ▲ 63 (0.9) | 58 (0.9) | 65 (0.6) | 63 (0.6) |
| Korea | 75 (0.5) | 73 (0.5) | 77 (0.5) | 75 (0.5) | 67 (1.1) | 63 (0.9) | 73 (0.8) | 72 (0.9) |
| Latvia (LSS) | 55 (0.9) | 57 (1.0) | 59 (0.8) | 61 (1.0) | 51 (1.6) | 49 (1.4) | 43 (1.4) | 46 (1.4) |
| Netherlands | ▲ 70 (0.7) | 65 (0.7) | ▲ 71 (0.7) | 67 (0.7) | ▲ 63 (1.2) | 55 (1.2) | ▲ 67 (0.9) | 62 (1.0) |
| New Zealand | 59 (1.2) | 61 (0.9) | 63 (1.2) | 64 (0.8) | 51 (1.6) | 53 (1.5) | 51 (1.7) | 55 (1.5) |
| Norway | 61 (0.8) | 60 (0.7) | 64 (0.8) | 63 (0.6) | ▲ 58 (1.4) | 52 (1.2) | 52 (1.2) | 49 (1.2) |
| Portugal | 50 (0.9) | 50 (0.8) | 55 (0.8) | 56 (0.8) | 41 (1.6) | 39 (1.2) | 36 (1.3) | 34 (1.1) |
| Scotland | 61 (0.9) | 60 (0.8) | 63 (0.8) | 62 (0.8) | 56 (1.4) | 54 (1.2) | 55 (1.1) | 54 (1.2) |
| Singapore | 65 (0.9) | 64 (1.0) | 67 (0.8) | 66 (0.9) | 62 (1.2) | 62 (1.4) | 56 (1.4) | 57 (1.3) |
| Slovenia | 64 (0.7) | 63 (0.8) | 68 (0.7) | 66 (0.7) | 62 (1.2) | 61 (1.2) | 52 (1.1) | 52 (1.0) |
| United States | 67 (0.6) | 65 (0.6) | 69 (0.6) | 68 (0.6) | 58 (0.9) | 55 (0.9) | 63 (0.8) | 62 (0.9) |
| International Avg. | ▲ 62 (0.2) | 60 (0.1) | ▲ 65 (0.2) | 64 (0.1) | ▲ 55 (0.3) | 52 (0.2) | 53 (0.2) | 52 (0.2) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.32 Average Percent Correct by Item Format and Gender - Science
### Eighth Grade*

| Country | Overall (146 items) | | Multiple-Choice (102 items) | | Short-Answer (23 items) | | Extended-Response (21 items) | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Australia | 61 (1.0) | 59 (0.8) | 63 (0.9) | 61 (0.8) | 60 (1.2) | 59 (1.1) | 47 (1.3) | 49 (1.0) |
| Austria | 63 (0.8) | 60 (0.8) | ▲ 67 (0.7) | 63 (0.8) | 61 (1.2) | 57 (1.2) | 48 (1.1) | 47 (1.2) |
| Belgium (Fl) | 62 (1.7) | 59 (1.5) | 63 (1.5) | 59 (1.4) | 63 (2.2) | 60 (2.3) | 53 (2.3) | 55 (1.4) |
| Belgium (Fr) | 52 (1.0) | 49 (0.7) | 55 (0.9) | 52 (0.6) | 50 (1.8) | 48 (1.0) | 35 (1.4) | 34 (1.2) |
| Canada | 60 (0.6) | 58 (0.6) | 62 (0.6) | 60 (0.7) | 59 (0.8) | 58 (0.9) | 49 (1.0) | 47 (0.9) |
| Colombia | 40 (1.4) | 37 (0.8) | 44 (1.2) | 41 (0.7) | 37 (2.2) | 33 (1.1) | 26 (2.4) | 25 (1.2) |
| Cyprus | 46 (0.4) | 47 (0.6) | 51 (0.4) | 51 (0.5) | 43 (1.2) | 45 (1.5) | 30 (1.0) | 31 (1.0) |
| Czech Republic | ▲ 67 (0.8) | 61 (1.1) | ▲ 71 (0.8) | 65 (1.0) | 64 (1.3) | 59 (1.5) | ▲ 51 (1.3) | 44 (1.7) |
| England | 63 (1.0) | 60 (0.7) | 64 (1.0) | 61 (0.7) | 65 (1.5) | 62 (1.2) | 53 (1.5) | 54 (1.2) |
| France | ▲ 55 (0.7) | 52 (0.7) | ▲ 59 (0.6) | 55 (0.7) | 54 (1.3) | 52 (1.2) | 38 (1.1) | 38 (1.1) |
| Germany | 59 (1.2) | 57 (1.0) | 63 (1.1) | 60 (0.9) | 57 (1.6) | 55 (1.6) | 43 (1.8) | 43 (1.8) |
| Hong Kong | ▲ 60 (1.1) | 55 (1.1) | ▲ 66 (1.0) | 61 (1.0) | 53 (1.6) | 46 (1.5) | 39 (1.6) | 35 (1.7) |
| Hungary | ▲ 63 (0.7) | 59 (0.7) | ▲ 66 (0.6) | 63 (0.6) | ▲ 64 (1.3) | 56 (1.3) | 44 (1.1) | 43 (1.1) |
| Iceland | 53 (1.2) | 51 (0.9) | 55 (1.1) | 53 (0.8) | 54 (1.7) | 54 (1.8) | 42 (1.5) | 39 (1.8) |
| Iran, Islamic Rep. | ▲ 49 (0.8) | 45 (0.8) | ▲ 52 (0.7) | 49 (0.7) | ▲ 51 (1.7) | 43 (1.5) | 33 (1.1) | 30 (1.3) |
| Ireland | 60 (1.3) | 57 (1.0) | 61 (1.2) | 59 (1.0) | 59 (1.7) | 56 (1.3) | 52 (1.8) | 50 (1.2) |
| Japan | ▲ 67 (0.5) | 64 (0.4) | ▲ 69 (0.4) | 66 (0.3) | 67 (0.8) | 65 (0.8) | 53 (0.8) | 52 (0.7) |
| Korea | ▲ 67 (0.5) | 64 (0.5) | ▲ 71 (0.5) | 67 (0.5) | 65 (1.2) | 62 (1.3) | 53 (1.0) | 50 (1.1) |
| Latvia (LSS) | ▲ 52 (0.8) | 48 (0.6) | ▲ 56 (0.7) | 53 (0.6) | ▲ 51 (1.7) | 42 (1.4) | 34 (1.1) | 31 (1.2) |
| Lithuania | ▲ 51 (0.8) | 47 (0.8) | ▲ 56 (0.8) | 53 (0.7) | ▲ 48 (1.4) | 41 (1.4) | 30 (1.2) | 27 (1.2) |
| Netherlands | 64 (1.2) | 60 (1.1) | ▲ 66 (1.0) | 62 (1.0) | 64 (2.0) | 61 (1.6) | 55 (2.1) | 52 (1.8) |
| New Zealand | 60 (1.0) | 56 (1.0) | ▲ 61 (1.0) | 56 (0.9) | 62 (1.2) | 58 (1.2) | 51 (1.3) | 49 (1.4) |
| Norway | 59 (0.6) | 56 (0.4) | ▲ 61 (0.6) | 57 (0.4) | 60 (1.1) | 59 (0.9) | 49 (1.0) | 50 (0.9) |
| Portugal | ▲ 52 (0.7) | 48 (0.6) | ▲ 57 (0.7) | 52 (0.6) | ▲ 48 (1.2) | 43 (1.1) | 34 (0.8) | 33 (0.8) |
| Romania | 51 (0.9) | 49 (0.9) | 56 (0.9) | 54 (0.9) | 45 (1.2) | 42 (1.3) | 33 (1.3) | 30 (1.2) |
| Russian Federation | 60 (0.9) | 57 (0.7) | 64 (0.9) | 62 (0.7) | 55 (1.4) | 51 (1.3) | 42 (1.3) | 38 (1.2) |
| Scotland | 58 (1.2) | 53 (0.9) | ▲ 60 (1.2) | 55 (0.9) | 56 (1.6) | 52 (1.4) | 48 (1.4) | 44 (1.3) |
| Singapore | 71 (1.2) | 69 (1.1) | 73 (1.2) | 71 (1.1) | 70 (1.3) | 67 (1.3) | 61 (1.7) | 61 (1.5) |
| Slovak Republic | ▲ 62 (0.6) | 57 (0.7) | ▲ 65 (0.6) | 61 (0.7) | ▲ 62 (1.0) | 54 (1.2) | 43 (1.2) | 40 (1.2) |
| Slovenia | ▲ 64 (0.6) | 59 (0.7) | ▲ 67 (0.6) | 63 (0.6) | ▲ 63 (1.2) | 57 (1.0) | 49 (1.3) | 44 (1.3) |
| Spain | ▲ 58 (0.5) | 54 (0.5) | ▲ 60 (0.5) | 56 (0.5) | ▲ 60 (1.1) | 55 (1.1) | 42 (0.7) | 41 (0.8) |
| Sweden | ▲ 60 (0.6) | 57 (0.6) | ▲ 63 (0.7) | 59 (0.6) | 59 (0.8) | 56 (1.0) | 47 (1.0) | 48 (1.0) |
| Switzerland | ▲ 58 (0.6) | 54 (0.5) | ▲ 61 (0.6) | 56 (0.5) | 57 (0.9) | 53 (1.0) | 46 (1.0) | 46 (0.9) |
| United States | 59 (1.0) | 57 (1.0) | 62 (1.0) | 60 (0.9) | 58 (1.2) | 53 (1.4) | 46 (1.3) | 47 (1.4) |
| International Avg. | ▲ 58 (0.1) | 55 (0.1) | ▲ 62 (0.1) | 58 (0.1) | ▲ 57 (0.2) | 53 (0.2) | ▲ 44 (0.2) | 43 (0.2) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.33 Average Percent Correct by Item Format and Gender - Science Literacy
### Final Year of Secondary School*

| Country | Overall (30 items) | | Multiple-Choice (16 items) | | Short-Answer (9 items) | | Extended-Response (5 items) | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Australia | 62 (2.3) | 57 (1.7) | 70 (1.9) | 64 (1.5) | 56 (3.5) | 49 (2.1) | 50 (2.1) | 45 (2.6) |
| Austria | ▲ 63 (1.4) | 55 (1.0) | ▲ 72 (1.1) | 63 (0.8) | ▲ 56 (2.1) | 48 (1.8) | 47 (2.3) | 46 (1.8) |
| Canada | ▲ 62 (0.8) | 58 (0.8) | ▲ 70 (0.8) | 66 (0.7) | 56 (1.4) | 51 (1.6) | 46 (1.7) | 46 (1.4) |
| Cyprus | 44 (1.4) | 41 (0.8) | 55 (1.5) | 51 (1.0) | 34 (1.9) | 30 (1.7) | 27 (2.9) | 27 (1.7) |
| Czech Republic | ▲ 56 (1.7) | 46 (1.8) | ▲ 66 (1.6) | 54 (2.0) | ▲ 45 (1.9) | 35 (1.3) | 47 (2.4) | 38 (2.4) |
| France | ▲ 57 (1.9) | 50 (1.3) | ▲ 69 (1.4) | 61 (1.2) | 45 (2.5) | 37 (1.6) | 41 (3.0) | 38 (2.3) |
| Germany | 57 (1.4) | 51 (1.5) | ▲ 69 (1.1) | 60 (1.2) | 48 (2.3) | 46 (2.5) | 36 (2.5) | 34 (2.1) |
| Hungary | ▲ 51 (0.9) | 46 (0.8) | ▲ 61 (0.8) | 56 (0.7) | ▲ 41 (1.0) | 35 (0.9) | 37 (1.2) | 35 (1.2) |
| Iceland | ▲ 65 (0.6) | 58 (0.7) | ▲ 75 (0.6) | 68 (0.5) | ▲ 62 (1.1) | 52 (1.2) | 43 (1.2) | 39 (0.8) |
| Lithuania | 51 (1.6) | 48 (1.5) | 64 (1.3) | 61 (1.7) | 39 (2.0) | 34 (1.5) | 32 (2.4) | 30 (1.9) |
| Netherlands | ▲ 68 (1.0) | 60 (1.0) | ▲ 74 (0.8) | 63 (0.9) | ▲ 71 (1.5) | 61 (1.9) | 47 (1.5) | 48 (1.2) |
| New Zealand | 61 (1.4) | 58 (1.0) | 69 (1.4) | 65 (1.0) | 57 (2.2) | 52 (1.5) | 45 (1.2) | 45 (1.2) |
| Norway | ▲ 67 (1.0) | 57 (0.9) | ▲ 76 (0.9) | 65 (0.8) | ▲ 67 (1.5) | 55 (1.3) | 42 (1.1) | 38 (1.0) |
| Russian Federation | ▲ 58 (1.2) | 51 (1.2) | ▲ 66 (1.0) | 60 (1.2) | ▲ 54 (2.0) | 43 (1.6) | 40 (1.7) | 33 (1.7) |
| Slovenia | 61 (2.0) | 54 (1.5) | ▲ 74 (1.9) | 66 (1.5) | 47 (2.6) | 39 (1.8) | 46 (2.6) | 40 (2.0) |
| Sweden | ▲ 68 (0.9) | 60 (0.7) | ▲ 76 (0.8) | 67 (0.7) | ▲ 67 (1.4) | 59 (1.1) | 48 (1.2) | 43 (0.9) |
| Switzerland | ▲ 61 (1.3) | 54 (1.4) | ▲ 70 (1.3) | 62 (1.4) | ▲ 55 (1.7) | 47 (1.7) | 46 (1.5) | 42 (1.8) |
| United States | ▲ 55 (0.7) | 51 (0.8) | ▲ 67 (0.7) | 61 (0.9) | ▲ 44 (1.0) | 39 (1.1) | 40 (1.0) | 41 (1.0) |
| International Avg. | ▲ 59 (0.3) | 53 (0.3) | ▲ 69 (0.3) | 62 (0.3) | ▲ 52 (0.4) | 45 (0.3) | ▲ 41 (0.4) | 39 (0.4) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Exhibit 3.34 Average Percent Correct by Item Format and Gender - Physics
### Final Year of Secondary School*

| Country | Overall (80 items) | | Multiple-Choice (41 items) | | Short-Answer (20 items) | | Extended-Response (19 items) | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| Australia | ▲ 39 (1.3) | 33 (1.1) | ▲ 47 (1.1) | 41 (1.3) | 32 (1.8) | 27 (2.7) | 29 (2.4) | 24 (2.3) |
| Austria | ▲ 30 (1.2) | 22 (1.1) | ▲ 39 (1.1) | 32 (1.2) | ▲ 22 (1.8) | 13 (1.2) | ▲ 22 (1.6) | 11 (1.7) |
| Canada | ▲ 34 (0.8) | 28 (1.3) | ▲ 43 (0.8) | 37 (1.1) | ▲ 26 (1.4) | 19 (1.4) | ▲ 24 (1.2) | 17 (1.9) |
| Cyprus | ▲ 39 (1.3) | 33 (1.3) | ▲ 45 (1.3) | 38 (1.1) | 31 (2.0) | 28 (2.6) | ▲ 34 (1.9) | 25 (2.2) |
| Czech Republic | ▲ 35 (1.6) | 23 (0.6) | ▲ 45 (1.4) | 34 (0.9) | ▲ 23 (2.4) | 12 (0.9) | ▲ 25 (1.7) | 10 (0.7) |
| France | 31 (0.7) | 28 (1.0) | 41 (0.7) | 39 (0.8) | 20 (1.1) | 20 (1.8) | ▲ 20 (1.0) | 14 (1.4) |
| Germany | ▲ 43 (2.2) | 32 (1.7) | ▲ 47 (2.0) | 38 (1.5) | 34 (2.8) | 26 (2.7) | ▲ 41 (3.2) | 24 (2.9) |
| Norway | ▲ 51 (1.1) | 43 (1.8) | ▲ 57 (1.0) | 50 (1.6) | 43 (1.5) | 36 (2.4) | ▲ 44 (1.3) | 36 (2.3) |
| Russian Federation | ▲ 46 (1.7) | 37 (2.5) | ▲ 56 (1.4) | 47 (2.2) | 37 (2.2) | 28 (2.8) | ▲ 36 (2.3) | 24 (3.4) |
| Slovenia | 43 (2.8) | 35 (3.1) | 51 (2.5) | 46 (3.0) | 34 (2.9) | 24 (3.4) | 36 (3.8) | 23 (5.1) |
| Sweden | ▲ 50 (1.0) | 41 (1.1) | ▲ 57 (1.1) | 50 (1.0) | ▲ 45 (1.3) | 36 (1.8) | ▲ 39 (1.4) | 29 (1.4) |
| Switzerland | ▲ 37 (1.0) | 27 (0.7) | ▲ 45 (1.1) | 36 (0.7) | ▲ 30 (1.4) | 18 (1.1) | ▲ 30 (1.3) | 15 (1.1) |
| United States | ▲ 25 (0.6) | 21 (0.4) | ▲ 36 (0.6) | 32 (0.6) | 13 (0.7) | 11 (0.5) | ▲ 13 (1.0) | 8 (0.5) |
| International Avg. | ▲ 39 (0.4) | 31 (0.4) | ▲ 47 (0.4) | 40 (0.4) | ▲ 30 (0.6) | 23 (0.6) | ▲ 30 (0.6) | 20 (0.6) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for characteristics of students sampled.

( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

## Summary

The results presented in this chapter suggest that internationally, in mathematics, males tended to perform higher than females on items employing spatial reasoning, reading maps and diagrams, as well as problems involving percentages or area. Females tended to perform higher on items requiring common algorithms. In science, males tended to perform higher on items involving earth science and the physical sciences while females performed higher on items involving life sciences and environmental issues. Males seem to have had a particular advantage on science items presented via diagrams, such as those depicting phenomena in the physical sciences (e.g., electricity and motion).

An analysis of the small set of identical items given to both fourth and eighth graders and a different small set of identical items administered at eighth grade in the literacy assessments at the secondary level, for mathematics and science, respectively, revealed a slight tendency for gender gaps to be somewhat larger for older students. That is, achievement on a given set of identical items increased with grade for both genders, but sometimes the increase in achievement for males tended to exceed the increase in achievement for females, resulting in a widening of the gender gap.

The results of the analysis of items by cognitive demand revealed that across most countries in both mathematics and science, significant gender differences in achievement by cognitive demand tended to coincide with the gender differences favoring males in overall achievement. In most countries, the gender differences were similar across both types of items analyzed – those items essentially requiring knowing as compared to those requiring reasoning and/or problem-solving.

Finally, the results of an analysis by item format compared gender differences on multiple-choice, short-answer, and extended-response questions to gender differences in mathematics and science overall. The results were not consistent across grades or subject areas, although there was a slight tendency at the upper grades for males to have outperformed females in more countries on free-response mathematics items and on multiple-choice science items.

# 4

# Students' Backgrounds and Attitudes Towards Mathematics and Science

## Overview

What leads to such large gender discrepancies in mathematics performance by the final year of secondary school, when relatively few gender differences appear at the fourth and eighth grades? In addition, why do gender differences in science performance appear in the primary grades and increase as students progress through school? Previous studies have examined career aspirations by gender and found that females tended to have much less interest in mathematics and science because of a perceived conflict of roles, interests, usefulness of mathematics, or parental influences.

As a complement to the achievement analyses presented in this report, Chapter 4 explores these issues using the TIMSS background and questionnaire data. More specifically, it presents the results by gender for several background questions, including the amount of time devoted to studying mathematics and science, the perceived value of mathematics and science education, motivating factors to do well in mathematics and science, and career aspirations in fields related to mathematics and science.

## Homework: Do Males and Females Devote the Same Amount of Time to Studying Mathematics and Science?

Since homework assignments can reinforce in-class learning and provide students with additional learning activities, the amount of time students devote to their homework is thought to have a major impact on what is learned. For example, research in learning mathematics has shown that students who spend more time on homework are more likely to develop mathematical ideas, and perform at higher levels on tests that measure mathematical concepts.[8] Thus, this report looks at the amount of time males and females reported spending doing homework or studying mathematics and science.

Exhibit 4.1-4.2

Exhibits 4.1 and 4.2 summarize for the fourth and eighth grades, respectively, the amount of out-of-school time males and females reported studying mathematics and science on a normal school day. On average, internationally, fourth-grade females reported significantly more hours per day spent studying both mathematics and science out of school than did males. They also reported more total hours of daily homework than did males.

At the eighth grade, females in 16 countries devoted significantly more time out of school to their mathematics schoolwork than did males while females in 14 countries spent significantly more time out of school studying science. These data indicate that although female students in the eighth grade reported dedicating just as much, and in several countries, slightly more, time to studying mathematics as did males, it was not evident in their performance. Some students do spend extra time on homework to keep up academically, which possibly could be a contributing factor here.

Exhibit 4.3

Exhibit 4.3 reveals that, internationally, females in the final year of secondary school reported spending more time out of school than males, in studying mathematics (0.9 to 0.7 hours), and science (0.8 to 0.6 hours). Yet, despite the additional time spent studying, females had lower average performance than males on the mathematics and science literacy assessments. Interestingly, even though the gender gap in achievement increased to favor males more at the upper grade levels than at the lower grades, the gender gap in the amount of time devoted to out-of-school study tended to favor of females across the grades. These findings are consistent with those reported in the literature that suggest that females often do better in their mathematics classes (i.e., grades, homework) than males despite performing less well on assessments of mathematics.[9]

[8] Fennema, E. (1990). Justice, equity, and mathematics education" in E. Fennema and G. Leder (Eds.), *Mathematics and Gender: Influences on Teachers and Students.* New York, NY: Teachers College Press.

[9] Willingham, W., and Cole, N. (1997). *Gender and Fair Assessment.* Mawhaw, NJ: Lawrence Erlbaum and Associates.

## Exhibit 4.1 Students' Reports by Gender on Time Spent Studying on a Normal School Day
### Fourth Grade*

| Country | Hours Studying Mathematics | | Hours Studying Science | | Total Hours Studying | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 0.7 (0.02) | 0.8 (0.02) | 0.4 (0.02) | 0.4 (0.02) | 1.9 (0.05) | 2.0 (0.04) |
| Austria | 0.9 (0.03) | 1.0 (0.03) | 0.9 (0.03) | 0.9 (0.04) | 2.8 (0.07) | 3.0 (0.1) |
| Canada | 0.8 (0.03) | 0.8 (0.03) | 0.6 (0.03) | 0.6 (0.03) | 2.1 (0.07) | 2.3 (0.09) |
| Cyprus | 1.1 (0.04) | 1.1 (0.04) | 0.8 (0.03) | 0.9 (0.04) | 3.0 (0.08) | 3.2 (0.09) |
| Czech Republic | 0.7 (0.02) | 0.8 (0.02) | 0.6 (0.02) | 0.6 (0.02) | 2.1 (0.05) | 2.2 (0.06) |
| Hong Kong | 1.2 (0.04) | ▲ 1.4 (0.03) | 0.8 (0.02) | 0.9 (0.03) | 3.7 (0.07) | ▲ 4.1 (0.08) |
| Hungary | 1.0 (0.03) | 1.1 (0.04) | 1.0 (0.03) | 1.1 (0.04) | 3.1 (0.09) | 3.4 (0.11) |
| Iceland | 0.8 (0.03) | 0.9 (0.04) | 0.3 (0.03) | 0.4 (0.03) | 1.7 (0.07) | 2.0 (0.07) |
| Iran, Islamic Rep. | s 2.3 (0.05) | r 2.4 (0.12) | s 2.0 (0.06) | r 2.2 (0.1) | s 6.4 (0.13) | r 6.8 (0.25) |
| Ireland | 0.7 (0.03) | 0.9 (0.03) | 0.4 (0.02) | 0.4 (0.02) | 2.1 (0.07) | 2.2 (0.05) |
| Japan | 0.8 (0.02) | ▲ 0.9 (0.02) | 0.4 (0.02) | ▲ 0.5 (0.02) | 1.9 (0.06) | ▲ 2.3 (0.05) |
| Korea | 0.9 (0.03) | ▲ 1.1 (0.03) | 0.7 (0.02) | 0.8 (0.03) | 2.8 (0.06) | ▲ 3.1 (0.07) |
| Latvia (LSS) | 1.0 (0.04) | 1.0 (0.04) | 0.8 (0.03) | 0.8 (0.04) | 3.0 (0.1) | 2.8 (0.09) |
| Netherlands | 0.5 (0.04) | 0.5 (0.04) | 0.4 (0.04) | 0.4 (0.03) | 1.4 (0.09) | 1.5 (0.08) |
| New Zealand | 0.8 (0.05) | 0.8 (0.04) | 0.5 (0.04) | 0.4 (0.03) | 2.2 (0.1) | 2.1 (0.09) |
| Norway | 0.6 (0.03) | 0.7 (0.03) | 0.3 (0.02) | 0.4 (0.03) | 1.5 (0.06) | 1.7 (0.06) |
| Portugal | 1.2 (0.04) | 1.3 (0.05) | 1.2 (0.04) | 1.3 (0.05) | 3.7 (0.11) | 3.9 (0.13) |
| Scotland | 0.5 (0.02) | 0.6 (0.02) | 0.3 (0.02) | 0.3 (0.02) | 1.6 (0.05) | 1.6 (0.07) |
| Slovenia | 1.0 (0.03) | 1.1 (0.04) | 1.0 (0.03) | 1.1 (0.04) | 3.0 (0.08) | 3.3 (0.09) |
| United States | 0.9 (0.03) | 1.0 (0.03) | 0.8 (0.03) | 0.8 (0.03) | 2.8 (0.06) | 3.0 (0.07) |
| International Avg. | 0.9 (0.01) | ▲ 1.0 (0.01) | 0.7 (0.01) | ▲ 0.8 (0.01) | 2.6 (0.02) | ▲ 2.8 (0.02) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Fourth Grade in most countries; see Appendix A for 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.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for England and Singapore because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.2 Students' Reports by Gender on Time Spent Studying on a Normal School Day - Eighth Grade*

| Country | Hours Studying Mathematics | | Hours Studying Science | | Total Hours Studying | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 0.6 (0.02) | ▲ 0.7 (0.02) | 0.5 (0.02) | ▲ 0.6 (0.02) | 1.8 (0.05) | ▲ 2.3 (0.05) |
| Austria | 0.7 (0.02) | ▲ 0.9 (0.03) | 0.6 (0.03) | ▲ 0.9 (0.05) | 2.0 (0.06) | ▲ 2.7 (0.11) |
| Belgium (Fl) | 1.0 (0.03) | 1.2 (0.04) | 0.7 (0.02) | ▲ 0.9 (0.03) | 3.1 (0.07) | ▲ 3.8 (0.1) |
| Belgium (Fr) | 0.9 (0.03) | 1.0 (0.03) | 0.8 (0.03) | 0.9 (0.04) | 2.8 (0.1) | 3.2 (0.09) |
| Canada | 0.7 (0.03) | 0.8 (0.02) | 0.5 (0.02) | 0.6 (0.02) | 2.0 (0.08) | ▲ 2.4 (0.07) |
| Colombia | 1.3 (0.09) | 1.4 (0.05) | 1.2 (0.1) | 1.2 (0.05) | 4.5 (0.23) | 4.7 (0.14) |
| Cyprus | 1.1 (0.03) | 1.3 (0.03) | 0.8 (0.03) | 0.9 (0.03) | 3.3 (0.08) | ▲ 3.9 (0.09) |
| Czech Republic | 0.5 (0.02) | ▲ 0.7 (0.02) | 0.5 (0.02) | ▲ 0.7 (0.03) | 1.6 (0.05) | ▲ 2.1 (0.05) |
| France | 0.8 (0.03) | 0.9 (0.02) | 0.6 (0.02) | 0.6 (0.02) | 2.5 (0.06) | ▲ 2.9 (0.07) |
| Germany | 0.6 (0.02) | ▲ 0.7 (0.02) | 0.6 (0.03) | 0.7 (0.02) | 1.8 (0.06) | ▲ 2.2 (0.06) |
| Hong Kong | 0.8 (0.03) | 0.9 (0.02) | 0.6 (0.02) | 0.5 (0.02) | 2.5 (0.08) | 2.7 (0.08) |
| Hungary | 0.8 (0.02) | ▲ 0.9 (0.02) | 0.9 (0.03) | ▲ 1.2 (0.04) | 2.6 (0.06) | ▲ 3.6 (0.08) |
| Iceland | 0.9 (0.03) | 0.9 (0.04) | 0.6 (0.04) | 0.6 (0.03) | 2.3 (0.09) | 2.5 (0.09) |
| Iran, Islamic Rep. | 1.9 (0.06) | ▲ 2.2 (0.06) | 1.7 (0.06) | ▲ 2.1 (0.06) | 5.9 (0.13) | ▲ 7.1 (0.12) |
| Ireland | 0.7 (0.02) | 0.8 (0.02) | 0.6 (0.02) | 0.6 (0.02) | 2.4 (0.06) | ▲ 2.9 (0.07) |
| Japan | 0.7 (0.02) | 0.8 (0.02) | 0.6 (0.02) | 0.6 (0.02) | 2.2 (0.05) | 2.4 (0.05) |
| Korea | 0.7 (0.03) | ▲ 0.9 (0.03) | 0.5 (0.02) | 0.6 (0.02) | 2.3 (0.06) | ▲ 2.7 (0.07) |
| Latvia (LSS) | 0.8 (0.02) | ▲ 1.0 (0.03) | 0.6 (0.02) | ▲ 0.7 (0.02) | 2.3 (0.06) | ▲ 3.1 (0.07) |
| Lithuania | 0.7 (0.03) | ▲ 0.9 (0.03) | 0.6 (0.03) | 0.8 (0.03) | 2.3 (0.08) | ▲ 3.0 (0.08) |
| Netherlands | 0.6 (0.02) | 0.6 (0.01) | 0.6 (0.02) | 0.6 (0.02) | 2.1 (0.05) | 2.2 (0.05) |
| New Zealand | 0.6 (0.02) | 0.7 (0.02) | 0.5 (0.02) | 0.6 (0.02) | 2.0 (0.06) | 2.2 (0.06) |
| Norway | 0.7 (0.02) | 0.7 (0.02) | 0.6 (0.02) | 0.6 (0.01) | 2.3 (0.05) | 2.4 (0.06) |
| Portugal | 0.8 (0.02) | ▲ 1.1 (0.03) | 0.8 (0.02) | ▲ 1.0 (0.03) | 2.7 (0.06) | ▲ 3.4 (0.07) |
| Romania | 1.7 (0.07) | 1.9 (0.08) | 1.5 (0.07) | 1.7 (0.08) | 4.7 (0.19) | 5.3 (0.22) |
| Russian Federation | 0.8 (0.03) | ▲ 1.0 (0.02) | 0.9 (0.02) | ▲ 1.1 (0.04) | 2.6 (0.06) | ▲ 3.2 (0.07) |
| Scotland | 0.5 (0.02) | 0.6 (0.02) | 0.5 (0.02) | 0.5 (0.02) | 1.6 (0.06) | ▲ 1.9 (0.05) |
| Singapore | 1.4 (0.02) | 1.5 (0.03) | 1.3 (0.02) | 1.4 (0.02) | 4.5 (0.06) | 4.7 (0.05) |
| Slovak Republic | 0.6 (0.02) | ▲ 0.8 (0.02) | 0.7 (0.02) | ▲ 0.8 (0.03) | 2.1 (0.05) | ▲ 2.7 (0.05) |
| Slovenia | 0.8 (0.03) | ▲ 1.0 (0.03) | 0.9 (0.03) | ▲ 1.1 (0.03) | 2.5 (0.07) | ▲ 3.2 (0.07) |
| Spain | 1.1 (0.03) | ▲ 1.2 (0.03) | 0.9 (0.03) | ▲ 1.1 (0.03) | 3.2 (0.07) | ▲ 4.0 (0.08) |
| Sweden | 0.6 (0.02) | 0.7 (0.02) | 0.6 (0.02) | 0.7 (0.02) | 2.1 (0.05) | ▲ 2.4 (0.05) |
| Switzerland | 0.9 (0.02) | ▲ 1.0 (0.02) | 0.7 (0.02) | ▲ 0.8 (0.02) | 2.4 (0.05) | ▲ 2.9 (0.06) |
| United States | 0.7 (0.02) | ▲ 0.8 (0.02) | 0.6 (0.02) | ▲ 0.7 (0.02) | 2.1 (0.05) | ▲ 2.5 (0.05) |
| International Avg. | 0.9 (0.01) | ▲ 1.0 (0.01) | 0.7 (0.01) | ▲ 0.9 (0.01) | 2.6 (0.01) | ▲ 3.1 (0.01) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for 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.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for England because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.3 Students' Reports by Gender on Time Spent Studying on a Normal School Day - Final Year of Secondary School*

| Country | Hours Studying Mathematics | | Hours Studying Science | | Total Hours Studying | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 0.9 (0.06) | 1.0 (0.04) | 0.9 (0.06) | 1.1 (0.05) | 2.9 (0.18) | ▲ 3.6 (0.14) |
| Austria | 0.5 (0.04) | 0.7 (0.05) | 0.3 (0.03) | ▲ 0.5 (0.04) | 1.5 (0.1) | ▲ 2.3 (0.12) |
| Canada | 1.0 (0.05) | ▲ 1.2 (0.07) | 0.9 (0.04) | ▲ 1.3 (0.09) | 2.3 (0.1) | ▲ 3.1 (0.16) |
| Cyprus | 0.9 (0.07) | 1.1 (0.08) | 0.6 (0.06) | 0.5 (0.03) | 2.7 (0.17) | ▲ 3.5 (0.17) |
| Czech Republic | 0.3 (0.02) | 0.4 (0.05) | 0.3 (0.06) | ▲ 0.7 (0.07) | 1.0 (0.07) | ▲ 1.8 (0.09) |
| France | 1.0 (0.04) | 0.9 (0.05) | 0.9 (0.05) | 1.0 (0.06) | 3.1 (0.1) | ▲ 3.8 (0.16) |
| Hungary | 0.7 (0.02) | ▲ 0.8 (0.03) | 0.7 (0.03) | ▲ 1.1 (0.05) | 2.3 (0.07) | ▲ 3.6 (0.12) |
| Iceland | 0.6 (0.03) | 0.7 (0.03) | 0.4 (0.02) | ▲ 0.5 (0.02) | 1.8 (0.05) | ▲ 2.4 (0.07) |
| Lithuania | 0.7 (0.04) | ▲ 0.9 (0.04) | 0.6 (0.03) | ▲ 1.0 (0.05) | 2.3 (0.14) | ▲ 3.7 (0.13) |
| Netherlands | 0.6 (0.03) | ▲ 0.8 (0.05) | 0.6 (0.04) | 0.7 (0.05) | 1.5 (0.08) | 1.9 (0.09) |
| New Zealand | 0.7 (0.03) | 0.8 (0.04) | 0.6 (0.03) | 0.6 (0.03) | 2.0 (0.08) | ▲ 2.5 (0.07) |
| Norway | 0.4 (0.03) | 0.5 (0.05) | 0.6 (0.06) | ▲ 0.9 (0.06) | 1.5 (0.05) | ▲ 2.4 (0.07) |
| Russian Federation | 1.2 (0.07) | 1.3 (0.07) | 1.0 (0.06) | 1.1 (0.05) | 3.0 (0.12) | ▲ 3.8 (0.13) |
| Slovenia | 0.6 (0.04) | ▲ 1.0 (0.07) | 0.4 (0.03) | 0.5 (0.07) | 1.6 (0.1) | ▲ 2.7 (0.17) |
| Sweden | 0.4 (0.02) | 0.5 (0.02) | 0.6 (0.04) | 0.6 (0.04) | 1.5 (0.08) | ▲ 2.3 (0.06) |
| Switzerland | 0.8 (0.05) | ▲ 1.0 (0.06) | 0.6 (0.05) | 0.7 (0.06) | 1.6 (0.08) | ▲ 2.5 (0.11) |
| United States | 0.6 (0.03) | ▲ 0.8 (0.03) | 0.6 (0.04) | ▲ 0.7 (0.05) | 1.4 (0.08) | ▲ 2.1 (0.07) |
| International Avg. | 0.7 (0.01) | ▲ 0.9 (0.01) | 0.6 (0.01) | ▲ 0.8 (0.01) | 2.0 (0.03) | ▲ 2.9 (0.03) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for 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.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for Germany because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Attitudes Towards Mathematics and Science: How Much Do Males and Females Value Education in Mathematics and Science?

Student's attitudes and beliefs have an enormous impact on student performance in a particular subject area. As part of examining students' attitudes towards mathematics and science, TIMSS asked questions about the degree of agreement with the importance of doing well in the three major academic subjects of mathematics, science, and language. For purposes of comparison, students also were asked about the importance of two non-academic activities – having time to have fun and being good at sports. The degree of agreement within each category was examined by gender to see if males and females had different levels of agreement on all three academic-related questions and the two non-academic questions.

There is a whole host of literature, including the findings of TIMSS and previous IEA studies in reading literacy, mathematics, and science, showing that females usually outperform males in reading and writing, and that males outperform females in science and mathematics and devote more time to playing sports.[10] The literature sometimes suggests that these have become "stereotypical roles" for males and females that are often reinforced by teachers, parents, and by the students themselves.

Exhibit 4.4

Perhaps somewhat surprisingly, Exhibit 4.4 shows that in many countries, at fourth grade, it was females who were significantly more likely than males to report that it is important to do well in mathematics and science. Consistent with anticipated results, however, in two-thirds of the countries, significantly greater percentages of fourth-grade males than females reported that it was important to do well in sports. Exhibit 4.5 indicates that in the eighth grade there were few differences in the percentages of males and females reporting that they think it is important to do well in mathematics or science. Consistent with the previous studies mentioned above, however, significantly more females than males felt that it was important to well in language. Again, in all but two countries, Colombia and Iran, eighth-grade males more often than females felt that they needed to be good in sports.

Exhibit 4.5

[10] See Beaton, A.E., Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1996). *Mathematics Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College; Beaton, A.E., Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. (1996). *Science Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College; Elley, W.B. (1992). *How in the world do students read?: IEA Study of reading literacy.* Hamburg, Germany: Grindeldruck GMBH (especially Chapter 6).

## Exhibit 4.4 Students' Reports by Gender on the Importance of Doing Well in Various Activities - Fourth Grade*

| Country | Do Well in Mathematics | | Do Well in Science | | Be Good at Sports | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 93 (0.6) | ▲ 97 (0.4) | 90 (1.0) | 92 (1.0) | ▲ 91 (0.7) | 86 (0.9) |
| Austria | 96 (0.8) | 95 (0.7) | 94 (0.6) | 94 (0.9) | 89 (1.1) | 85 (1.7) |
| Canada | 97 (0.5) | 98 (0.4) | 93 (0.8) | 96 (0.7) | ▲ 86 (1.0) | 80 (0.9) |
| Cyprus | 97 (0.5) | 97 (0.5) | 93 (0.7) | 92 (0.8) | ▲ 93 (0.8) | 83 (1.5) |
| Czech Republic | 96 (0.5) | 97 (0.5) | 95 (0.5) | 97 (0.5) | 90 (0.9) | 86 (1.1) |
| England | 96 (0.5) | 97 (0.5) | 93 (0.8) | 94 (0.7) | ▲ 92 (0.6) | 89 (1.1) |
| Hong Kong | 95 (0.6) | ▲ 98 (0.4) | 88 (1.1) | 92 (0.9) | ▲ 69 (1.4) | 56 (1.7) |
| Hungary | 97 (0.4) | 98 (0.4) | 97 (0.5) | 97 (0.4) | ▲ 89 (0.9) | 82 (1.3) |
| Iceland | 94 (0.8) | ▲ 98 (0.4) | 84 (1.8) | 90 (1.7) | 92 (1.0) | 94 (0.8) |
| Iran, Islamic Rep. | r 95 (0.7) | 97 (0.7) | 97 (0.5) | 97 (0.9) | r 91 (1.1) | r 91 (1.8) |
| Ireland | 95 (0.7) | ▲ 99 (0.3) | 86 (1.2) | ▲ 93 (0.8) | 92 (0.9) | 88 (1.0) |
| Japan | 77 (0.9) | 74 (1.0) | 73 (1.0) | 70 (1.1) | ▲ 80 (0.9) | 70 (1.0) |
| Korea | 72 (1.4) | 71 (1.3) | 71 (1.3) | 68 (1.4) | ▲ 76 (1.2) | 69 (1.3) |
| Latvia (LSS) | 96 (0.6) | 97 (0.5) | 91 (0.9) | ▲ 95 (0.7) | ▲ 92 (1.2) | 83 (1.5) |
| Netherlands | 93 (1.2) | 93 (1.0) | 82 (1.8) | 85 (1.6) | 88 (1.2) | 84 (1.4) |
| New Zealand | 94 (0.9) | ▲ 97 (0.5) | 89 (1.0) | 92 (1.0) | 91 (0.9) | 91 (0.9) |
| Norway | 92 (0.9) | 96 (1.0) | 88 (1.3) | ▲ 94 (1.0) | ▲ 84 (1.2) | 75 (1.5) |
| Portugal | 94 (0.7) | 95 (0.7) | 94 (0.8) | 95 (0.8) | ▲ 94 (0.7) | 84 (1.7) |
| Scotland | 96 (0.5) | ▲ 99 (0.3) | 92 (0.7) | 94 (0.7) | ▲ 94 (0.6) | 90 (0.9) |
| Singapore | 97 (0.3) | ▲ 98 (0.3) | 93 (0.5) | ▲ 96 (0.5) | 82 (0.9) | 79 (1.2) |
| Slovenia | 92 (0.7) | 95 (0.7) | 91 (0.9) | ▲ 96 (0.7) | ▲ 94 (0.6) | 90 (0.8) |
| United States | 97 (0.4) | ▲ 99 (0.3) | 96 (0.5) | ▲ 98 (0.3) | ▲ 89 (0.9) | 76 (1.0) |
| International Avg. | 93 (0.2) | ▲ 95 (0.1) | 90 (0.2) | ▲ 92 (0.2) | ▲ 88 (0.2) | 82 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Fourth Grade in most countries; see Appendix A for 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.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for Germany because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.5 Students' Reports by Gender on the Importance of Doing Well in Various Activities - Eighth Grade*

| Country | Do Well in Mathematics | | Do Well in Science | | Do Well in Language | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 96 (0.5) | 96 (0.4) | 89 (0.9) | 89 (0.7) | 94 (0.7) | ▲ 96 (0.4) |
| Austria | 95 (0.6) | 93 (0.8) | 83 (1.2) | 81 (1.7) | 91 (1.0) | ▲ 95 (0.9) |
| Belgium (Fl) | 98 (0.5) | 99 (0.4) | 93 (0.7) | 93 (0.9) | 97 (0.6) | 99 (0.3) |
| Belgium (Fr) | 98 (0.4) | 99 (0.3) | 94 (0.9) | 94 (0.9) | 98 (0.5) | 99 (0.4) |
| Canada | 97 (0.4) | 98 (0.4) | 94 (0.8) | 94 (0.9) | 96 (0.5) | ▲ 98 (0.3) |
| Colombia | 99 (0.4) | 100 (0.1) | 99 (0.3) | 100 (0.1) | 99 (0.4) | 99 (0.2) |
| Cyprus | 93 (0.9) | 96 (0.5) | 87 (1.2) | 86 (1.2) | 92 (0.8) | ▲ 97 (0.5) |
| Czech Republic | 98 (0.6) | 97 (0.9) | 90 (1.2) | 87 (1.2) | 97 (0.6) | 98 (0.5) |
| England | 99 (0.3) | 99 (0.4) | 97 (0.5) | 95 (0.8) | 99 (0.3) | 99 (0.4) |
| France | 97 (0.5) | 97 (0.6) | ▲ 86 (1.3) | 79 (1.5) | 95 (0.8) | ▲ 99 (0.3) |
| Germany | 94 (0.8) | 91 (0.9) | ▲ 77 (1.3) | 68 (1.4) | 90 (0.9) | 93 (0.7) |
| Hong Kong | 96 (0.6) | 97 (0.6) | 91 (0.9) | 90 (1.3) | 95 (0.7) | 97 (0.6) |
| Hungary | 94 (0.8) | 96 (0.6) | 84 (1.2) | 87 (0.9) | 93 (0.9) | ▲ 96 (0.5) |
| Iceland | 96 (1.7) | 98 (0.7) | 89 (1.5) | 91 (1.5) | 95 (1.8) | 98 (0.6) |
| Iran, Islamic Rep. | 97 (0.7) | 98 (0.5) | 98 (0.7) | 98 (0.5) | 96 (0.7) | 95 (0.8) |
| Ireland | 97 (0.6) | 98 (0.4) | 87 (1.4) | 86 (1.6) | 95 (0.6) | ▲ 98 (0.4) |
| Japan | 92 (0.5) | 93 (0.5) | 88 (0.7) | 86 (0.8) | 90 (0.6) | ▲ 93 (0.5) |
| Korea | 93 (0.7) | 94 (0.7) | 90 (0.8) | 93 (0.8) | 91 (0.8) | ▲ 95 (0.7) |
| Latvia (LSS) | 96 (0.6) | 98 (0.4) | 83 (1.4) | 85 (1.2) | 96 (0.6) | ▲ 99 (0.3) |
| Lithuania | 91 (1.0) | ▲ 95 (0.7) | 77 (1.5) | 79 (1.4) | 94 (0.9) | ▲ 98 (0.4) |
| Netherlands | 98 (0.5) | 97 (1.1) | 96 (0.7) | 94 (1.2) | 98 (0.5) | 99 (0.2) |
| New Zealand | 97 (0.4) | 97 (0.5) | 93 (0.7) | 91 (0.8) | 94 (0.7) | 97 (0.4) |
| Norway | 96 (0.7) | 96 (0.6) | 94 (0.8) | 91 (0.7) | 95 (0.7) | 97 (0.6) |
| Portugal | 97 (0.5) | 98 (0.4) | 97 (0.4) | 98 (0.3) | 98 (0.3) | 100 (0.2) |
| Romania | 88 (1.0) | 87 (1.1) | 86 (0.9) | 86 (1.2) | 88 (1.2) | 89 (1.1) |
| Russian Federation | 97 (0.5) | 97 (0.5) | 94 (0.8) | 95 (0.7) | 95 (0.7) | ▲ 99 (0.4) |
| Scotland | 98 (0.4) | 98 (0.5) | 93 (1.0) | 91 (0.9) | 98 (0.5) | 98 (0.3) |
| Singapore | 99 (0.3) | 99 (0.2) | 99 (0.3) | 99 (0.2) | 100 (0.1) | 100 (0.1) |
| Slovak Republic | 97 (0.5) | 95 (0.5) | 86 (1.0) | 85 (1.1) | 95 (0.6) | ▲ 98 (0.4) |
| Slovenia | 96 (0.5) | 96 (0.7) | 87 (1.0) | 85 (1.3) | 95 (0.6) | 96 (0.6) |
| Spain | 98 (0.4) | ▲ 100 (0.1) | 98 (0.4) | 99 (0.2) | 98 (0.4) | ▲ 100 (0.2) |
| Sweden | 92 (0.7) | 91 (0.8) | 87 (1.0) | 82 (1.2) | 89 (0.9) | 91 (0.8) |
| Switzerland | 97 (0.5) | 94 (0.6) | ▲ 72 (1.6) | 64 (1.4) | 92 (0.8) | ▲ 96 (0.4) |
| United States | 96 (0.4) | 98 (0.4) | 95 (0.6) | 96 (0.5) | 95 (0.4) | ▲ 98 (0.4) |
| International Avg. | 96 (0.1) | 96 (0.1) | ▲ 90 (0.2) | 89 (0.2) | 95 (0.1) | ▲ 97 (0.1) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for 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.

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

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.5 (Continued)

**Students' Reports by Gender on the Importance of Doing Well in Various Activities - Eighth Grade***

| Country | Have Time to Have Fun | | Be Good at Sports | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Australia | 98 (0.3) | 99 (0.3) | ▲ 91 (0.6) | 78 (0.8) |
| Austria | 98 (0.5) | 99 (0.4) | ▲ 86 (1.2) | 79 (1.1) |
| Belgium (Fl) | 97 (0.5) | 99 (0.3) | ▲ 86 (1.1) | 74 (1.4) |
| Belgium (Fr) | 98 (0.6) | 99 (0.4) | ▲ 93 (0.9) | 81 (1.1) |
| Canada | 99 (0.2) | 99 (0.2) | ▲ 91 (0.7) | 81 (1.0) |
| Colombia | 98 (0.6) | 98 (0.3) | 98 (0.5) | 97 (0.5) |
| Cyprus | 94 (0.8) | 95 (0.6) | ▲ 92 (1.0) | 78 (1.4) |
| Czech Republic | 98 (0.4) | 98 (0.4) | ▲ 89 (1.2) | 78 (1.5) |
| England | 99 (0.3) | 98 (0.5) | ▲ 88 (1.2) | 70 (1.7) |
| France | 97 (0.5) | 98 (0.5) | ▲ 87 (1.0) | 72 (1.2) |
| Germany | 96 (0.5) | 97 (0.5) | ▲ 79 (1.4) | 65 (1.7) |
| Hong Kong | 95 (0.7) | 94 (0.7) | ▲ 89 (0.7) | 75 (1.5) |
| Hungary | 96 (0.6) | 97 (0.6) | ▲ 86 (1.2) | 70 (1.4) |
| Iceland | 97 (0.7) | 98 (0.5) | 93 (2.5) | 87 (1.5) |
| Iran, Islamic Rep. | ▲ 92 (0.8) | 81 (2.0) | ▲ 91 (0.2) | 92 (1.5) |
| Ireland | 98 (0.4) | 100 (0.2) | ▲ 97 (0.5) | 79 (1.3) |
| Japan | 99 (0.2) | 99 (0.2) | ▲ 90 (1.0) | 77 (1.2) |
| Korea | 89 (0.9) | 85 (1.3) | ▲ 88 (0.7) | 80 (1.2) |
| Latvia (LSS) | 97 (0.5) | 97 (0.6) | ▲ 91 (0.7) | 81 (1.3) |
| Lithuania | 94 (0.9) | 94 (0.7) | ▲ 95 (0.7) | 89 (0.8) |
| Netherlands | 98 (0.6) | 98 (0.7) | ▲ 97 (0.7) | 70 (1.7) |
| New Zealand | 98 (0.4) | 99 (0.3) | ▲ 87 (1.3) | 81 (0.9) |
| Norway | 99 (0.3) | 99 (0.2) | ▲ 92 (0.7) | 76 (1.2) |
| Portugal | ▲ 97 (0.4) | 89 (0.8) | ▲ 83 (1.2) | 91 (0.9) |
| Romania | 88 (1.1) | 84 (1.4) | ▲ 98 (0.4) | 74 (1.5) |
| Russian Federation | 98 (0.4) | 98 (0.5) | ▲ 86 (1.2) | 82 (1.2) |
| Scotland | 98 (0.4) | 98 (0.4) | ▲ 95 (0.7) | 74 (1.4) |
| Singapore | 95 (0.4) | 96 (0.4) | ▲ 90 (0.9) | 85 (1.0) |
| Slovak Republic | 98 (0.4) | 98 (0.4) | ▲ 93 (0.6) | 87 (0.9) |
| Slovenia | 95 (0.7) | 95 (0.7) | ▲ 95 (0.5) | 81 (1.2) |
| Spain | 99 (0.2) | 99 (0.2) | ▲ 92 (0.8) | 93 (0.5) |
| Sweden | 98 (0.3) | 99 (0.2) | ▲ 97 (0.4) | 79 (1.0) |
| Switzerland | 94 (0.7) | 95 (0.6) | ▲ 89 (0.8) | 71 (1.5) |
| United States | 98 (0.3) | 99 (0.2) | ▲ 85 (0.9) | 83 (0.9) |
| International Avg. | 97 (0.1) | 96 (0.1) | ▲ 93 (0.5) | 80 (0.2) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for 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.

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

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

Exhibit 4.6

Exhibit 4.6 shows the responses given by students in the final year of secondary school to the questions about the importance of doing well in mathematics and science. As the data reveal, the response patterns by gender shift dramatically between the fourth grade and the final-year of secondary school. The TIMSS data show a progression from the fourth grade, where more females than males felt it was important to do well in mathematics and science, to the eighth grade where there were few differences by gender. By the final year of secondary school, significantly more males than females in most countries reported that it was important to do well in mathematics and science. Consistent with the earlier grades, final-year females reported that they thought it was important to do well in language, and males reported that it was important to do well in sports. Internationally, the differences were statistically significant with more males than females reporting it was important to do well in mathematics (83% to 75%); in science (73% to 66%); and sports (78% to 61%). Females reported in significantly greater numbers than males (91% to 84%) that it was important to do well in language.

There are a number of theories as to why more males than females seem to believe that it is important to do well in mathematics and science, including the role of parents in the development of their children's belief structure. The TIMSS results show that as early as the eighth-grade students in nearly every country reported a gender difference in parental views about the importance of learning mathematics and science. As shown in Exhibit 4.7, more eighth-grade males than females strongly agreed that it was important to do well in mathematics to please their parents (27% compared to 17%, on average internationally) and significantly more females than males disagreed or strongly disagreed with the same question (42% compared to 30%). In addition, Exhibit 4.8 presenting results for countries teaching science as an integrated subject at the eighth grade reveals a similar trend for science, with significantly more males than females internationally strongly agreeing that it was important to do well in science to please their parents (25% compared to 18%).

Exhibit 4.7

Exhibit 4.8

## Exhibit 4.6 Students' Reports by Gender on the Importance of Doing Well in Various Activities - Final Year of Secondary School*

| Country | Do Well in Mathematics | | Do Well in Science | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Australia | ▲ 90 (1.3) | 84 (1.5) | 75 (2.2) | 66 (3.1) |
| Austria | ▲ 80 (2.2) | 69 (2.7) | 69 (2.8) | 72 (2.2) |
| Cyprus | r 84 (2.5) | 79 (3.2) | r 69 (2.4) | 57 (3.5) |
| Czech Republic | 83 (2.0) | 78 (2.2) | r 64 (1.4) | 64 (7.0) |
| France | ▲ 88 (1.4) | 80 (1.7) | ▲ 77 (2.0) | 55 (2.0) |
| Iceland | ▲ 85 (1.2) | 78 (1.4) | 70 (1.6) | 71 (1.9) |
| Lithuania | r ▲ 85 (1.5) | r 76 (1.6) | r 72 (2.3) | r 69 (1.7) |
| Netherlands | ▲ 88 (1.6) | 73 (2.5) | ▲ 82 (1.8) | 64 (3.4) |
| New Zealand | ▲ 86 (1.8) | 74 (2.4) | ▲ 73 (2.4) | 57 (2.9) |
| Norway | ▲ 79 (1.9) | 71 (1.6) | 68 (2.2) | 68 (2.1) |
| Russian Federation | r 87 (2.6) | r 83 (1.5) | 90 (1.5) | 91 (1.3) |
| Slovenia | ▲ 63 (3.0) | 48 (3.7) | ▲ 70 (3.3) | 52 (2.4) |
| Sweden | ▲ 81 (1.4) | 69 (1.5) | ▲ 65 (1.7) | 55 (1.8) |
| Switzerland | ▲ 85 (2.1) | 69 (2.4) | 59 (3.3) | 57 (2.5) |
| United States | 90 (1.2) | 91 (1.1) | 86 (1.3) | 85 (1.5) |
| International Avg. | ▲ 83 (0.5) | 75 (0.5) | ▲ 73 (0.6) | 66 (0.7) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for 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.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for Canada, Germany, and Hungary because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.6 (Continued)

## Students' Reports by Gender on the Importance of Doing Well in Various Activities - Final Year of Secondary School*

| Country | Do Well in Language | | Be Good at Sports | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Australia | 89 (1.1) | ▲ 95 (0.8) | ▲ 78 (2.4) | 49 (1.8) |
| Austria | 83 (1.6) | ▲ 94 (0.7) | 72 (2.2) | 66 (2.1) |
| Cyprus | r 93 (1.8) | 96 (1.3) | ▲ 89 (1.9) | 63 (2.4) |
| Czech Republic | 80 (1.9) | ▲ 93 (1.2) | 83 (1.5) | 77 (2.4) |
| France | 78 (2.7) | ▲ 94 (1.0) | ▲ 72 (2.3) | 54 (2.0) |
| Iceland | 83 (1.0) | ▲ 93 (1.1) | ▲ 74 (1.3) | 53 (2.4) |
| Lithuania | r 85 (1.4) | r ▲ 92 (0.9) | ▲ 96 (0.7) | r 87 (1.1) |
| Netherlands | 88 (1.7) | ▲ 96 (1.2) | ▲ 70 (2.0) | 55 (2.1) |
| New Zealand | 86 (1.0) | 91 (1.9) | ▲ 76 (2.0) | 49 (2.7) |
| Norway | 80 (1.5) | ▲ 94 (0.9) | 69 (2.0) | 63 (1.6) |
| Russian Federation | r 82 (2.1) | r ▲ 94 (1.2) | r ▲ 92 (1.4) | r 70 (1.8) |
| Slovenia | 70 (3.1) | 59 (3.6) | ▲ 75 (2.7) | 54 (2.0) |
| Sweden | 80 (1.4) | ▲ 90 (1.0) | ▲ 74 (1.3) | 61 (1.7) |
| Switzerland | 80 (1.6) | ▲ 91 (1.3) | ▲ 68 (1.9) | 54 (2.0) |
| United States | 90 (1.2) | ▲ 96 (0.7) | ▲ 77 (1.2) | 47 (1.6) |
| International Avg. | 84 (0.4) | ▲ 91 (0.4) | ▲ 78 (0.5) | 61 (0.5) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for 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.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for Canada, Germany, and Hungary because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.7 Students' Reports by Gender on Doing Well in Mathematics to Please Parents
### Eighth Grade*

| Country | I need to do well in mathematics to please my parents | | | | | |
|---|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Disagree/ Strongly Disagree | |
| | Males | Females | Males | Females | Males | Females |
| Australia | ▲ 26 (1.0) | 18 (0.9) | 51 (0.9) | 50 (0.9) | 23 (0.9) | ▲ 32 (0.9) |
| Austria | ▲ 21 (1.5) | 12 (1.1) | 40 (1.5) | 34 (1.6) | 39 (1.7) | ▲ 53 (1.7) |
| Belgium (Fl) | ▲ 20 (1.2) | 11 (1.0) | 55 (1.9) | 50 (1.4) | 25 (1.4) | ▲ 39 (1.8) |
| Belgium (Fr) | ▲ 33 (1.7) | 23 (2.1) | 48 (1.8) | 51 (1.7) | 19 (1.7) | ▲ 26 (1.3) |
| Canada | ▲ 28 (1.1) | 19 (0.8) | 45 (1.1) | 43 (1.4) | 27 (1.3) | ▲ 38 (1.3) |
| Colombia | ▲ 48 (3.0) | 35 (2.1) | 35 (1.9) | 38 (1.4) | 18 (1.8) | ▲ 28 (1.8) |
| Cyprus | ▲ 43 (1.2) | 24 (1.2) | 36 (1.5) | 38 (1.4) | 22 (1.4) | ▲ 38 (1.3) |
| Czech Republic | ▲ 28 (1.5) | 17 (1.3) | 59 (1.6) | 64 (1.4) | 13 (1.3) | 18 (1.3) |
| England | ▲ 27 (1.7) | 13 (1.3) | 45 (2.0) | 41 (1.7) | 28 (1.9) | ▲ 45 (2.1) |
| France | ▲ 21 (1.4) | 13 (1.0) | 41 (1.9) | 42 (1.5) | 38 (1.8) | 45 (1.7) |
| Germany | ▲ 31 (1.6) | 19 (1.3) | 33 (1.2) | 30 (1.4) | 36 (1.7) | ▲ 51 (1.6) |
| Hong Kong | 17 (0.8) | 15 (1.1) | 44 (1.1) | 43 (1.3) | 40 (1.2) | 42 (1.7) |
| Hungary | ▲ 13 (1.1) | 7 (0.9) | ▲ 58 (1.5) | 49 (1.7) | 29 (1.2) | ▲ 44 (1.8) |
| Iceland | ▲ 17 (2.0) | 8 (1.2) | ▲ 38 (2.1) | 22 (1.6) | 45 (2.2) | ▲ 70 (2.3) |
| Iran, Islamic Rep. | 70 (1.7) | 69 (2.0) | 25 (1.7) | 26 (2.0) | 5 (0.6) | 6 (1.2) |
| Ireland | ▲ 24 (1.3) | 13 (0.9) | ▲ 47 (1.0) | 40 (1.3) | 29 (1.1) | ▲ 46 (1.4) |
| Japan | 6 (0.5) | 5 (0.5) | 29 (0.8) | 28 (1.0) | 65 (1.1) | 67 (1.2) |
| Korea | 13 (1.1) | 9 (0.7) | 46 (1.7) | 42 (1.4) | 41 (2.0) | ▲ 49 (1.4) |
| Latvia (LSS) | ▲ 35 (1.8) | 24 (1.6) | 48 (1.9) | 53 (1.5) | 17 (1.4) | 23 (1.5) |
| Lithuania | ▲ 22 (1.5) | 12 (1.0) | ▲ 42 (1.8) | 32 (1.6) | 36 (1.8) | ▲ 56 (1.7) |
| Netherlands | ▲ 12 (1.4) | 5 (0.9) | ▲ 41 (2.0) | 29 (1.8) | 48 (2.2) | ▲ 66 (2.1) |
| New Zealand | ▲ 27 (1.2) | 17 (1.2) | 45 (1.4) | 43 (1.4) | 28 (1.3) | ▲ 40 (1.7) |
| Norway | ▲ 19 (1.2) | 8 (0.7) | ▲ 43 (1.4) | 34 (1.2) | 38 (1.4) | ▲ 58 (1.4) |
| Portugal | ▲ 30 (1.3) | 14 (1.2) | 45 (1.3) | 44 (1.5) | 25 (1.2) | ▲ 42 (1.4) |
| Romania | ▲ 37 (1.3) | 30 (1.3) | 43 (1.4) | 43 (1.4) | 20 (1.2) | ▲ 28 (1.5) |
| Russian Federation | ▲ 34 (1.3) | 19 (1.1) | 46 (1.2) | 45 (1.5) | 20 (1.3) | ▲ 36 (1.4) |
| Scotland | ▲ 29 (1.2) | 15 (1.2) | 44 (1.3) | 42 (1.6) | 27 (1.2) | ▲ 43 (1.7) |
| Singapore | 22 (0.9) | 18 (0.9) | 46 (1.0) | 46 (1.0) | 32 (1.3) | 36 (1.1) |
| Slovak Republic | ▲ 18 (1.1) | 11 (0.9) | 59 (1.3) | 54 (1.4) | 23 (1.4) | ▲ 35 (1.4) |
| Slovenia | ▲ 12 (0.9) | 5 (0.8) | ▲ 41 (1.6) | 30 (1.6) | 47 (1.8) | ▲ 65 (1.7) |
| Spain | ▲ 45 (1.3) | 28 (1.2) | 43 (1.1) | 48 (1.5) | 13 (0.8) | ▲ 24 (1.5) |
| Sweden | ▲ 16 (1.3) | 5 (0.6) | ▲ 42 (1.2) | 28 (1.2) | 42 (1.3) | ▲ 67 (1.4) |
| Switzerland | ▲ 21 (1.4) | 14 (1.0) | ▲ 43 (1.4) | 34 (1.2) | 36 (1.3) | ▲ 52 (1.4) |
| United States | ▲ 41 (1.0) | 30 (1.2) | 44 (1.0) | 45 (0.8) | 14 (0.9) | ▲ 25 (1.2) |
| International Avg. | ▲ 27 (0.2) | 17 (0.2) | ▲ 44 (0.3) | 41 (0.2) | 30 (0.3) | ▲ 42 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for 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.

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

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.8 Students' Reports by Gender on Doing Well in Science to Please Parents
### Eighth Grade*

| Country | I need to do well in science to please my parents | | | | | |
|---|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Disagree/ Strongly Disagree | |
| | Males | Females | Males | Females | Males | Females |
| Australia | ▲ 20 (0.9) | 13 (0.7) | 50 (1.1) | 48 (1.0) | 30 (1.0) | ▲ 38 (1.1) |
| Austria | 14 (1.1) | 11 (1.0) | 38 (1.6) | 33 (1.7) | 49 (1.7) | 56 (1.7) |
| Belgium (Fr) | ▲ 32 (2.8) | s 20 (2.0) | 47 (3.0) | 47 (2.5) | 21 (2.9) | 33 (2.7) |
| Canada | ▲ 21 (1.1) | 16 (0.8) | 44 (1.2) | 43 (1.4) | 34 (1.6) | ▲ 41 (1.5) |
| Colombia | ▲ 43 (2.6) | 32 (1.9) | 38 (1.8) | 38 (1.4) | 19 (1.7) | ▲ 30 (1.7) |
| Cyprus | ▲ 30 (1.4) | 18 (1.4) | 42 (1.4) | 38 (1.7) | 28 (1.5) | ▲ 44 (1.4) |
| England | ▲ 24 (1.6) | 11 (1.2) | 48 (1.7) | 42 (1.9) | 29 (1.8) | ▲ 46 (2.0) |
| Hong Kong | 16 (0.9) | 13 (0.9) | 40 (1.1) | 43 (1.3) | 43 (1.4) | 44 (1.5) |
| Iran, Islamic Rep. | 62 (1.2) | 62 (1.7) | 34 (1.1) | 33 (1.5) | 4 (0.9) | 5 (0.9) |
| Ireland | ▲ 18 (1.1) | 10 (1.0) | ▲ 46 (1.4) | 37 (1.3) | 36 (1.3) | ▲ 53 (1.4) |
| Japan | 6 (0.5) | 5 (0.4) | 28 (0.8) | 27 (0.9) | 65 (1.1) | 68 (1.0) |
| Korea | ▲ 14 (1.1) | 10 (0.7) | 42 (1.3) | 39 (1.3) | 43 (1.7) | ▲ 52 (1.2) |
| New Zealand | ▲ 21 (1.1) | 14 (1.0) | ▲ 47 (1.3) | 41 (1.1) | 33 (1.1) | ▲ 45 (1.5) |
| Norway | ▲ 15 (1.1) | 6 (0.6) | ▲ 43 (1.3) | 32 (1.3) | 42 (1.6) | ▲ 62 (1.3) |
| Scotland | ▲ 25 (1.4) | 13 (1.1) | 44 (1.4) | 39 (1.5) | 32 (1.4) | ▲ 48 (1.7) |
| Singapore | ▲ 24 (1.1) | 20 (0.8) | 47 (1.2) | 46 (1.2) | 29 (1.3) | ▲ 34 (1.1) |
| Spain | ▲ 44 (1.4) | 28 (1.4) | 43 (1.2) | ▲ 50 (1.6) | 12 (0.8) | ▲ 22 (1.6) |
| Switzerland | 11 (1.1) | 8 (0.7) | ▲ 37 (1.5) | 29 (1.1) | 52 (1.7) | ▲ 63 (1.3) |
| United States | ▲ 37 (1.2) | 26 (1.0) | 45 (1.3) | 48 (0.9) | 18 (0.9) | ▲ 25 (1.0) |
| International Avg. | ▲ 25 (0.3) | 18 (0.3) | ▲ 42 (0.3) | 40 (0.3) | 33 (0.3) | 43 (0.3) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth grade in most countries; see Appendix A for characteristics of students sampled.

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

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for Belgium (Fl), Czech Republic, France, Germany, Hungary, Iceland, Latvia (LSS), Lithuania, Netherlands, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, and Sweden because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded becauseachievement data by gender is not available.

## Careers in Mathematics: How Do Males and Females Differ in Their Views Towards Having a Job in Mathematics?

Exhibit 4.9

Exhibit 4.10

Exhibit 4.11

Exhibit 4.9 shows that in many of the TIMSS countries, significantly more eighth-grade males than females (39% to 30%, on average internationally) reported that doing well in mathematics was important for getting a desired job. In a large majority of countries and internationally, females disagreed or strongly disagreed about the importance of future employment as a reason to do well in mathematics (29% to 20%). Exhibit 4.10 shows that the pattern was similar for science, with significantly more males than females internationally reporting that doing well in science was important to getting a desired job (27% to 23%). Similarly, significantly greater percentages of females than males disagreed or strongly disagreed about the importance of future employment as a reason to do well in science (46% to 41%).

TIMSS asked the final-year students participating in the literacy testing if they would like a job in the area of mathematics. The results are presented by gender in Exhibit 4.11. In many countries, significantly more males than females strongly agreed or agreed they would like a mathematics-related job. On average internationally, about three-fourths of the females (73%) disagreed or strongly disagreed that they wanted a job that involved the use of mathematics. In considering these results, it is important to remember that the students participating in the literacy testing represent the total population of students graduating from secondary school and going on to future endeavors.

## Exhibit 4.9 Students' Reports by Gender on Doing Well in Mathematics to Get Desired Job - Eighth Grade*

| Country | I need to do well in mathematics to get the job I want | | | | | |
|---|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Disagree/ Strongly Disagree | |
| | Males | Females | Males | Females | Males | Females |
| Australia | ▲ 42 (1.2) | 29 (1.0) | 41 (1.1) | 46 (1.0) | 17 (0.7) | ▲ 25 (1.0) |
| Austria | ▲ 43 (1.9) | 23 (1.4) | 31 (1.3) | 31 (1.4) | 26 (1.6) | ▲ 46 (1.8) |
| Belgium (Fl) | ▲ 22 (1.4) | 12 (1.3) | 43 (1.5) | 37 (1.6) | 35 (1.5) | ▲ 51 (2.5) |
| Belgium (Fr) | ▲ 44 (1.6) | 26 (1.6) | 37 (1.7) | 35 (1.9) | 19 (1.2) | ▲ 38 (1.7) |
| Canada | ▲ 47 (1.4) | 40 (1.2) | 38 (1.3) | 44 (1.2) | 15 (1.0) | 16 (0.8) |
| Colombia | 53 (2.2) | 47 (2.0) | 34 (2.0) | 36 (1.4) | 13 (1.2) | 17 (1.3) |
| Cyprus | ▲ 58 (1.6) | 48 (1.3) | 30 (1.2) | ▲ 37 (1.2) | 12 (1.1) | 15 (0.9) |
| Czech Republic | ▲ 37 (1.6) | 27 (1.8) | 51 (1.4) | 49 (1.5) | 12 (1.0) | ▲ 23 (1.8) |
| England | ▲ 45 (1.7) | 28 (1.5) | 40 (1.7) | 46 (1.6) | 15 (1.2) | ▲ 26 (1.4) |
| France | ▲ 42 (1.3) | 28 (1.4) | 35 (1.3) | 38 (1.4) | 23 (1.2) | ▲ 34 (1.5) |
| Germany | ▲ 49 (1.6) | 29 (1.8) | 29 (1.4) | 32 (1.5) | 22 (1.1) | ▲ 38 (1.7) |
| Hong Kong | 26 (1.3) | 21 (1.4) | 51 (1.4) | 53 (1.2) | 22 (1.0) | 26 (1.2) |
| Hungary | 24 (1.3) | 21 (1.2) | 57 (1.4) | 53 (1.3) | 19 (1.3) | ▲ 26 (1.5) |
| Iceland | 36 (2.8) | 28 (1.7) | 45 (2.4) | 49 (2.5) | 18 (1.2) | 24 (2.2) |
| Iran, Islamic Rep. | 63 (1.6) | 61 (1.5) | 29 (1.2) | 26 (1.2) | 8 (0.9) | 12 (1.4) |
| Ireland | ▲ 47 (1.7) | 33 (1.3) | 37 (1.5) | 43 (1.5) | 16 (1.3) | ▲ 24 (1.2) |
| Japan | ▲ 13 (0.7) | 10 (0.6) | 43 (1.0) | 44 (1.1) | 44 (1.1) | 45 (1.1) |
| Korea | 14 (1.4) | 11 (0.8) | 34 (1.1) | 33 (1.4) | 51 (1.7) | 56 (1.4) |
| Latvia (LSS) | 42 (1.6) | 36 (1.5) | 44 (1.5) | 47 (1.4) | 14 (1.1) | 17 (1.3) |
| Lithuania | 45 (1.8) | 40 (1.5) | 42 (1.8) | 46 (1.6) | 12 (1.0) | 14 (1.1) |
| Netherlands | ▲ 22 (1.9) | 10 (0.7) | ▲ 44 (1.9) | 30 (1.8) | 35 (1.7) | ▲ 60 (1.8) |
| New Zealand | ▲ 48 (1.1) | 34 (1.3) | 41 (1.2) | 43 (1.2) | 12 (0.7) | ▲ 23 (1.2) |
| Norway | ▲ 30 (1.3) | 18 (1.0) | 48 (1.3) | 49 (1.3) | 22 (1.1) | ▲ 33 (1.2) |
| Portugal | ▲ 44 (1.3) | 30 (1.1) | 36 (1.4) | ▲ 42 (1.2) | 19 (1.0) | ▲ 27 (1.2) |
| Romania | 43 (1.4) | 37 (1.5) | 38 (1.3) | 39 (1.4) | 19 (1.1) | 24 (1.6) |
| Russian Federation | 44 (1.4) | 41 (1.0) | 40 (1.5) | 40 (1.2) | 17 (1.0) | 19 (1.3) |
| Scotland | ▲ 57 (1.7) | 45 (1.5) | 33 (1.5) | ▲ 40 (1.4) | 11 (0.9) | 14 (0.9) |
| Singapore | 39 (1.0) | 35 (1.3) | 47 (0.8) | 49 (1.2) | 14 (0.9) | 17 (1.2) |
| Slovak Republic | ▲ 35 (1.3) | 28 (1.4) | 50 (1.3) | 47 (1.6) | 15 (1.1) | ▲ 25 (1.3) |
| Slovenia | ▲ 31 (1.5) | 24 (1.2) | 50 (1.7) | 52 (1.3) | 20 (1.1) | 25 (1.4) |
| Spain | ▲ 37 (1.4) | 26 (1.3) | 39 (1.3) | 40 (1.2) | 24 (1.0) | ▲ 34 (1.3) |
| Sweden | ▲ 30 (1.2) | 18 (0.9) | 47 (1.4) | 46 (1.0) | 23 (1.2) | ▲ 36 (1.1) |
| Switzerland | ▲ 39 (1.4) | 20 (1.0) | 38 (1.3) | 35 (1.2) | 23 (1.1) | ▲ 45 (1.3) |
| United States | 49 (1.3) | 44 (1.2) | 37 (1.2) | 40 (0.9) | 14 (0.8) | 16 (1.1) |
| International Avg. | ▲ 39 (0.3) | 30 (0.2) | 41 (0.2) | ▲ 42 (0.2) | 20 (0.2) | ▲ 29 (0.2) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth Grade in most countries; see Appendix A for 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.

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

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.10 Students' Reports by Gender on Doing Well in Science to Get Desired Job
### Eighth Grade*

| Country | I need to do well in science to get the job I want | | | | | |
|---|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Disagree/ Strongly Disagree | |
| | Males | Females | Males | Females | Males | Females |
| Australia | 24 (0.9) | 20 (0.8) | 31 (0.9) | 29 (1.0) | 45 (1.2) | ▲ 51 (1.1) |
| Austria | 17 (1.2) | 16 (1.4) | 20 (1.4) | 23 (1.0) | 63 (2.0) | 61 (1.7) |
| Belgium (Fr) | s 29 (2.7) | s 24 (2.9) | 25 (2.5) | 29 (1.8) | 46 (3.8) | 47 (2.4) |
| Canada | 28 (1.5) | 26 (1.0) | 36 (1.3) | 36 (1.4) | 37 (1.5) | 38 (1.4) |
| Colombia | 41 (2.6) | 36 (1.9) | 36 (1.8) | 36 (1.5) | 24 (1.8) | 28 (1.6) |
| Cyprus | ▲ 31 (1.5) | 21 (1.3) | 30 (1.4) | 33 (1.6) | 39 (1.5) | ▲ 47 (1.5) |
| England | 31 (1.7) | 25 (1.4) | 37 (1.6) | 30 (1.7) | 32 (1.7) | ▲ 45 (2.2) |
| Hong Kong | ▲ 19 (1.2) | 13 (1.0) | 39 (1.2) | 38 (1.3) | 42 (1.3) | ▲ 49 (1.5) |
| Iran, Islamic Rep. | 58 (1.9) | 56 (2.3) | 33 (1.4) | 33 (1.7) | 9 (1.3) | 11 (1.5) |
| Ireland | 22 (1.3) | 20 (1.3) | 29 (1.3) | 30 (1.1) | 50 (1.5) | 50 (1.8) |
| Japan | ▲ 11 (0.6) | 7 (0.5) | 31 (0.9) | 30 (0.9) | 58 (1.0) | ▲ 63 (1.0) |
| Korea | ▲ 16 (0.9) | 10 (0.8) | ▲ 35 (1.2) | 26 (1.2) | 49 (1.3) | ▲ 63 (1.3) |
| New Zealand | ▲ 25 (1.1) | 20 (1.0) | 34 (1.4) | 30 (1.1) | 41 (1.5) | ▲ 51 (1.3) |
| Norway | ▲ 16 (1.1) | 12 (0.7) | 35 (1.2) | 30 (1.2) | 49 (1.4) | ▲ 58 (1.3) |
| Scotland | 39 (1.7) | 32 (1.5) | 30 (1.4) | 29 (1.2) | 31 (1.4) | ▲ 39 (1.7) |
| Singapore | ▲ 33 (1.8) | 24 (1.2) | 42 (1.2) | 43 (1.3) | 26 (1.6) | ▲ 33 (1.6) |
| Spain | 32 (1.2) | 27 (1.5) | 34 (1.1) | 37 (1.3) | 34 (1.2) | 36 (1.2) |
| Switzerland | 12 (0.8) | 11 (0.9) | 19 (1.0) | ▲ 24 (1.1) | 70 (1.1) | 65 (1.2) |
| United States | 33 (1.4) | 31 (0.9) | 35 (1.2) | 32 (1.0) | 33 (0.9) | 36 (1.3) |
| International Avg. | ▲ 27 (0.4) | 23 (0.3) | 32 (0.3) | 31 (0.3) | 41 (0.4) | ▲ 46 (0.4) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* Eighth grade in most countries; see Appendix A for characteristics of the students sampled.

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

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for Belgium(Fl), Czech Republic, France, Germany, Hungary, Iceland, Latvia (LSS), Lithuania, Netherlands, Portugal, Romania, Russian Federation, Slovak Republic, Slovenia, and Sweden because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Exhibit 4.11 Students' Reports by Gender on Doing Well in Mathematics to Get Desired Job - Final Year of Secondary School*

| Country | I would like a job that involves using mathematics | | | | | |
|---|---|---|---|---|---|---|
| | Strongly Agree | | Agree | | Disagree/Strongly Disagree | |
| | Males | Females | Males | Females | Males | Females |
| Australia | 6 (1.1) | 3 (0.9) | ▲ 37 (2.1) | 18 (2.0) | 57 (2.2) | ▲ 80 (2.2) |
| Austria | ▲ 11 (1.9) | 4 (0.7) | ▲ 21 (2.3) | 12 (1.2) | 69 (2.9) | ▲ 84 (1.3) |
| Canada | 11 (1.1) | 7 (1.1) | ▲ 39 (2.6) | 23 (1.8) | 51 (2.4) | ▲ 71 (2.0) |
| Cyprus | 14 (2.3) | 9 (1.7) | 35 (3.6) | 24 (1.8) | 52 (3.2) | ▲ 68 (2.2) |
| Czech Rep. | 4 (0.7) | 3 (0.7) | 23 (2.1) | 18 (2.0) | 73 (2.4) | 79 (1.9) |
| France | 10 (1.6) | 6 (1.1) | ▲ 40 (2.1) | 22 (1.8) | 50 (3.1) | ▲ 73 (2.1) |
| Hungary | 5 (0.5) | 5 (0.5) | 15 (1.0) | 12 (0.9) | 80 (1.1) | 84 (1.0) |
| Iceland | 8 (1.3) | 4 (0.6) | ▲ 40 (1.9) | 24 (1.5) | 52 (1.9) | ▲ 72 (1.4) |
| Lithuania | 11 (1.4) | 10 (1.0) | 31 (2.0) | 28 (1.0) | 59 (2.2) | 62 (1.4) |
| Netherlands | 5 (1.0) | 4 (1.1) | ▲ 30 (1.8) | 14 (1.5) | 65 (2.1) | ▲ 82 (2.0) |
| New Zealand | 5 (1.0) | 3 (0.8) | ▲ 38 (2.8) | 26 (1.6) | 57 (2.7) | ▲ 71 (1.8) |
| Norway | ▲ 7 (0.8) | 4 (0.6) | ▲ 29 (1.7) | 19 (1.4) | 64 (2.0) | ▲ 77 (1.7) |
| Russian Fed. | 11 (0.9) | 12 (0.9) | 36 (2.6) | 33 (1.5) | 53 (2.8) | 55 (1.7) |
| Slovenia | 5 (1.0) | 4 (0.9) | 32 (2.6) | 25 (1.9) | 63 (2.8) | 71 (2.2) |
| Sweden | ▲ 7 (0.8) | 4 (0.5) | ▲ 37 (1.7) | 22 (1.1) | 56 (2.0) | ▲ 74 (1.3) |
| Switzerland | ▲ 13 (1.3) | 4 (0.6) | ▲ 32 (1.8) | 15 (1.6) | 55 (2.3) | ▲ 81 (1.8) |
| United States | 12 (1.0) | 9 (0.8) | ▲ 35 (1.2) | 26 (1.4) | 53 (1.5) | ▲ 65 (1.6) |
| International Avg. | ▲ 8 (0.3) | 5 (0.2) | ▲ 32 (0.5) | 21 (0.4) | 60 (0.6) | ▲ 73 (0.4) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

* See Appendix A for 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.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% response rate. Data are not available for Germany because the student response rate was less than 50%.

For comparative purposes, only those countries with approved sampling procedures across all populations are included. As a result, data from Kuwait, Philippines, Denmark, Greece, Thailand, Israel, and South Africa are not analyzed in this section. Bulgaria has also been excluded because achievement data by gender is not available.

## Summary

The findings from this chapter show that even though males outperformed females in mathematics and science, females in most countries reported spending more time out-of-school studying mathematics and science than their male counterparts. Also, interestingly, at the fourth grade, more females than males reported that it was important to do well in mathematics and science. These attitudes shifted dramatically, however, as students became older. At the eighth grade, there were few differences between the genders regarding the importance of doing well in mathematics and science and by the final year of secondary school – significantly more males than females in most countries agreed that it was important to do well in mathematics and science.

According to student's perceptions, parental influence encourages mathematics achievement differently for males than females. As early as the eighth grade, significantly greater percentages of males than females agreed that it was important to do well in mathematics to please their parents. Also, more eighth-grade males than females agreed that it was important to do well in mathematics and science to get their desired job. At the final year of secondary school, internationally, greater percentages of males than females reported that they would like a job in mathematics or a mathematics-related field. Nearly three-fourths of the females, on average internationally, reported that they did not need to do well in mathematics to get their desired job.

# Appendix A

# TIMSS Design and Procedures

## Test Design

The TIMSS tests were developed through an international consensus involving input from experts in mathematics, science, and educational measurement. The TIMSS Subject Matter Advisory Committee ensured that the tests reflected current thinking and priorities within the fields of mathematics and science. Every effort was made to help ensure that the tests represented the curricula of the participating countries and that the items exhibited no bias toward or against particular countries. This involved modifying specifications in accordance with data from the curriculum analysis component, obtaining ratings of the items by subject matter specialists within the participating countries, and conducting thorough statistical item analyses of data collected in the pilot testing. The final forms of the tests were endorsed by the National Research Coordinators (NRCs) of the participating countries.

TIMSS tested students at three points in their schooling – primary school (third and fourth grades in most countries), middle school (seventh and eighth grades in most countries), and the final year of secondary school. In mathematics, the third- and fourth-grade tests included items from six content areas: whole numbers; fractions and proportionality; measurement, estimation, and number sense; data representation, analysis, and probability; geometry; and algebra. For the seventh and eighth grades, the mathematics test included items from six content areas: fractions and number sense; proportionality; measurement; data representation, analysis, and probability; geometry; and algebra. In science, the primary-school test included items from four content areas: earth science; life science; physical science; and environmental issues and the nature of science. For the seventh and eighth grades, the science test included items from five content areas: earth science; life science; chemistry; physics; and environmental issues and the nature of science.

The mathematics and science literacy tests for final-year students were designed to assess students' general knowledge and understanding of mathematical and scientific principles. The mathematics items covered number sense, including fractions, percentages, and proportionality. Algebraic sense, measurement, and estimation are also covered, as are data representation and analysis. Reasoning and social utility were emphasized in several items. A general criterion in selecting the items was that they should involve the types of mathematics questions that could arise in real-life situations and that they be contextualized accordingly. Similarly, the science items selected for use in the TIMSS literacy test were organized according to three areas of science – earth science, life science, and physical science – and included a reasoning and social utility component. The emphasis was on measuring how well students could use their knowledge in addressing real-world problems having a science component. The test was designed to enable reporting for mathematics literacy and science literacy separately as well as overall.

To maximize the content coverage of the TIMSS tests, yet minimize the burden on individual students, TIMSS used a multiple

matrix sampling design whereby subsets of items from the total item pool were administered to sub-samples of students.[11] Each student responded to a subset of the total item pool; by aggregating data across booklets, TIMSS was able to derive population estimates of mathematics and science achievement. TIMSS does not provide individual proficiency estimates. The design was nearly identical for the primary and middle school assessments, but different for the assessment of final-year students.

For the primary and middle school tests, items were assigned to 26 mutually exclusive groups or "clusters." The clusters were then assigned to eight test booklets so that one cluster appeared in all test booklets, some clusters appeared in several test booklets, and some clusters appeared in one test booklet. Each test booklet contained mathematics and science test items. The test booklets were systematically distributed to students and each student completed one. Primary-school students had 64 minutes to complete their test booklets, and middle-school students had 90 minutes.

For the final year of secondary-school assessment, there were nine test booklets containing the assessment material for mathematics and science literacy, advanced mathematics, and physics. Two of these booklets contained exclusively mathematics and science literacy items, and one booklet contained some mathematics and science literacy items. Students were assigned one of nine booklets depending upon their academic preparation; all students were eligible to receive the two mathematics and science literacy booklets. Final-year students had 90 minutes to complete their booklets.

In each test, approximately one-quarter of the items were in the free-response format, requiring students to generate and write their own answers. Designed to take up about one-third of students' response time, some of these questions asked for short answers while others required extended responses in which students needed to show their work. The remaining questions were in multiple-choice format. In scoring the tests, correct answers to most questions were worth one point. Consistent with the approach of allotting longer response times for constructed-response questions than for multiple-choice questions, responses to some of these questions (particularly those requiring extended responses) could earn partial credit, with a fully correct answer being awarded two or three points.

## Sampling

TIMSS included testing at three separate populations.

> Population 1: Students enrolled in the two adjacent grades that contained the largest proportion of 9-year-old students at the time of testing – third- and fourth-grade students in most countries.
>
> Population 2: Students enrolled in the two adjacent grades that contained the largest proportion of 13-year-old students at the time of testing – seventh- and eighth-grade students in most countries.

[11] The TIMSS test design is fully described in Adams, R.J. and Gonzalez, E.J. (1996). "TIMSS Test Design" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume I.* Chestnut Hill, MA: Boston College.

Population 3: Students in their final year of secondary education. As an additional option, countries could test two special subgroups of these students: (1) students taking advanced courses in mathematics and (2) students taking physics.

Countries participating in the study were required to test the students in the two grades at Population 2, but could choose whether or not to participate at the other levels.

The selection of valid and efficient samples is crucial to the quality and success of an international comparative study such as TIMSS. The accuracy of the survey results depends on the quality of sampling information available and on the quality of the sampling activities themselves. For TIMSS, NRCs worked on all phases of sampling with staff from Statistics Canada. NRCs were trained in how to select the school and student samples and in the use of the sampling software. In consultation with the TIMSS sampling referee (Keith Rust, Westat), staff from Statistics Canada reviewed the national sampling plans, sampling data, sampling frames, and sample execution. This documentation was used by the International Study Center in consultation with Statistics Canada, the sampling referee, and the Technical Advisory Committee to evaluate the quality of the samples. In the achievement tables presented in Chapter 1 of this report, countries are grouped according to the extent to which they met the TIMSS sampling requirements. In the remaining tables, countries that did not meet the TIMSS standards for sampling at the eighth grade were excluded from the analysis.

To achieve acceptable participation rates, countries needed to assess 85% of both the schools and students or have a combined rate (the product of school and student participation) of 75% with or without replacement schools. Countries that met the participation guidelines only after including replacement schools are annotated in Chapter 1. Countries not reaching at least 50% of school participation without the use of replacement schools, or that failed to reach the sampling participation standard even with the inclusion of replacement schools are shown in a separate category for each of the tables in Chapter 1. Countries also needed to comply with the TIMSS guidelines for grade selection and classroom sampling. In particular, several countries did not comply with the guidelines for randomly sampling classrooms and these are shown in the last category in the Chapter 1 tables.

Exhibits A.1 through A.5 present the TIMSS school and student sample sizes by gender for each of the participating countries. Exhibit A.6 presents the name of the upper grade and the number of formal years of schooling associated with that grade for each country in populations 1 and 2.

## Data Collection Procedures

Each participating country was responsible for carrying out all aspects of the data collection, using standardized procedures developed for the study. Training manuals were developed for school coordinators and test administrators that detailed procedures for receipt and distribution of materials as well as for the activities related to the testing sessions. The test administrator manuals covered test security, standardized scripts to regulate directions and timing, rules for answering students' questions, and steps to ensure that

identification on the test booklets and questionnaires corresponded to the information on the forms used to track students.

Each country was responsible for conducting quality control procedures and for describing these in a report provided to the International Study Center. In addition, the International Study Center considered it essential to establish some method to monitor compliance with standard procedures. NRCs were asked to nominate a person, such as a retired school teacher, to serve as quality control monitor for their countries, and in almost all cases the International Study Center adopted the NRCs' first suggestion. The International Study Center developed manuals for the quality control monitors and briefed them in two-day training sessions about TIMSS, the responsibilities of the national centers in conducting the study, and their own roles and responsibilities.

The quality control monitors interviewed the NRCs about data collection plans and procedures. They also selected about 10 schools to visit, where they observed testing sessions and interviewed school coordinators.[12] The results of the interviews indicate that, in general, NRCs had prepared well for data collection and, despite the heavy demands of the schedule and shortages of resources, were in a position to collect the data in an efficient and professional manner. Similarly, the TIMSS tests appeared to have been administered in compliance with international procedures throughout the activities preliminary to the testing session, those during testing, and the school-level activities related to receiving, distributing, and returning materials from the national centers.

## Scoring the Free-Response Items

Because about one-third of the written test time was devoted to free-response items, TIMSS needed to develop procedures for reliably evaluating student responses within and across countries. Scoring used two-digit codes with rubrics specific to each item. Development of the rubrics was led by the Norwegian TIMSS national center. The first digit designates the correctness level of the response. The second digit, combined with the first, represents a diagnostic code used to identify specific types of approaches, strategies, or common errors and misconceptions. Although not specifically used to estimate overall proficiency in mathematics and science, analyses of responses based on the second digit should provide insight into ways to help students better understand mathematics concepts and problem-solving approaches.

To ensure reliable scoring procedures based on the TIMSS rubrics, the International Study Center prepared guides containing the rubrics and explaining how to implement them together with example student responses for the various rubric categories. These guides, together with more examples of student responses for practice in applying the rubrics, were used as a basis for an ambitious series of regional training sessions. These sessions

[12] The results of the interviews and observations by the quality control monitors are presented in Martin, M.O., Hoyle, C.D., and Gregory, K.D. (1996) "Monitoring the TIMSS Data Collection" and "Observing the TIMSS Test Administration" both in M.O. Martin and I.V.S. Mullis (Eds.), *Third International Mathematics and Science Study: Quality Assurance in Data Collection.* Chestnut Hill, MA: Boston College.

were designed to assist representatives of national centers who would then be responsible for training personnel in their countries to apply the two-digit codes reliably.[13]

To gather and document empirical information about the within-country agreement among scorers, TIMSS developed a procedure whereby systematic subsamples of some 10% of the students' responses were coded independently by two scorers. The percentage of exact agreement between the scorers was computed for each free-response item based on both the score level (first digit) and the diagnostic code (second digit) level. A very high percentage of exact agreement at the score level was observed for the free-response items on all TIMSS tests.[14]

## Data Processing

To ensure the availability of comparable, high-quality data for analysis, TIMSS undertook a rigorous set of quality control steps to create the international database.[15] TIMSS prepared manuals and software for countries to use in entering their data so that the information would be in a standard international format before being forwarded to the IEA Data Processing Center in Hamburg. Upon arrival at the Center, the data from each country underwent an exhaustive cleaning process. That process involved several iterative steps and procedures designed to identify, document, and correct deviations from the international instruments, file structures, and coding schemes. The process also emphasized consistency of information within national data sets and appropriate linking among the many student, teacher, and school data files.

Throughout the process, the data were checked and double-checked by the IEA Data Processing Center, the International Study Center, and the national centers. The national centers were contacted regularly and given multiple opportunities to review the data for their countries. In conjunction with the Australian Council for Educational Research (ACER), the International Study Center reviewed the item statistics of each cognitive item in each country to identify poorly performing items. Usually the poor statistics (negative point-biserials for the key, large item-by-country interactions, and statistics indicating lack of fit with the model) were a result of deviations in translation, adaptation, or printing.

[13] The procedures used in the training sessions are documented in Mullis, I.V.S., Garden, R.A., and Jones, C.A. (1996) "Training for Scoring the TIMSS Free-Response Items" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume I.* Chestnut Hill, MA: Boston College.

[14] Summaries of the scoring reliability data for each test are included in the appendices of the international reports (see references in "Summary of Results" chapter).

[15] These steps are detailed in Jungclaus, H. and Bruneforth, M. (1996). "Data Consistency Checking Across Countries" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume I.* Chestnut Hill, MA: Boston College.

## IRT Scaling and Data Analysis

The mathematics and science achievement results were summarized using an item response theory (IRT) scaling method (Rasch model).[16] This scaling method produces a test score by averaging the responses of each student to the items they took in a way that takes into account the difficulty of each item. The method used in TIMSS includes refinements that enable reliable scores to be produced even though individual students responded to relatively small subsets of the total mathematics item pool. Analyses of the response patterns of students from participating countries indicated that, although the items in each TIMSS test address a wide range of mathematics or science content, the performance of the students across the items was sufficiently consistent to be usefully summarized in a single score per test.

The IRT method was preferred for developing comparable estimates of performance for all students, since students answered different test items depending upon which test booklet they received. The IRT analysis provides a common scale on which performance can be compared across countries. In addition to providing a basis for estimating mean achievement, scale scores permit estimates of how students within countries vary and provide information on percentiles of performance. For Population 1 and Population 2, each scale was standardized using students from both the grades tested. When all participating countries and grades are treated equally, the TIMSS scale average is 500 and the standard deviation is 100. Since the countries vary in size, each country was reweighted to contribute equally to the mean and standard deviation of the scale. The international averages of the Population 1 scale scores (mathematics and science) were constructed to be the averages of the 26 means of countries that were available at fourth grade and the 24 means of those at third grade. The international averages of the Population 2 scale scores (mathematics and science) were constructed to be the averages of the 41 means of countries that were available at eighth grade and the 39 means of those at seventh grade. For the Population 3 mathematics and science literacy assessment, the mathematics literacy scale and the science literacy scale were constructed using data from the 21 countries that participated in the assessment and have an average of 500 and a standard deviation of 100.

[16] The TIMSS scaling model is fully documented in Adams, R.J., Wu, M.L., and Macaskill, G. (1997). "Scaling Methodology and Procedures for the Mathematics and Science Scales" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume II.* Chestnut Hill, MA: Boston College.

## The Gender Difference Index (GDI)

This report used a statistic known as the Gender Difference Index (GDI) in order to explore differences by gender at the item level. The GDI was developed for use in a previous IEA study of reading literacy.[17] The formula for calculating the GDI is listed below:

where: $$D = -\beta X.Y * 100 = -\frac{(P_0 - P_1)}{(P_0 + P_1)(2 - P_0 - P_1)} * 100$$

$D$ = (The percentage of females among those who answered incorrectly) – (The percentage of females among those who answered correctly)

$\beta$ = Regression coefficient

$X$ = A dummy variable for gender where X = 0 for females and X=1 for males

$Y$ = A dummy variable for the outcome where Y = 0 for an incorrect answer and Y=1 for a correct answer

$P_0$ = The relative frequency of females answering correctly

$P_1$ = The relative frequency of males answering correctly

In this report, an item on which males outperformed females would yield a positive GDI. Conversely, an item on which females outperformed males would yield a negative value for the GDI. For further information on the Gender Difference Index, refer to Wagemaker (1996), Appendix L.

## Estimating Sampling Error

Because the statistics presented in this report are national estimates based on samples of schools and students rather than the values that could be calculated if every school and student in a country answered every question, it is important to have measures of the degree of uncertainty of the estimates. The jackknife procedure was used to estimate the standard error associated with each statistic presented in this report.[18] The use of confidence intervals, based on the standard errors, allows inferences to be made about the population means and proportions in a manner that reflects the uncertainty associated with the sample estimates. An estimated sample statistic plus or minus two standard errors represents a 95% confidence interval for the corresponding population result.

[17] Taube, K. and Munck, I. (1996). "Gender Differences at the Item Level" in H. Wagemaker (Ed.), *Are Girls Better Readers?: Gender Differences in Reading Literacy in 32 Countries*. Delft, Amsterdam: Eburon Publishers.

[18] The jackknife repeated replication technique for estimating sampling errors is documented in Gonzalez, E.J. and Foy, P. (1997). "Estimation of Sampling Variability, Design Effects, and Effective Sample Sizes" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume II*. Chestnut Hill, MA: Boston College.

## Exhibit A.1 School and Student Sample Sizes by Gender
### Fourth Grade

| Country | Number of Schools | Number of Students | Number of Males | Number of Females |
|---|---|---|---|---|
| *Australia* | 177 | 6492 | 3240 | 3252 |
| *Austria* | 132 | 2603 | 1341 | 1262 |
| **Canada** | 389 | 8235 | 4172 | 4063 |
| **Cyprus** | 146 | 3362 | 1705 | 1657 |
| **Czech Republic** | 187 | 3268 | 1561 | 1707 |
| **England** | 127 | 3126 | 1544 | 1582 |
| **Hong Kong** | 124 | 4388 | 2375 | 2013 |
| *Hungary* | 149 | 2936 | 1474 | 1462 |
| **Iceland** | 144 | 1809 | 880 | 929 |
| **Iran, Islamic Rep.** | 180 | 3385 | 1730 | 1655 |
| **Ireland** | 165 | 2873 | 1452 | 1421 |
| **Japan** | 142 | 4306 | 2153 | 2153 |
| **Korea** | 150 | 2812 | 1424 | 1388 |
| *Latvia (LSS)* | 125 | 2216 | 1128 | 1088 |
| *Netherlands* | 129 | 2496 | 1258 | 1238 |
| **New Zealand** | 149 | 2421 | 1183 | 1238 |
| **Norway** | 134 | 2192 | 1167 | 1025 |
| **Portugal** | 148 | 2852 | 1459 | 1393 |
| **Scotland** | 152 | 3290 | 1651 | 1639 |
| **Singapore** | 191 | 7133 | 3750 | 3383 |
| *Slovenia* | 120 | 2540 | 1258 | 1282 |
| **United States** | 182 | 7296 | 3547 | 3749 |

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

Countries appearing in italics either did not satisfy guidelines for sample participation rates or did not meet age/grade specifications.

## Exhibit A.2 School and Student Sample Sizes by Gender
### Eighth Grade

| Country | Number of Schools | Number of Students | Number of Males | Number of Females |
|---|---|---|---|---|
| *Australia* | 161 | 7251 | 3529 | 3722 |
| *Austria* | 123 | 2706 | 1385 | 1321 |
| **Belgium (Fl)** | 141 | 2894 | 1457 | 1437 |
| *Belgium (Fr)* | 119 | 2560 | 1269 | 1291 |
| **Canada** | 364 | 8225 | 4137 | 4088 |
| *Colombia* | 140 | 2623 | 1240 | 1383 |
| **Cyprus** | 55 | 2918 | 1494 | 1424 |
| **Czech Republic** | 149 | 3327 | 1690 | 1637 |
| **England** | 121 | 1776 | 923 | 853 |
| **France** | 124 | 2879 | 1449 | 1430 |
| *Germany* | 135 | 2833 | 1410 | 1423 |
| **Hong Kong** | 85 | 3337 | 1829 | 1508 |
| **Hungary** | 150 | 2912 | 1423 | 1489 |
| **Iceland** | 129 | 1773 | 905 | 868 |
| **Iran, Islamic Rep.** | 191 | 3680 | 2043 | 1637 |
| **Ireland** | 132 | 3076 | 1541 | 1535 |
| **Japan** | 151 | 5141 | 2646 | 2495 |
| **Korea** | 150 | 2920 | 1585 | 1335 |
| **Latvia (LSS)** | 141 | 2407 | 1148 | 1259 |
| **Lithuania** | 145 | 2525 | 1140 | 1385 |
| *Netherlands* | 94 | 1957 | 980 | 977 |
| **New Zealand** | 149 | 3683 | 1908 | 1775 |
| **Norway** | 146 | 3267 | 1633 | 1634 |
| **Portugal** | 142 | 3391 | 1728 | 1663 |
| *Romania* | 163 | 3723 | 1809 | 1914 |
| **Russian Federation** | 174 | 4022 | 1871 | 2151 |
| *Scotland* | 124 | 2815 | 1457 | 1358 |
| **Singapore** | 137 | 4641 | 2334 | 2307 |
| **Slovak Republic** | 145 | 3501 | 1716 | 1785 |
| *Slovenia* | 121 | 2705 | 1324 | 1381 |
| **Spain** | 153 | 3855 | 1848 | 2007 |
| **Sweden** | 116 | 4063 | 2084 | 1979 |
| **Switzerland** | 250 | 4854 | 2443 | 2411 |
| **United States** | 183 | 7087 | 3526 | 3561 |

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

Countries appearing in italics either did not satisfy guidelines for sample participation rates or did not meet age/grade specifications.

## Exhibit A.3 School and Student Sample Sizes by Gender - Mathematics and Science Literacy
### Final Year of Secondary School

| Country | Number of Schools | Number of Students | Number of Males | Number of Females |
|---|---|---|---|---|
| *Australia* | 87 | 1941 | 775 | 1166 |
| *Austria* | 169 | 1919 | 878 | 1041 |
| *Canada* | 337 | 5205 | 2672 | 2533 |
| **Cyprus** | 28 | 531 | 251 | 280 |
| **Czech Republic** | 150 | 2167 | 1115 | 1052 |
| *France* | 56 | 1572 | 813 | 759 |
| *Germany* | 150 | 2179 | 1071 | 1108 |
| **Hungary** | 204 | 4912 | 2370 | 2542 |
| *Iceland* | 30 | 1687 | 800 | 887 |
| **Lithuania** | 142 | 2886 | 948 | 1938 |
| *Netherlands* | 79 | 1470 | 745 | 725 |
| **New Zealand** | 79 | 1763 | 852 | 911 |
| *Norway* | 131 | 2518 | 1190 | 1328 |
| **Russian Federation** | 163 | 2289 | 841 | 1448 |
| *Slovenia* | 78 | 1563 | 828 | 735 |
| **Sweden** | 145 | 3068 | 1462 | 1606 |
| **Switzerland** | 383 | 3283 | 1660 | 1623 |
| *United States* | 211 | 5807 | 2839 | 2968 |

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

Countries appearing in italics either did not satisfy guidelines for sample participation rates or did not meet age/grade specifications.

## Exhibit A.4 School and Student Sample Sizes by Gender - Advanced Mathematics
### Final Year of Secondary School

| Country | Number of Schools | Number of Students | Number of Males | Number of Females |
|---|---|---|---|---|
| *Australia* | 83 | 645 | 360 | 285 |
| *Austria* | 114 | 763 | 299 | 464 |
| **Canada** | 309 | 2772 | 1474 | 1298 |
| **Cyprus** | 21 | 388 | 237 | 151 |
| **Czech Republic** | 90 | 1101 | 451 | 650 |
| **France** | 61 | 1055 | 665 | 390 |
| **Germany** | 76 | 2250 | 832 | 1418 |
| **Lithuania** | 29 | 734 | 372 | 362 |
| **Russian Federation** | 113 | 1638 | 908 | 730 |
| *Slovenia* | 72 | 1521 | 746 | 775 |
| **Sweden** | 101 | 1001 | 644 | 357 |
| **Switzerland** | 197 | 1389 | 766 | 623 |
| *United States* | 199 | 2785 | 1417 | 1368 |

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

Countries appearing in italics either did not satisfy guidelines for sample participation rates or did not meet age/grade specifications.

## Exhibit A.5 School and Student Sample Sizes by Gender - Physics
### Final Year of Secondary School

| Country | Number of Schools | Number of Students | Number of Males | Number of Females |
|---|---|---|---|---|
| *Australia* | 85 | 661 | 417 | 244 |
| *Austria* | 114 | 763 | 306 | 457 |
| **Canada** | 306 | 2353 | 1440 | 913 |
| **Cyprus** | 21 | 367 | 230 | 137 |
| **Czech Republic** | 90 | 1087 | 426 | 661 |
| **France** | 61 | 1087 | 670 | 417 |
| **Germany** | 74 | 709 | 487 | 222 |
| **Norway** | 66 | 1048 | 781 | 267 |
| **Russian Federation** | 91 | 1259 | 724 | 535 |
| *Slovenia* | 51 | 726 | 566 | 160 |
| **Sweden** | 101 | 1012 | 651 | 361 |
| **Switzerland** | 197 | 1359 | 727 | 632 |
| *United States* | 203 | 3114 | 1617 | 1497 |

Countries appearing in italics either did not satisfy guidelines for sample participation rates or did not meet age/grade specifications.

## Exhibit A.6 Grades Tested in TIMSS

| Country | Upper Grade - Population 1 | | Upper Grade - Population 2 | |
|---|---|---|---|---|
| | Country's Name for Upper Grade | Years of Formal Schooling Including Upper Grade[1] | Country's Name for Upper Grade | Years of Formal Schooling Including Upper Grade[1] |
| [2] Australia | 4 or 5 | 4 or 5 | 8 or 9 | 8 or 9 |
| Austria | 4 | 4 | 4. Klasse | 8 |
| Belgium (Fl) | | | 2A & 2P | 8 |
| Belgium (Fr) | | | 2A & 2P | 8 |
| Bulgaria | | | 8 | 8 |
| Canada | 4 | 4 | 8 | 8 |
| Colombia | | | 8 | 8 |
| [3] Cyprus | 4 | 4 | 8 | 8 |
| Czech Republic | 4 | 4 | 8 | 8 |
| Denmark | | | 7 | 7 |
| England | Year 5 | 5 | Year 9 | 9 |
| France | | | 4ème (90%) or 4ème Technologique (10%) | 8 |
| Germany | | | 8 | 8 |
| Greece | 4 | 4 | Secondary 2 | 8 |
| Hong Kong | Primary 4 | 4 | Secondary 2 | 8 |
| Hungary | 4 | 4 | 8 | 8 |
| Iceland | 4 | 4 | 8 | 8 |
| Iran, Islamic Rep. | 4 | 4 | 8 | 8 |
| Ireland | 4th Class | 4 | 2nd Year | 8 |
| Israel | 4 | 4 | 8 | 8 |
| Japan | 4 | 4 | 2nd Grade Lower Secondary | 8 |
| Korea | 4th Grade | 4 | 2nd Grade Middle School | 8 |
| Kuwait | 5 | 5 | 9 | 9 |
| Latvia | 4 | 4 | 8 | 8 |
| Lithuania | | | 8 | 8 |
| [4] Netherlands | 6 | 4 | Secondary 2 | 8 |
| [3,5] New Zealand | Standard 3 | 4.5–5.5 | Form 3 | 8.5 - 9.5 |
| [3] Norway | 3 | 3 | 7 | 7 |
| [3] Philippines | | | 1st Year High School | 7 |
| Portugal | 4 | 4 | Grade 8 | 8 |
| Romania | | | 8 | 8 |
| [6] Russian Federation | | | 8 | 7 or 8 |
| Scotland | Year 5 | 5 | Secondary 2 | 9 |
| Singapore | Primary 4 | 4 | Secondary 2 | 8 |
| Slovak Republic | | | 8 | 8 |
| Slovenia | 4 | 4 | 8 | 8 |
| Spain | | | 8 EGB | 8 |
| [3] South Africa | | | Standard 6 | 8 |
| [3] Sweden | | | 7 | 7 |
| [3] Switzerland | | | 0 | 0 |
| (German) | | | 7 | 7 |
| (French and Italian) | | | 8 | 8 |
| Thailand | Primary 4 | 4 | Secondary 2 | 8 |
| United States | 4 | 4 | 8 | 8 |

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

1 Years of schooling based on the number of years children in the grade level have been in formal schooling, beginning with primary education (International Standard Classification of Education Level 1). Does not include preprimary education.

2 Australia: Each state/territory has its own policy regarding age of entry to primary school. In 4 of the 8 states/territories students were sampled from grades 3 and 4; in the other four states/territories students were sampled from grades 4 and 5. In 4 of the 8 states/territories students were sampled from grades 7 and 8; in the other four states/territories students were sampled from grades 8 and 9.

3 Indicates that there is a system-split between the lower and upper grades. In Cyprus, system-split occurs only in the large or city schools. In Switzerland there is a system-split in 14 of 26 cantons.

4 In the Netherlands kindergarten is integrated with primary education. Grade-counting starts at age 4 (formerly kindergarten 1). Formal schooling in reading, writing, and arithmetic starts in grade 3, age 6.

5 New Zealand: The majority of students begin primary school on or near their 5th birthday so the "years of formal schooling" vary.

6 Russian Federation: 70% of students in the seventh grade have had 6 years of formal schooling; 70% in the eighth grade have had 7 years of formal schooling.

Appendix B

# Gender Differences Across the Performance Distribution

## Exhibit B.1

**Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Mathematics - Fourth Grade***

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 49 (2.0) | 51 (2.0) | 50 (1.1) | 50 (1.1) | 52 (1.8) | 48 (1.8) |
| Austria | 47 (2.5) | 53 (2.5) | 49 (1.2) | 51 (1.2) | 54 (1.6) | 46 (1.6) |
| Canada | 48 (2.0) | 52 (2.0) | 50 (1.0) | 50 (1.0) | 52 (1.7) | 48 (1.7) |
| Cyprus | 51 (1.9) | 49 (1.9) | 46 (1.3) | 54 (1.3) | ▲ 56 (1.9) | 44 (1.9) |
| Czech Republic | 48 (1.6) | 52 (1.6) | 52 (1.3) | 48 (1.3) | 49 (2.2) | 51 (2.2) |
| England | 48 (2.8) | 52 (2.8) | 49 (1.6) | 51 (1.6) | 53 (2.3) | 47 (2.3) |
| Hong Kong | 50 (1.7) | 50 (1.7) | 50 (1.0) | 50 (1.0) | 50 (1.7) | 50 (1.7) |
| Hungary | 51 (2.5) | 49 (2.5) | 48 (1.8) | 52 (1.8) | 53 (2.5) | 47 (2.5) |
| Iceland | 50 (2.7) | 50 (2.7) | 50 (1.5) | 50 (1.5) | 49 (2.7) | 51 (2.7) |
| Iran, Islamic Rep. | 48 (4.0) | 52 (4.0) | 49 (1.8) | 51 (1.8) | 55 (4.3) | 45 (4.3) |
| Ireland | 51 (2.3) | 49 (2.3) | 49 (1.4) | 51 (1.4) | 51 (2.6) | 49 (2.6) |
| Japan | 47 (1.6) | 53 (1.6) | 48 (1.2) | 52 (1.2) | ▲ 56 (1.6) | 44 (1.6) |
| Korea | 43 (1.8) | ▲ 57 (1.8) | 50 (1.3) | 50 (1.3) | 56 (2.4) | 44 (2.4) |
| Latvia (LSS) | 54 (2.3) | 46 (2.3) | 50 (1.3) | 50 (1.3) | 47 (2.3) | 53 (2.3) |
| Netherlands | 43 (2.5) | 57 (2.5) | 50 (1.7) | 50 (1.7) | 56 (2.0) | 44 (2.0) |
| New Zealand | ▲ 58 (2.4) | 42 (2.4) | 46 (1.3) | 54 (1.3) | 49 (2.4) | 51 (2.4) |
| Norway | 50 (2.4) | 50 (2.4) | 48 (1.7) | 52 (1.7) | 54 (2.7) | 46 (2.7) |
| Portugal | 49 (1.9) | 51 (1.9) | 49 (1.7) | 51 (1.7) | 52 (2.5) | 48 (2.5) |
| Scotland | 53 (1.5) | 47 (1.5) | 48 (1.0) | 52 (1.0) | 51 (1.7) | 49 (1.7) |
| Singapore | 53 (1.6) | 47 (1.6) | 49 (0.8) | 51 (0.8) | 48 (2.0) | 52 (2.0) |
| Slovenia | 51 (2.6) | 49 (2.6) | 49 (1.5) | 51 (1.5) | 51 (2.5) | 49 (2.5) |
| United States | 50 (1.3) | 50 (1.3) | 49 (1.0) | 51 (1.0) | 51 (1.5) | 49 (1.5) |
| International Avg. | 50 (0.5) | 50 (0.5) | 49 (0.3) | ▲ 51 (0.3) | ▲ 52 (0.5) | 48 (0.5) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

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

## Exhibit B.2 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Mathematics - Fourth Grade*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 429 (5.0) | 432 (5.1) | 546 (3.0) | 547 (3.6) | 664 (3.0) | 664 (4.1) |
| Austria | 457 (5.1) | 454 (3.9) | 562 (3.4) | 562 (3.4) | 659 (3.5) | 657 (4.3) |
| Canada | 422 (4.9) | 429 (5.3) | 532 (3.4) | 533 (3.7) | 640 (4.2) | 638 (5.2) |
| Cyprus | 392 (3.4) | 393 (4.0) | 506 (4.0) | 500 (3.0) | 611 (5.1) | 613 (3.3) |
| Czech Republic | 457 (4.4) | 458 (2.9) | 567 (3.8) | 566 (3.3) | 678 (5.0) | 676 (5.4) |
| England | 396 (2.4) | 402 (5.3) | 510 (2.5) | 509 (4.1) | 631 (4.9) | 632 (7.4) |
| Hong Kong | 480 (6.3) | 489 (4.8) | 591 (4.4) | 589 (5.1) | 683 (4.5) | 683 (4.6) |
| Hungary | 439 (5.0) | 437 (3.9) | 549 (4.1) | 548 (3.8) | 664 (4.3) | 658 (6.5) |
| Iceland | 385 (3.3) | 382 (3.1) | 472 (3.0) | 472 (3.3) | 570 (4.0) | 565 (5.3) |
| Iran, Islamic Rep. | 343 (3.6) | 344 (4.3) | 427 (4.3) | 425 (4.1) | 522 (8.0) | 513 (5.1) |
| Ireland | 437 (4.9) | 442 (5.4) | 549 (4.3) | 555 (3.7) | 658 (4.3) | 653 (2.8) |
| Japan | 486 (3.0) | ▲ 498 (2.9) | 599 (2.3) | 598 (2.5) | 699 (2.6) | 695 (2.5) |
| Korea | 515 (3.9) | 515 (3.4) | 614 (2.3) | 611 (2.5) | 705 (3.2) | 698 (3.1) |
| Latvia (LSS) | 418 (3.9) | 422 (4.8) | 520 (4.3) | 526 (5.5) | 640 (10.2) | 632 (7.9) |
| Netherlands | 489 (4.9) | 486 (4.4) | 579 (3.1) | 575 (4.1) | 671 (4.0) | 663 (4.2) |
| New Zealand | 378 (7.5) | 389 (4.9) | 503 (5.7) | 499 (3.5) | 612 (6.6) | 608 (4.8) |
| Norway | 404 (5.4) | 407 (3.1) | 504 (3.7) | 503 (2.6) | 596 (3.8) | 592 (4.4) |
| Portugal | 372 (5.0) | 372 (5.9) | 478 (3.8) | 477 (3.5) | 577 (4.2) | 573 (3.3) |
| Scotland | 407 (4.6) | 406 (4.7) | 520 (4.3) | 520 (3.8) | 637 (6.2) | 630 (4.6) |
| Singapore | 483 (4.7) | 493 (6.9) | 630 (4.7) | 631 (6.4) | 751 (6.5) | 752 (7.9) |
| Slovenia | 445 (4.8) | 451 (4.6) | 552 (4.6) | 552 (2.7) | 655 (4.6) | 661 (3.4) |
| United States | 432 (3.2) | 436 (3.8) | 547 (3.2) | 546 (3.4) | 652 (3.8) | 650 (4.3) |
| International Avg. | 430 (1.0) | ▲ 433 (1.0) | 539 (0.8) | 538 (0.8) | ▲ 644 (1.1) | 641 (1.1) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Fourth Grade in most countries; see Appendix A for 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.

## Exhibit B.3 Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Mathematics - Eighth Grade*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 53 (2.3) | 47 (2.3) | 48 (0.9) | 52 (0.9) | 50 (2.0) | 50 (2.0) |
| Austria | 48 (2.5) | 52 (2.5) | 49 (1.2) | 51 (1.2) | 54 (1.8) | 46 (1.8) |
| Belgium (Fl) | 50 (6.0) | 50 (6.0) | 51 (2.3) | 49 (2.3) | 49 (4.0) | 51 (4.0) |
| Belgium (Fr) | 48 (4.2) | 52 (4.2) | 49 (2.3) | 51 (2.3) | 54 (2.6) | 46 (2.6) |
| Canada | 52 (3.0) | 48 (3.0) | 49 (1.6) | 51 (1.6) | 50 (1.9) | 50 (1.9) |
| Colombia | 50 (4.4) | 50 (4.4) | 49 (1.8) | 51 (1.8) | 52 (4.6) | 48 (4.6) |
| Cyprus | 51 (1.8) | 49 (1.8) | 50 (1.0) | 50 (1.0) | 48 (1.6) | 52 (1.6) |
| Czech Republic | 46 (2.0) | 54 (2.0) | 50 (1.0) | 50 (1.0) | 54 (2.3) | 46 (2.3) |
| England | 52 (3.1) | 48 (3.1) | 47 (1.4) | 53 (1.4) | 55 (3.1) | 45 (3.1) |
| France | 46 (2.1) | 54 (2.1) | 51 (1.4) | 49 (1.4) | 51 (2.2) | 49 (2.2) |
| Germany | 52 (2.5) | 48 (2.5) | 49 (1.4) | 51 (1.4) | 51 (2.3) | 49 (2.3) |
| Hong Kong | 43 (3.3) | 57 (3.3) | 49 (1.5) | 51 (1.5) | 58 (3.1) | 42 (3.1) |
| Hungary | 52 (2.0) | 48 (2.0) | 49 (1.2) | 51 (1.2) | 50 (2.0) | 50 (2.0) |
| Iceland | 52 (4.0) | 48 (4.0) | 45 (1.6) | 55 (1.6) | 57 (2.7) | 43 (2.7) |
| Iran, Islamic Rep. | 42 (3.3) | 58 (3.3) | 51 (1.4) | 49 (1.4) | 56 (2.8) | 44 (2.8) |
| Ireland | 46 (3.2) | 54 (3.2) | 48 (1.4) | 52 (1.4) | 57 (3.3) | 43 (3.3) |
| Japan | 49 (1.4) | 51 (1.4) | 48 (0.9) | 52 (0.9) | ▲ 55 (1.5) | 45 (1.5) |
| Korea | 44 (2.0) | 56 (2.0) | 50 (1.2) | 50 (1.2) | 55 (2.2) | 45 (2.2) |
| Latvia (LSS) | 48 (2.5) | 52 (2.5) | 50 (1.6) | 50 (1.6) | 53 (2.1) | 47 (2.1) |
| Lithuania | 49 (3.0) | 51 (3.0) | 51 (1.6) | 49 (1.6) | 49 (2.1) | 51 (2.1) |
| Netherlands | 47 (2.3) | 53 (2.3) | 49 (1.5) | 51 (1.5) | 54 (2.9) | 46 (2.9) |
| New Zealand | 48 (2.7) | 52 (2.7) | 49 (1.7) | 51 (1.7) | 55 (3.1) | 45 (3.1) |
| Norway | 52 (2.2) | 48 (2.2) | 48 (1.2) | 52 (1.2) | 53 (1.9) | 47 (1.9) |
| Portugal | 45 (2.1) | 55 (2.1) | 50 (1.3) | 50 (1.3) | 55 (1.8) | 45 (1.8) |
| Romania | 50 (2.2) | 50 (2.2) | 49 (1.3) | 51 (1.3) | 52 (2.2) | 48 (2.2) |
| Russian Federation | 53 (1.9) | 47 (1.9) | 48 (1.0) | 52 (1.0) | 51 (1.5) | 49 (1.5) |
| Scotland | 44 (2.1) | 56 (2.1) | 50 (1.3) | 50 (1.3) | 56 (2.9) | 44 (2.9) |
| Singapore | 51 (2.6) | 49 (2.6) | 49 (0.9) | 51 (0.9) | 50 (2.6) | 50 (2.6) |
| Slovak Republic | 50 (2.6) | 50 (2.6) | 48 (1.3) | 52 (1.3) | 55 (2.0) | 45 (2.0) |
| Slovenia | 47 (1.7) | 53 (1.7) | 51 (1.0) | 49 (1.0) | 52 (2.0) | 48 (2.0) |
| Spain | 47 (1.8) | 53 (1.8) | 49 (1.1) | 51 (1.1) | 54 (2.2) | 46 (2.2) |
| Sweden | 49 (1.8) | 51 (1.8) | 51 (1.2) | 49 (1.2) | 48 (1.7) | 52 (1.7) |
| Switzerland | 49 (2.1) | 51 (2.1) | 49 (1.0) | 51 (1.0) | 53 (1.7) | 47 (1.7) |
| United States | 50 (1.7) | 50 (1.7) | 47 (0.8) | ▲ 53 (0.8) | ▲ 55 (1.6) | 45 (1.6) |
| International Avg. | 49 (0.5) | 51 (0.5) | 49 (0.2) | 51 (0.2) | ▲ 53 (0.4) | 47 (0.4) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

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

## Exhibit B.4 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Mathematics - Eighth Grade*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 403 (5.0) | 407 (2.8) | 528 (5.8) | 529 (3.6) | 656 (5.1) | 657 (4.6) |
| Austria | 423 (5.4) | 423 (4.5) | 537 (3.6) | 539 (4.0) | 660 (4.0) | 655 (4.0) |
| Belgium (Fl) | 439 (14.1) | 454 (4.9) | 565 (7.1) | 568 (5.7) | 685 (4.0) | 678 (4.2) |
| Belgium (Fr) | 413 (10.0) | 418 (5.4) | 528 (6.6) | 528 (3.9) | 636 (4.1) | 631 (4.8) |
| Canada | 415 (2.6) | 422 (5.1) | 527 (2.6) | 526 (3.5) | 639 (3.8) | 639 (4.2) |
| Colombia | 309 (4.8) | 311 (3.2) | 380 (4.5) | 380 (2.7) | 470 (7.5) | 469 (5.6) |
| Cyprus | 365 (3.3) | 367 (3.1) | 469 (3.0) | 471 (2.7) | 592 (3.7) | 585 (3.7) |
| Czech Republic | 448 (3.0) | 449 (4.5) | 559 (5.6) | 559 (6.6) | 688 (6.8) | 687 (7.8) |
| England | 391 (2.6) | 389 (5.7) | 502 (3.4) | 503 (3.5) | 628 (4.6) | 628 (4.0) |
| France | 447 (4.1) | 443 (3.9) | 537 (2.9) | 536 (4.2) | 638 (3.5) | 638 (5.4) |
| Germany | 404 (4.9) | 398 (3.9) | 508 (6.1) | 505 (4.9) | 629 (5.6) | 625 (5.7) |
| Hong Kong | 453 (12.4) | 460 (9.2) | 594 (6.9) | 590 (6.0) | 713 (6.0) | 709 (5.9) |
| Hungary | 424 (4.0) | 419 (4.4) | 536 (4.6) | 532 (3.4) | 657 (4.5) | 660 (3.9) |
| Iceland | 390 (6.6) | 395 (4.2) | 482 (7.9) | 486 (3.8) | 586 (5.0) | 587 (6.3) |
| Iran, Islamic Rep. | 357 (2.5) | 356 (3.2) | 427 (2.1) | 422 (2.6) | 507 (3.2) | 506 (3.0) |
| Ireland | 406 (7.3) | 414 (4.9) | 527 (5.8) | 524 (5.9) | 649 (4.4) | 645 (7.3) |
| Japan | 469 (2.5) | ▲ 478 (3.2) | 609 (2.4) | 604 (2.3) | 736 (2.6) | 730 (2.2) |
| Korea | 467 (5.6) | 467 (3.5) | 611 (2.7) | 608 (3.3) | 745 (3.2) | 741 (4.5) |
| Latvia (LSS) | 396 (4.3) | 393 (3.4) | 487 (3.8) | 489 (3.0) | 603 (5.1) | 603 (4.6) |
| Lithuania | 378 (5.3) | 378 (3.5) | 473 (4.8) | 476 (3.6) | 583 (5.2) | 581 (4.6) |
| Netherlands | 428 (10.8) | 426 (10.0) | 540 (7.5) | 539 (8.1) | 656 (8.1) | 654 (7.5) |
| New Zealand | 394 (6.0) | 397 (3.1) | 506 (5.6) | 504 (4.8) | 627 (5.9) | 624 (6.1) |
| Norway | 401 (3.8) | 399 (2.2) | 500 (2.9) | 500 (2.3) | 617 (2.9) | 609 (4.0) |
| Portugal | 380 (2.9) | 376 (2.1) | 452 (2.9) | 448 (2.2) | 540 (4.4) | 538 (3.5) |
| Romania | 370 (3.1) | 372 (4.7) | 478 (4.3) | 477 (5.9) | 602 (4.7) | 597 (6.2) |
| Russian Federation | 415 (5.4) | 423 (6.1) | 535 (6.9) | 535 (6.3) | 659 (4.9) | 648 (4.3) |
| Scotland | 393 (4.0) | 391 (4.0) | 494 (5.9) | 493 (6.1) | 619 (8.4) | 610 (7.3) |
| Singapore | 531 (6.2) | 533 (5.3) | 642 (5.9) | 643 (5.4) | 754 (5.1) | 758 (5.0) |
| Slovak Republic | 431 (6.1) | 433 (2.7) | 543 (6.0) | 545 (3.3) | 667 (3.9) | 667 (5.4) |
| Slovenia | 429 (3.8) | 432 (3.2) | 540 (3.8) | 536 (3.9) | 658 (4.0) | 654 (3.5) |
| Spain | 400 (2.1) | 398 (2.7) | 484 (2.4) | 482 (2.6) | 588 (3.6) | 583 (3.6) |
| Sweden | 415 (3.4) | 409 (4.1) | 517 (3.2) | 516 (3.7) | 632 (3.9) | 626 (2.6) |
| Switzerland | 430 (4.2) | 435 (5.4) | 548 (2.3) | 546 (3.7) | 657 (2.7) | 653 (3.2) |
| United States | 386 (4.1) | 389 (4.1) | 496 (5.2) | 496 (5.5) | 618 (4.9) | 621 (6.7) |
| International Avg. | 412 (1.0) | 413 (0.8) | 520 (0.9) | 519 (0.8) | ▲ 637 (0.9) | 634 (0.9) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Eighth Grade in most countries; see Appendix A for 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.

## Exhibit B.5 Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Mathematics Literacy - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 44 (4.3) | 56 (4.3) | 46 (2.7) | 54 (2.7) | ▲ 64 (4.1) | 36 (4.1) |
| Austria | 35 (4.5) | ▲ 65 (4.5) | 47 (2.1) | 53 (2.1) | ▲ 69 (4.4) | 31 (4.4) |
| Canada | 38 (3.2) | ▲ 62 (3.2) | 50 (2.2) | 50 (2.2) | ▲ 62 (3.2) | 38 (3.2) |
| Cyprus | 45 (6.1) | 55 (6.1) | 48 (3.0) | 52 (3.0) | 59 (3.2) | 41 (3.2) |
| Czech Republic | 36 (5.7) | 64 (5.7) | 50 (2.8) | 50 (2.8) | 63 (6.0) | 37 (6.0) |
| France | 36 (4.0) | ▲ 64 (4.0) | 49 (2.6) | 51 (2.6) | ▲ 66 (3.6) | 34 (3.6) |
| Germany | 41 (4.7) | 59 (4.7) | 50 (2.4) | 50 (2.4) | 60 (4.7) | 40 (4.7) |
| Hungary | 54 (3.6) | 46 (3.6) | 46 (1.7) | 54 (1.7) | 55 (3.6) | 45 (3.6) |
| Iceland | 36 (2.8) | ▲ 64 (2.8) | 48 (1.4) | 52 (1.4) | ▲ 67 (2.3) | 33 (2.3) |
| Lithuania | 37 (4.2) | ▲ 63 (4.2) | 53 (1.7) | 47 (1.7) | 56 (4.1) | 44 (4.1) |
| Netherlands | 27 (3.9) | ▲ 73 (3.9) | 54 (2.4) | 46 (2.4) | ▲ 66 (3.4) | 34 (3.4) |
| New Zealand | 44 (4.3) | 56 (4.3) | 48 (2.3) | 52 (2.3) | 61 (3.6) | 39 (3.6) |
| Norway | 33 (3.2) | ▲ 67 (3.2) | 48 (2.5) | 52 (2.5) | ▲ 70 (3.4) | 30 (3.4) |
| Russian Federation | 42 (3.1) | 58 (3.1) | 48 (2.2) | 52 (2.2) | 61 (3.8) | 39 (3.8) |
| Slovenia | 35 (6.5) | 65 (6.5) | 47 (3.3) | 53 (3.3) | ▲ 71 (6.0) | 29 (6.0) |
| Sweden | 40 (2.7) | ▲ 60 (2.7) | 46 (1.4) | 54 (1.4) | ▲ 68 (2.4) | 32 (2.4) |
| Switzerland | 39 (5.5) | 61 (5.5) | 50 (2.6) | 50 (2.6) | ▲ 62 (3.1) | 38 (3.1) |
| United States | 50 (2.1) | 50 (2.1) | 47 (1.4) | 53 (1.4) | 55 (2.7) | 45 (2.7) |
| International Avg. | 40 (1.0) | ▲ 60 (1.0) | 49 (0.5) | 51 (0.5) | ▲ 63 (0.9) | 37 (0.9) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit B.6 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Mathematics Literacy - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 397 (16.0) | 399 (12.8) | 525 (12.9) | 521 (9.2) | 649 (8.3) | 639 (14.5) |
| Austria | 420 (10.3) | 421 (4.4) | 521 (7.6) | 514 (5.6) | 628 (8.9) | 617 (7.0) |
| Canada | 413 (4.3) | 405 (4.9) | 517 (3.7) | 516 (4.3) | 643 (4.6) | 628 (4.6) |
| Cyprus | 354 (8.1) | 359 (3.4) | 444 (5.3) | 442 (2.8) | 545 (6.8) | 536 (4.9) |
| Czech Republic | 361 (6.3) | 346 (13.7) | 456 (10.8) | 453 (17.9) | ▲ 611 (13.4) | 588 (12.8) |
| France | 424 (6.1) | 422 (6.4) | 528 (5.7) | 519 (5.5) | 629 (8.7) | 619 (5.3) |
| Germany | 388 (8.6) | 371 (10.3) | 496 (7.5) | 494 (7.9) | 618 (8.9) | 612 (7.5) |
| Hungary | 369 (4.3) | 372 (3.0) | 477 (4.6) | 479 (3.3) | 613 (6.4) | 596 (5.9) |
| Iceland | 432 (4.1) | 422 (2.8) | 537 (3.1) | 528 (3.2) | 652 (4.5) | 643 (4.8) |
| Lithuania | 366 (9.4) | 359 (8.8) | 470 (5.0) | 470 (7.9) | 581 (6.0) | 574 (6.9) |
| Netherlands | 450 (8.3) | 437 (6.9) | 567 (4.8) | 559 (6.5) | 674 (7.0) | 668 (8.8) |
| New Zealand | 397 (11.2) | 394 (7.4) | 526 (7.2) | 518 (4.1) | 653 (4.6) | 638 (4.8) |
| Norway | 414 (5.9) | 412 (5.7) | 530 (5.7) | 518 (3.9) | 657 (7.3) | 641 (4.7) |
| Russian Federation | 374 (5.2) | 365 (5.1) | 468 (8.0) | 463 (6.6) | 586 (10.0) | 584 (13.3) |
| Slovenia | 400 (20.7) | 400 (9.6) | 520 (8.4) | 512 (9.8) | 625 (8.5) | 612 (12.0) |
| Sweden | 428 (6.4) | 428 (4.8) | 552 (5.3) | 546 (4.1) | 687 (6.2) | 670 (7.2) |
| Switzerland | 433 (7.0) | 422 (9.6) | 541 (6.6) | 539 (7.3) | ▲ 658 (4.7) | 645 (4.3) |
| United States | 353 (2.6) | 350 (5.1) | 457 (3.9) | 454 (3.9) | 586 (6.3) | 577 (4.8) |
| International Avg. | 397 (2.1) | 392 (1.8) | ▲ 506 (1.6) | 501 (1.7) | ▲ 62 (1.8) | 614 (1.9) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit B.7 Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Advanced Mathematics - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 46 (4.7) | 54 (4.7) | 50 (3.9) | 50 (3.9) | 54 (8.3) | 46 (8.3) |
| Austria | 16 (5.8) | ▲ 84 (5.8) | 50 (3.6) | 50 (3.6) | ▲ 75 (4.6) | 25 (4.6) |
| Canada | 40 (4.6) | 60 (4.6) | 48 (3.0) | 52 (3.0) | ▲ 65 (4.6) | 35 (4.6) |
| Cyprus | 44 (4.0) | 56 (4.0) | 49 (3.6) | 51 (3.6) | 59 (6.2) | 41 (6.2) |
| Czech Republic | 20 (4.0) | ▲ 80 (4.0) | 47 (2.0) | 53 (2.0) | ▲ 79 (2.5) | 21 (2.5) |
| France | 40 (4.8) | 60 (4.8) | 50 (3.7) | 50 (3.7) | 63 (7.1) | 37 (7.1) |
| Germany | 38 (3.4) | ▲ 62 (3.4) | 49 (1.9) | 51 (1.9) | ▲ 63 (2.9) | 37 (2.9) |
| Lithuania | 28 (4.1) | ▲ 72 (4.1) | 52 (3.2) | 48 (3.2) | ▲ 69 (4.2) | 31 (4.2) |
| Russian Federation | 37 (4.4) | ▲ 63 (4.4) | 48 (2.3) | 52 (2.3) | ▲ 67 (3.2) | 33 (3.2) |
| Slovenia | 45 (6.4) | 55 (6.4) | 48 (2.9) | 52 (2.9) | 58 (5.8) | 42 (5.8) |
| Sweden | 44 (4.3) | 56 (4.3) | 48 (3.3) | 52 (3.3) | 62 (9.5) | 38 (9.5) |
| Switzerland | 35 (3.8) | ▲ 65 (3.8) | 46 (2.3) | 54 (2.3) | ▲ 74 (3.2) | 26 (3.2) |
| United States | 35 (3.7) | ▲ 65 (3.7) | 54 (2.7) | 46 (2.7) | 57 (4.5) | 43 (4.5) |
| International Avg. | 37 (1.3) | ▲ 63 (1.3) | 49 (0.9) | 51 (0.9) | ▲ 65 (1.5) | 35 (1.5) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit B.8 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Advanced Mathematics - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 387 (20.2) | 379 (23.7) | 529 (11.5) | 528 (9.7) | 658 (17.2) | 657 (11.5) |
| Austria | 331 (20.6) | 315 (14.1) | 449 (7.1) | 435 (8.0) | 555 (8.9) | 533 (7.2) |
| Canada | 388 (4.3) | 385 (8.9) | 509 (4.5) | 507 (6.7) | ▲ 645 (8.3) | 617 (5.9) |
| Cyprus | 401 (7.7) | 414 (10.2) | 521 (4.0) | 522 (5.2) | 626 (8.1) | 611 (7.7) |
| Czech Republic | 364 (8.7) | 347 (9.9) | 466 (10.4) | 452 (9.2) | 618 (21.9) | 595 (24.0) |
| France | 470 (6.2) | 468 (5.5) | 560 (4.8) | 557 (4.6) | 647 (4.4) | 641 (8.0) |
| Germany | 359 (8.6) | 359 (7.4) | 468 (6.1) | 463 (7.6) | 578 (6.5) | 568 (7.8) |
| Lithuania | 415 (8.7) | 413 (5.5) | 515 (3.3) | 510 (4.7) | 632 (6.2) | 613 (16.9) |
| Russian Federation | 411 (8.7) | 398 (14.3) | 544 (10.1) | 535 (10.1) | 690 (12.0) | 679 (17.2) |
| Slovenia | 361 (12.2) | 353 (8.6) | 471 (12.9) | 473 (8.9) | 601 (12.3) | 584 (8.9) |
| Sweden | 403 (7.5) | 404 (7.4) | 513 (4.4) | 511 (8.4) | 624 (5.5) | 603 (12.3) |
| Switzerland | 433 (6.6) | 424 (7.7) | 532 (6.4) | 522 (5.6) | ▲ 657 (8.5) | 632 (8.2) |
| United States | 326 (7.4) | 321 (6.5) | 439 (8.3) | 436 (8.2) | 574 (8.6) | 563 (13.1) |
| International Avg. | 386 (3.1) | 381 (3.1) | 499 (2.1) | 495 (2.1) | ▲ 621 (2.9) | 606 (3.9) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit B.9 Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Science - Fourth Grade*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 47 (1.9) | 53 (1.9) | 48 (1.3) | 52 (1.3) | ▲ 58 (2.2) | 42 (2.2) |
| Austria | 43 (2.7) | 57 (2.7) | 50 (1.7) | 50 (1.7) | 57 (3.0) | 43 (3.0) |
| Canada | 49 (2.2) | 51 (2.2) | 48 (1.2) | 52 (1.2) | ▲ 56 (1.3) | 44 (1.3) |
| Cyprus | 48 (3.0) | 52 (3.0) | 48 (1.8) | 52 (1.8) | ▲ 56 (1.7) | 44 (1.7) |
| Czech Republic | 43 (2.0) | ▲ 57 (2.0) | 50 (1.0) | 50 (1.0) | ▲ 57 (1.8) | 43 (1.8) |
| England | 53 (1.7) | 47 (1.7) | 46 (1.1) | ▲ 54 (1.1) | 55 (1.8) | 45 (1.8) |
| Hong Kong | 46 (1.6) | 54 (1.6) | 48 (1.1) | 52 (1.1) | ▲ 58 (2.0) | 42 (2.0) |
| Hungary | 45 (2.4) | 55 (2.4) | 49 (1.4) | 51 (1.4) | ▲ 57 (1.8) | 43 (1.8) |
| Iceland | 45 (2.2) | 55 (2.2) | 48 (1.4) | 52 (1.4) | ▲ 59 (2.1) | 41 (2.1) |
| Iran, Islamic Rep. | 46 (3.5) | 54 (3.5) | 49 (2.0) | 51 (2.0) | 55 (4.1) | 45 (4.1) |
| Ireland | 48 (2.1) | 52 (2.1) | 49 (1.0) | 51 (1.0) | 54 (1.9) | 46 (1.9) |
| Japan | 45 (1.1) | ▲ 55 (1.1) | 48 (0.8) | 52 (0.8) | ▲ 59 (1.2) | 41 (1.2) |
| Korea | 44 (1.9) | 56 (1.9) | 48 (1.4) | 52 (1.4) | ▲ 59 (2.2) | 41 (2.2) |
| Latvia (LSS) | 52 (2.9) | 48 (2.9) | 50 (1.3) | 50 (1.3) | 48 (2.8) | 52 (2.8) |
| Netherlands | 38 (2.4) | ▲ 62 (2.4) | 49 (1.2) | 51 (1.2) | ▲ 64 (2.3) | 36 (2.3) |
| New Zealand | 58 (2.6) | 42 (2.6) | 45 (1.5) | ▲ 55 (1.5) | 52 (2.5) | 48 (2.5) |
| Norway | 48 (1.9) | 52 (1.9) | 49 (1.6) | 51 (1.6) | 55 (2.9) | 45 (2.9) |
| Portugal | 51 (2.0) | 49 (2.0) | 48 (1.7) | 52 (1.7) | 53 (2.8) | 47 (2.8) |
| Scotland | 51 (2.1) | 49 (2.1) | 48 (1.2) | 52 (1.2) | 53 (1.9) | 47 (1.9) |
| Singapore | 49 (2.0) | 51 (2.0) | 49 (1.5) | 51 (1.5) | 52 (3.3) | 48 (3.3) |
| Slovenia | 51 (2.2) | 49 (2.2) | 48 (1.2) | 52 (1.2) | 53 (1.8) | 47 (1.8) |
| United States | 47 (1.4) | 53 (1.4) | 48 (0.8) | 52 (0.8) | ▲ 56 (1.3) | 44 (1.3) |
| International Avg. | 48 (0.5) | ▲ 52 (0.5) | 48 (0.3) | ▲ 52 (0.3) | ▲ 56 (0.5) | 44 (0.5) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Fourth Grade in most countries; see Appendix A for information about the grades tested in each country.

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

## Exhibit B.10 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Science - Fourth Grade*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 436 (5.9) | 443 (5.6) | 568 (2.7) | 567 (3.8) | 680 (2.4) | 671 (4.3) |
| Austria | 461 (5.4) | 460 (4.7) | 566 (3.8) | 568 (2.9) | 666 (6.2) | 659 (3.4) |
| Canada | 437 (4.6) | 440 (4.2) | 550 (4.4) | 551 (2.8) | 658 (3.5) | 653 (4.5) |
| Cyprus | 378 (3.8) | 379 (5.5) | 477 (3.3) | 476 (3.4) | 574 (4.8) | 565 (2.9) |
| Czech Republic | 455 (4.4) | 452 (3.2) | 557 (3.6) | 555 (2.9) | 661 (4.6) | 659 (4.9) |
| England | 428 (4.1) | 429 (4.9) | 553 (3.8) | 552 (3.3) | ▲ 679 (5.1) | 665 (3.9) |
| Hong Kong | 431 (5.3) | 435 (4.7) | 538 (3.7) | 534 (3.8) | 632 (4.4) | 624 (4.3) |
| Hungary | 428 (4.2) | 428 (5.6) | 536 (3.3) | 534 (3.9) | 633 (3.6) | 629 (4.9) |
| Iceland | 393 (4.5) | 396 (4.8) | 509 (3.7) | 505 (4.3) | 613 (3.8) | 605 (4.0) |
| Iran, Islamic Rep. | 322 (5.6) | 322 (3.2) | 415 (4.5) | 417 (4.1) | 515 (5.4) | 508 (5.5) |
| Ireland | 427 (4.9) | 431 (5.3) | 542 (3.0) | 543 (4.0) | 648 (3.1) | 639 (4.7) |
| Japan | 476 (3.1) | 484 (2.5) | 576 (1.8) | 575 (2.0) | ▲ 666 (2.1) | 658 (2.2) |
| Korea | 508 (3.1) | 509 (3.1) | 600 (1.9) | 599 (2.3) | 681 (2.3) | 677 (2.8) |
| Latvia (LSS) | 408 (5.3) | 411 (3.9) | 511 (5.5) | 509 (3.8) | 625 (12.6) | 614 (6.6) |
| Netherlands | 474 (5.4) | 472 (5.0) | 560 (3.0) | 556 (3.2) | 642 (2.6) | 635 (3.7) |
| New Zealand | 399 (7.6) | 410 (10.2) | 536 (4.2) | 534 (5.6) | 651 (4.8) | 647 (4.7) |
| Norway | 413 (6.7) | 422 (4.7) | 534 (4.5) | 533 (3.1) | 638 (4.9) | 630 (2.9) |
| Portugal | 369 (7.0) | 371 (6.4) | 484 (4.5) | 483 (3.1) | 585 (5.0) | 578 (3.8) |
| Scotland | 411 (5.2) | 417 (6.0) | 539 (4.3) | 537 (4.8) | 656 (4.3) | 648 (4.7) |
| Singapore | 416 (4.3) | 425 (5.4) | 551 (5.9) | 549 (4.6) | 669 (8.8) | 662 (5.0) |
| Slovenia | 450 (4.3) | 445 (5.8) | 547 (3.8) | 549 (3.5) | 643 (3.8) | 638 (4.2) |
| United States | 439 (5.2) | 441 (3.8) | 573 (4.5) | 569 (2.5) | 681 (3.0) | 680 (3.0) |
| International Avg. | 425 (1.1) | ▲ 428 (1.1) | 537 (0.8) | 536 (0.8) | ▲ 641 (1.1) | 634 (0.9) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Fourth Grade in most countries; see Appendix A for 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.

## Exhibit B.11 Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Science - Eighth Grade*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 49 (1.8) | 51 (1.8) | 48 (0.9) | 52 (0.9) | 56 (1.9) | 44 (1.9) |
| Austria | 46 (3.4) | 54 (3.4) | 49 (1.9) | 51 (1.9) | 55 (2.4) | 45 (2.4) |
| Belgium (Fl) | 46 (3.8) | 54 (3.8) | 48 (1.6) | 52 (1.6) | 57 (3.3) | 43 (3.3) |
| Belgium (Fr) | 46 (3.7) | 54 (3.7) | 48 (1.7) | 52 (1.7) | ▲ 58 (2.5) | 42 (2.5) |
| Canada | 46 (1.6) | 54 (1.6) | 49 (0.8) | 51 (0.8) | 56 (2.2) | 44 (2.2) |
| Colombia | 46 (3.6) | 54 (3.6) | 48 (1.7) | 52 (1.7) | 57 (4.0) | 43 (4.0) |
| Cyprus | 54 (1.7) | 46 (1.7) | 47 (1.3) | 53 (1.3) | 52 (1.7) | 48 (1.7) |
| Czech Republic | 41 (2.2) | ▲ 59 (2.2) | 49 (1.5) | 51 (1.5) | ▲ 62 (2.7) | 38 (2.7) |
| England | 45 (2.7) | 55 (2.7) | 50 (1.5) | 50 (1.5) | 56 (2.7) | 44 (2.7) |
| France | 44 (2.0) | 56 (2.0) | 49 (1.4) | 51 (1.4) | ▲ 58 (2.3) | 42 (2.3) |
| Germany | 45 (2.2) | 55 (2.2) | 50 (1.2) | 50 (1.2) | 56 (2.3) | 44 (2.3) |
| Hong Kong | 41 (2.7) | ▲ 59 (2.7) | 50 (1.1) | 50 (1.1) | ▲ 61 (2.5) | 39 (2.5) |
| Hungary | 44 (1.6) | ▲ 56 (1.6) | 49 (1.5) | 51 (1.5) | 57 (2.5) | 43 (2.5) |
| Iceland | 46 (4.5) | 54 (4.5) | 47 (1.9) | 53 (1.9) | 59 (3.3) | 41 (3.3) |
| Iran, Islamic Rep. | 45 (2.8) | 55 (2.8) | 48 (1.3) | 52 (1.3) | 60 (3.4) | 40 (3.4) |
| Ireland | 47 (3.0) | 53 (3.0) | 49 (1.2) | 51 (1.2) | 55 (2.9) | 45 (2.9) |
| Japan | 45 (1.3) | ▲ 55 (1.3) | 49 (0.8) | 51 (0.8) | ▲ 57 (1.5) | 43 (1.5) |
| Korea | 42 (1.7) | ▲ 58 (1.7) | 49 (1.2) | 51 (1.2) | ▲ 60 (2.2) | 40 (2.2) |
| Latvia (LSS) | 43 (2.2) | 57 (2.2) | 51 (1.4) | 49 (1.4) | 56 (2.0) | 44 (2.0) |
| Lithuania | 45 (2.3) | 55 (2.3) | 49 (1.3) | 51 (1.3) | 57 (2.2) | 43 (2.2) |
| Netherlands | 43 (2.6) | 57 (2.6) | 49 (1.6) | 51 (1.6) | ▲ 58 (2.5) | 42 (2.5) |
| New Zealand | 43 (2.5) | 57 (2.5) | 48 (1.7) | 52 (1.7) | 60 (3.7) | 40 (3.7) |
| Norway | 47 (1.5) | 53 (1.5) | 48 (0.8) | 52 (0.8) | ▲ 57 (1.8) | 43 (1.8) |
| Portugal | 40 (1.9) | ▲ 60 (1.9) | 50 (1.1) | 50 (1.1) | ▲ 60 (1.5) | 40 (1.5) |
| Romania | 48 (2.4) | 52 (2.4) | 49 (1.5) | 51 (1.5) | 55 (2.2) | 45 (2.2) |
| Russian Federation | 47 (2.2) | 53 (2.2) | 48 (1.2) | 52 (1.2) | 56 (2.1) | 44 (2.1) |
| Scotland | 44 (2.4) | 56 (2.4) | 49 (1.3) | 51 (1.3) | 57 (2.6) | 43 (2.6) |
| Singapore | 46 (2.9) | 54 (2.9) | 51 (1.6) | 49 (1.6) | 52 (3.3) | 48 (3.3) |
| Slovak Republic | 43 (1.8) | ▲ 57 (1.8) | 52 (0.9) | 48 (0.9) | 54 (1.6) | 46 (1.6) |
| Slovenia | 42 (2.0) | ▲ 58 (2.0) | 48 (1.1) | 52 (1.1) | ▲ 62 (2.6) | 38 (2.6) |
| Spain | 42 (1.6) | ▲ 58 (1.6) | 50 (1.0) | 50 (1.0) | ▲ 58 (1.8) | 42 (1.8) |
| Sweden | 46 (1.9) | 54 (1.9) | 48 (1.1) | 52 (1.1) | ▲ 57 (1.2) | 43 (1.2) |
| Switzerland | 47 (2.3) | 53 (2.3) | 48 (1.3) | 52 (1.3) | ▲ 56 (1.8) | 44 (1.8) |
| United States | 49 (1.7) | 51 (1.7) | 48 (1.4) | 52 (1.4) | 54 (2.1) | 46 (2.1) |
| International Avg. | 45 (0.4) | ▲ 55 (0.4) | 49 (0.2) | ▲ 51 (0.2) | ▲ 57 (0.4) | 43 (0.4) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Eighth Grade in most countries; see Appendix A for 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.

## Exhibit B.12 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Science - Eighth Grade*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 406 (6.5) | 411 (4.1) | 547 (5.2) | 543 (3.1) | 680 (4.2) | 679 (3.9) |
| Austria | 440 (10.6) | 428 (6.3) | 559 (5.5) | 556 (2.5) | 684 (4.9) | 677 (3.8) |
| Belgium (Fl) | 446 (7.0) | 446 (7.2) | 552 (4.3) | 549 (4.6) | 656 (4.0) | 651 (3.5) |
| Belgium (Fr) | 361 (7.8) | 363 (3.8) | 471 (4.6) | 471 (2.9) | 583 (4.1) | 570 (3.6) |
| Canada | 413 (4.4) | 416 (3.3) | 530 (2.6) | 531 (2.8) | 653 (2.8) | 646 (4.0) |
| Colombia | 314 (8.6) | 317 (4.2) | 411 (4.8) | 410 (4.1) | 512 (4.7) | 503 (5.5) |
| Cyprus | 345 (3.1) | 356 (2.7) | 462 (2.1) | 464 (2.8) | 579 (2.5) | 572 (3.3) |
| Czech Republic | 465 (5.2) | 465 (4.3) | 572 (4.8) | 571 (4.4) | 687 (5.0) | 689 (6.8) |
| England | 419 (5.2) | 418 (5.2) | 552 (4.5) | 550 (3.4) | 694 (5.6) | 679 (4.6) |
| France | 404 (3.6) | 398 (3.9) | 499 (2.7) | 497 (4.0) | 596 (2.3) | 595 (4.8) |
| Germany | 406 (7.2) | 403 (5.8) | 536 (5.4) | 531 (5.4) | 661 (4.4) | 657 (5.6) |
| Hong Kong | 410 (8.6) | 409 (5.3) | 524 (6.0) | 520 (3.3) | 638 (5.7) | 628 (3.4) |
| Hungary | 446 (3.9) | 437 (5.6) | 554 (2.8) | 551 (4.0) | 670 (3.1) | 667 (4.3) |
| Iceland | 391 (4.7) | 394 (6.5) | 494 (4.9) | 493 (4.9) | 597 (5.7) | 589 (4.5) |
| Iran, Islamic Rep. | 379 (2.8) | 381 (3.5) | 469 (2.1) | 467 (3.4) | s 568 (3.2) | 556 (3.6) |
| Ireland | 413 (8.0) | 419 (4.4) | 538 (5.1) | 535 (5.0) | 665 (3.6) | 655 (5.2) |
| Japan | 453 (3.7) | 457 (2.4) | 573 (2.4) | 571 (1.8) | s 688 (2.8) | 677 (2.8) |
| Korea | 446 (3.7) | 446 (2.8) | 566 (1.8) | 564 (2.8) | 686 (2.5) | 678 (4.1) |
| Latvia (LSS) | 381 (6.1) | 383 (2.9) | 485 (3.3) | 483 (3.2) | 592 (2.9) | 585 (4.2) |
| Lithuania | 375 (5.4) | 373 (3.2) | 476 (4.7) | 475 (3.1) | 580 (4.0) | 582 (4.7) |
| Netherlands | 452 (9.8) | 452 (5.5) | 563 (5.6) | 558 (5.0) | 669 (5.7) | 665 (4.1) |
| New Zealand | 398 (7.0) | 401 (4.4) | 526 (4.8) | 522 (6.2) | 659 (4.4) | 646 (7.5) |
| Norway | 416 (5.0) | 419 (3.1) | 527 (2.4) | 525 (2.6) | 643 (3.0) | 633 (3.9) |
| Portugal | 392 (3.4) | 385 (2.8) | 478 (2.8) | 476 (2.9) | 577 (3.0) | 575 (3.8) |
| Romania | 357 (5.2) | 358 (6.2) | 487 (5.5) | 483 (5.5) | 618 (5.7) | 614 (5.5) |
| Russian Federation | 418 (5.8) | 419 (6.1) | 536 (3.9) | 537 (5.1) | 661 (3.3) | 660 (4.7) |
| Scotland | 394 (5.4) | 392 (5.0) | 517 (5.2) | 514 (6.1) | 650 (6.9) | 640 (8.7) |
| Singapore | 489 (6.4) | 488 (4.0) | 605 (6.5) | 605 (6.0) | 733 (5.9) | 729 (8.0) |
| Slovak Republic | 430 (3.2) | 429 (3.9) | 544 (3.3) | 542 (3.8) | 666 (4.3) | 659 (4.0) |
| Slovenia | 453 (3.2) | 451 (3.5) | 559 (2.2) | 555 (3.8) | 676 (3.0) | 672 (5.5) |
| Spain | 423 (2.6) | 418 (2.6) | 515 (2.0) | 514 (2.1) | 620 (2.3) | 616 (2.2) |
| Sweden | 423 (3.3) | 420 (4.5) | 535 (3.5) | 534 (3.3) | 652 (3.2) | 650 (4.0) |
| Switzerland | 404 (5.1) | 406 (3.2) | 525 (3.6) | 520 (2.2) | 640 (3.5) | 631 (2.6) |
| United States | 396 (5.1) | 401 (7.6) | 537 (4.9) | 534 (5.3) | 672 (5.3) | 663 (3.7) |
| International Avg. | 411 (1.0) | 411 (0.8) | s 525 (0.7) | 523 (0.7) | s 643 (0.7) | 637 (0.8) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* Eighth Grade in most countries; see Appendix A for 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.

## Exhibit B.13 Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Science Literacy - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 43 (3.9) | 57 (3.9) | 46 (3.3) | 54 (3.3) | ▲ 64 (4.4) | 36 (4.4) |
| Austria | 35 (5.2) | 65 (5.2) | 45 (2.1) | 55 (2.1) | ▲ 71 (3.5) | 29 (3.5) |
| Canada | 39 (4.8) | 61 (4.8) | 49 (2.5) | 51 (2.5) | ▲ 62 (3.4) | 38 (3.4) |
| Cyprus | 44 (5.5) | 56 (5.5) | 47 (3.4) | 53 (3.4) | ▲ 61 (3.5) | 39 (3.5) |
| Czech Republic | 32 (6.5) | 68 (6.5) | 51 (2.4) | 49 (2.4) | ▲ 67 (4.8) | 33 (4.8) |
| France | 36 (4.3) | ▲ 64 (4.3) | 48 (3.0) | 52 (3.0) | ▲ 68 (4.1) | 32 (4.1) |
| Germany | 38 (6.5) | 62 (6.5) | 51 (3.3) | 49 (3.3) | 60 (6.0) | 40 (6.0) |
| Hungary | 42 (2.9) | 58 (2.9) | 48 (1.1) | 52 (1.1) | ▲ 63 (2.7) | 37 (2.7) |
| Iceland | 36 (2.5) | ▲ 64 (2.5) | 46 (1.7) | 54 (1.7) | ▲ 72 (2.0) | 28 (2.0) |
| Lithuania | 35 (5.5) | 65 (5.5) | 52 (2.2) | 48 (2.2) | 59 (4.3) | 41 (4.3) |
| Netherlands | 28 (4.2) | ▲ 72 (4.2) | 53 (2.3) | 47 (2.3) | ▲ 67 (3.8) | 33 (3.8) |
| New Zealand | 45 (4.2) | 55 (4.2) | 46 (1.8) | 54 (1.8) | ▲ 64 (2.5) | 36 (2.5) |
| Norway | 30 (3.2) | ▲ 70 (3.2) | 48 (2.0) | 52 (2.0) | ▲ 74 (2.5) | 26 (2.5) |
| Russian Federation | 31 (3.4) | ▲ 69 (3.4) | 50 (1.9) | 50 (1.9) | ▲ 65 (2.9) | 35 (2.9) |
| Slovenia | 35 (6.3) | 65 (6.3) | 48 (3.2) | 52 (3.2) | ▲ 70 (5.8) | 30 (5.8) |
| Sweden | 36 (3.1) | ▲ 64 (3.1) | 46 (1.5) | 54 (1.5) | ▲ 71 (2.6) | 29 (2.6) |
| Switzerland | 36 (3.9) | ▲ 64 (3.9) | 51 (2.0) | 49 (2.0) | ▲ 62 (3.8) | 38 (3.8) |
| United States | 45 (2.3) | 55 (2.3) | 47 (1.6) | 53 (1.6) | ▲ 61 (3.1) | 39 (3.1) |
| International Avg. | 37 (1.0) | ▲ 63 (1.0) | 49 (0.6) | 51 (0.6) | ▲ 66 (0.9) | 34 (0.9) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit B.14 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Science Literacy - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 402 (15.4) | 403 (12.2) | 532 (14.6) | 523 (9.2) | 657 (8.0) | 647 (15.7) |
| Austria | 418 (6.8) | 416 (7.4) | 523 (7.2) | 513 (5.4) | 645 (9.4) | 621 (8.2) |
| Canada | 430 (7.0) | 425 (3.3) | 534 (4.7) | 529 (3.2) | 648 (4.8) | 632 (5.6) |
| Cyprus | 342 (12.7) | 350 (5.9) | 444 (4.7) | 442 (3.9) | 561 (7.2) | 551 (7.7) |
| Czech Republic | 391 (8.1) | 374 (8.6) | 481 (10.2) | 476 (7.6) | 616 (12.9) | 594 (9.6) |
| France | 387 (7.9) | 389 (7.1) | 490 (5.9) | 482 (6.1) | 594 (5.0) | 577 (6.8) |
| Germany | 397 (6.0) | 375 (11.0) | 498 (5.2) | 495 (7.5) | 618 (6.0) | 604 (7.5) |
| Hungary | 369 (3.4) | 367 (3.5) | 465 (3.0) | 464 (3.4) | ▲ 592 (6.4) | 573 (5.2) |
| Iceland | 460 (3.6) | 456 (2.2) | 551 (2.8) | 544 (2.5) | 650 (3.1) | 644 (3.9) |
| Lithuania | 364 (8.8) | 352 (6.6) | 462 (7.3) | 458 (5.6) | 572 (8.1) | 566 (7.5) |
| Netherlands | 450 (10.1) | 450 (4.8) | ▲ 562 (5.2) | 550 (4.7) | 670 (10.6) | 664 (12.1) |
| New Zealand | 405 (11.3) | 410 (9.8) | 533 (6.8) | 527 (5.6) | 652 (4.7) | 636 (5.8) |
| Norway | 435 (6.1) | 433 (5.0) | ▲ 544 (3.9) | 533 (4.5) | ▲ 669 (7.0) | 648 (6.0) |
| Russian Federation | 380 (3.1) | 366 (6.1) | 482 (5.3) | 475 (6.9) | 603 (8.0) | 596 (11.6) |
| Slovenia | 416 (15.5) | 415 (8.3) | 519 (8.8) | 512 (9.1) | 634 (12.5) | 606 (9.8) |
| Sweden | 450 (4.6) | 449 (5.0) | ▲ 557 (4.3) | 549 (4.5) | ▲ 687 (7.0) | 667 (6.1) |
| Switzerland | 413 (7.5) | 400 (8.7) | 522 (5.4) | 517 (6.4) | 649 (6.4) | 632 (5.1) |
| United States | 366 (4.2) | 363 (5.8) | 478 (3.0) | 476 (4.6) | 607 (5.5) | 595 (6.6) |
| International Avg. | 402 (2.0) | 398 (1.7) | ▲ 508 (1.5) | 502 (1.4) | ▲ 627 (1.8) | 612 (1.9) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit B.15 Percentages by Gender of Low-, Middle-, and High-Performing Students[1] in Physics - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 36 (5.0) | 64 (5.0) | 50 (4.2) | 50 (4.2) | 67 (8.0) | 33 (8.0) |
| Austria | 22 (6.0) | ▲ 78 (6.0) | 46 (3.9) | 54 (3.9) | ▲ 78 (5.6) | 22 (5.6) |
| Canada | 36 (7.9) | 64 (7.9) | 47 (3.2) | 53 (3.2) | ▲ 72 (4.5) | 28 (4.5) |
| Cyprus | 41 (4.0) | 59 (4.0) | 46 (3.4) | 54 (3.4) | 68 (8.4) | 32 (8.4) |
| Czech Republic | 17 (3.5) | ▲ 83 (3.5) | 44 (2.6) | 56 (2.6) | ▲ 84 (2.3) | 16 (2.3) |
| France | 37 (4.6) | 63 (4.6) | 50 (3.1) | 50 (3.1) | ▲ 65 (4.6) | 35 (4.6) |
| Germany | 33 (6.0) | 67 (6.0) | 49 (3.5) | 51 (3.5) | ▲ 77 (7.1) | 23 (7.1) |
| Norway | 34 (4.1) | ▲ 66 (4.1) | 51 (3.2) | 49 (3.2) | ▲ 69 (5.1) | 31 (5.1) |
| Russian Federation | 30 (2.7) | ▲ 70 (2.7) | 51 (2.9) | 49 (2.9) | ▲ 69 (6.4) | 31 (6.4) |
| Slovenia | 24 (5.8) | ▲ 76 (5.8) | 56 (6.8) | 44 (6.8) | ▲ 78 (9.3) | 22 (9.3) |
| Sweden | 38 (3.8) | ▲ 62 (3.8) | 44 (2.9) | 56 (2.9) | ▲ 80 (5.6) | 20 (5.6) |
| Switzerland | 21 (4.6) | ▲ 79 (4.6) | 48 (2.9) | 52 (2.9) | ▲ 84 (2.4) | 16 (2.4) |
| United States | 34 (2.5) | ▲ 66 (2.5) | 49 (2.1) | 51 (2.1) | ▲ 68 (3.7) | 32 (3.7) |
| International Avg. | 31 (1.4) | ▲ 69 (1.4) | 49 (1.0) | 51 (1.0) | ▲ 74 (1.7) | 26 (1.7) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

## Exhibit B.16 Achievement by Gender of Low-, Middle-, and High-Performing Students[1] in Physics - Final Year of Secondary School*

| Country | Low-Performing | | Middle-Performing | | High-Performing | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| Australia | 420 (7.1) | 410 (10.1) | 518 (6.4) | 512 (8.0) | 627 (11.7) | 605 (11.5) |
| Austria | 338 (14.6) | 334 (6.5) | 439 (8.8) | 426 (6.0) | 550 (12.1) | 533 (12.2) |
| Canada | 384 (6.9) | 377 (3.7) | 484 (4.9) | 480 (4.5) | 602 (7.0) | 579 (10.4) |
| Cyprus | 373 (10.7) | 366 (10.8) | 490 (6.8) | 487 (6.4) | 630 (11.6) | 624 (14.1) |
| Czech Republic | 363 (9.7) | 359 (4.0) | 450 (7.0) | 438 (4.3) | ▲ 570 (13.9) | 541 (16.3) |
| France | 383 (9.3) | 384 (6.4) | 468 (3.7) | 463 (3.8) | 554 (5.6) | 543 (8.7) |
| Germany | 414 (20.4) | 399 (10.1) | 521 (12.1) | 513 (11.6) | 650 (13.8) | 619 (18.8) |
| Norway | 473 (6.3) | 455 (13.5) | 582 (6.0) | 575 (13.0) | 699 (6.7) | 686 (10.3) |
| Russian Federation | 417 (10.9) | 399 (13.0) | 550 (9.1) | 538 (18.0) | 687 (9.9) | 679 (28.2) |
| Slovenia | 389 (25.8) | 368 (12.5) | 529 (13.8) | 516 (18.5) | 655 (27.7) | 641 (20.3) |
| Sweden | 455 (7.3) | 454 (7.6) | 577 (6.1) | 569 (4.5) | 690 (6.9) | 681 (15.7) |
| Switzerland | 394 (10.4) | 381 (5.6) | ▲ 489 (5.6) | 475 (3.4) | ▲ 611 (6.5) | 580 (7.0) |
| United States | 356 (5.3) | 349 (3.1) | 423 (4.0) | 417 (2.9) | 504 (6.2) | 487 (4.2) |
| International Avg. | 397 (3.5) | 387 (2.5) | ▲ 502 (2.2) | 493 (2.7) | ▲ 618 (3.4) | 600 (4.1) |

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

▲ = Gender difference statistically significant at .05 level, adjusted for multiple comparisons

1 Low-performing students are defined as those students scoring at or below the 25th percentile for their country. Middle-performing students are defined as those students scoring above the 25th percentile but below the 75th percentile for their country. High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* See Appendix A for characteristics of students sampled.

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

# Appendix C

## Items with the Largest Gender Difference Index (GDI)

## Exhibit C.1 Items with the Largest Gender Difference Index (GDI) in Mathematics
### Fourth Grade*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Finds the time an event started given its duration and end time | 10 (1.0) | 15 | 0 |
| Locates a point on a rectangular grid by following specified moves | 9 (1.5) | 7 | 0 |
| Solves one-step multiplication problem involving rate | 9 (1.1) | 16 | 0 |
| Finds the increase in temperature from a negative to a positive temperature on a thermometer | 9 (0.7) | 14 | 0 |
| Writes a number that is 1,000 more than a given five-digit number | 9 (0.8) | 12 | 0 |
| Estimates the distance on a map given scale (in cm = km) | 8 (0.8) | 16 | 0 |
| Solves one-step multiplication problem involving rate | 7 (1.1) | 6 | 0 |
| Uses proportional reasoning to solve a word problem involving halves | 7 (1.4) | 7 | 0 |
| Knows that there is a better chance of landing on a shaded part of an area when a greater part of that area is shaded | 7 (1.4) | 3 | 0 |
| Recognizes the inverse relationship between size of unit and number of units required to cover a distance | 7 (1.5) | 3 | 0 |
| Solves a problem counting backwards or subtracting across a hundred point | 7 (0.9) | 7 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Adds two four-digit numbers involving three regroupings | -8 (1.7) | 0 | 3 |
| Solves a comparison problem by associating elements of a bar graph with a verbal description | -7 (0.8) | 0 | 15 |
| Reads information from a simple bar graph | -7 (1.2) | 0 | 9 |
| Arranges four digits into two two-digit numbers whose sum is greater than a given number (in the context of a game) | -7 (1.2) | 0 | 7 |
| Shows that a ratio of 10:20 is equivalent to 1:2 using words or pictures | -7 (1.3) | 0 | 7 |
| Recognizes same pattern of sequence of shapes when made with different shapes | -6 (1.5) | 0 | 2 |
| Identifies next terms in an alternating number pattern involving counting forward and backward by ones | -5 (0.8) | 0 | 5 |
| Subtracts two four-digit numbers involving multiple regrouping and 0s | -5 (1.9) | 0 | 3 |
| Subtracts two decimals involving hundredths with regrouping over 0 | -5 (0.9) | 0 | 5 |
| Uses numerical data from a table to draw sets of double bars to complete a bar graph | -5 (1.4) | 0 | 3 |

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

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

## Exhibit C.2 Items with the Largest Gender Difference Index (GDI) in Mathematics
### Eighth Grade*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Sets up the correct proportion in a word problem, and solves for the missing term | 12 (0.3) | 31 | 0 |
| Calculates the percent of increase in price in a word problem | 11 (1.2) | 17 | 1 |
| Solves a one-step word problem involving division of a whole number by a unit fraction | 11 (1.1) | 18 | 0 |
| Identifies the smallest of a set of decimals with differing number of places | 9 (0.8) | 25 | 0 |
| Applies knowledge of number of milliliters in a liter to solve a word problem | 9 (1.1) | 13 | 0 |
| Solves word problem involving the percent of increase and estimation | 8 (1.2) | 11 | 0 |
| Selects the smallest fraction from a set of familiar fractions | 8 (0.8) | 18 | 0 |
| Solves a word problem by reading information from a graph of a non-linear relationship | 8 (1.2) | 8 | 0 |
| Compares volume by visualizing and counting cubes | 8 (0.6) | 21 | 0 |
| In a word problem, solves for a missing number using proportional reasoning | 8 (0.7) | 18 | 0 |
| Recognizes that the precision of measurement is related to the size of the unit of measurement | 8 (0.6) | 21 | 0 |
| Solves a word problem by extrapolating a graph of a non-linear relationship | 8 (1.0) | 7 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Subtracts to three decimal points using multiple regrouping | -11 (1.2) | 0 | 13 |
| Solves a comparison problem by associating elements of a bar graph with a verbal description | -11 (1.4) | 0 | 10 |
| Recognizes same pattern of sequence of shapes when made with different shapes | -8 (1.7) | 1 | 7 |
| Subtracts one four-digit number from another in a problem involving multiple regrouping and 0s | -8 (1.6) | 1 | 5 |
| Solves one-step subtraction word problem involving two numbers with decimals to the hundredth | -8 (1.3) | 0 | 8 |
| Solves a problem involving terms common to two arithmetic sequences | -7 (1.1) | 0 | 10 |
| Decides whether estimate or exact value is appropriate in a situation involving money | -7 (1.0) | 0 | 10 |
| Adds three fractions with unlike denominators | -7 (1.2) | 0 | 9 |
| Divides one fraction by another fraction | -6 (1.2) | 0 | 7 |
| Identifies corresponding parts of congruent triangles | -6 (0.6) | 0 | 15 |
| Adds and multiplies fractions by applying rules of order of operations | -6 (1.0) | 0 | 9 |
| Identifies algebraic expressions corresponding to a verbal description | -6 (1.1) | 0 | 6 |
| Finds the value of an algebraic expression in one variable by substituting a given value for the variable | -6 (1.1) | 0 | 6 |

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

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

## Exhibit C.3 Items with the Largest Gender Difference Index (GDI) in Mathematics Literacy
### Final Year of Secondary School*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Translates graphical information into a mathematical expression | 17 (1.2) | 13 | 0 |
| Uses the concepts of volume and proportionality to solve a word problem | 16 (1.0) | 16 | 0 |
| Recognizes when a graphical presentation of data has been distorted | 15 (1.5) | 10 | 0 |
| Solves an addition problem involving negative numbers | 15 (1.3) | 15 | 0 |
| Multiplies fractions by fractions to solve a word problem | 15 (1.1) | 17 | 0 |
| Demonstrates the ability to estimate area in order to solve a word problem | 14 (1.1) | 16 | 0 |
| Uses the concept of volume to solve a word problem | 13 (1.0) | 14 | 0 |
| Understands how percentage increases and decreases affect pricing | 13 (1.2) | 14 | 0 |
| Knows how to translate fractions into percentages | 13 (1.3) | 11 | 0 |
| Understands the impact of width on changes in volume | 12 (1.3) | 9 | 0 |
| Knows how to convert distances in the metric system | 12 (1.0) | 15 | 0 |
| Uses the concept of rate to estimate the time it will take to fill a tank | 12 (1.1) | 11 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| None | - - | - | - |

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

* See Appendix A for information about the grades tested in each country.

## Exhibit C.4 Items with the Largest Gender Difference Index (GDI) in Advanced Mathematics
### Final Year of Secondary School*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Calculates the length of a string wrapped around a rod given the length and circumference of the rod | 30 (2.8) | 9 | 0 |
| Uses graphical information to determine differential values of x | 21 (3.6) | 6 | 0 |
| Calculates the limit of the perimeter of a polygon of n sides inscribed in a circle of fixed radius | 21 (2.5) | 9 | 0 |
| Uses spatial rotation to solve a graphical problem | 19 (2.2) | 9 | 0 |
| Knows how to calculate the overall average based on two samples of unequal size with unequal averages | 19 (2.4) | 8 | 0 |
| Calculates the height of a mountain based upon the angle and the average speed of a cable car | 18 (2.6) | 8 | 0 |
| Calculates the angle between two vectors | 17 (2.5) | 9 | 0 |
| Determines all complex numbers solving a given equation | 15 (2.6) | 4 | 1 |
| Uses the concept of exponential growth to solve a word problem | 13 (2.0) | 7 | 0 |
| Calculates the sum of an infinite geometric series | 13 (2.7) | 6 | 0 |
| Calculates joint probability | 13 (2.3) | 6 | 0 |
| Calculates the distance between intercepts on a plane | 13 (2.7) | 6 | 0 |
| Calculates the equation of a function given the derivative | 13 (2.4) | 5 | 0 |
| Calculates the length of a diagonal in a regular hexagon | 13 (2.0) | 4 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| None | - - | - | - |

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

* See Appendix A for information about the grades tested in each country.

## Exhibit C.5 Items with the Largest Gender Difference Index (GDI) in Science
### Fourth Grade*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Recognizes that the speed of light is faster than that of sound, airplanes or trains | 21 (1.3) | 21 | 0 |
| Demonstrates some understanding of fluid properties by drawing the liquid surface on a frame-of-reference diagram depicting a rotated container | 16 (1.4) | 17 | 0 |
| Recognizes most of Earth's surface is covered by water | 10 (0.5) | 19 | 0 |
| Interprets pictorial diagram depicting angle/length of shadows at different times of day and selects the shadow cast at mid-day | 9 (0.9) | 16 | 0 |
| Applies knowledge of the relationship between fire/burning and air/oxygen to explain why a covered flame goes out | 9 (1.3) | 4 | 0 |
| From a list of familiar animals, identifies the animal that eats only plants | 9 (1.5) | 7 | 1 |
| Interprets diagram and identifies change in buoyancy of object when placed in fresh and salt water | 8 (1.2) | 7 | 1 |
| Applies knowledge of levers (seesaws) to interpret a diagram and identify the conditions (weights/lever arms) required to balance a seesaw | 8 (1.2) | 6 | 0 |
| From a diagram comparing masses on a scale, reasons to a conclusion to determine the heaviest of three objects | 8 (1.0) | 10 | 0 |
| Recognizes the energy sources in a list of sources and non-sources | 8 (1.3) | 7 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Provides one reason animals need plants to survive | -7 (1.1) | 0 | 8 |
| Recognizes that people use sunscreen to protect the skin from the sun's radiation | -7 (1.4) | 0 | 4 |
| Identifies the order of developmental stages of a plant based on pictorial representations | -7 (1.7) | 0 | 5 |
| From a list of familiar edible and inedible plants, identifies a plant not grown for food | -6 (0.7) | 0 | 14 |
| Describes one effect of environmental change (temperature) on aquatic life | -6 (0.9) | 0 | 10 |
| Recognizes that washing hands removes germs to prevent illness | -6 (1.2) | 0 | 3 |
| Specifies the order of developmental stages of a frog based on pictorial representations | -5 (1.4) | 1 | 5 |
| Demonstrates knowledge of environmental effects by writing a cannot be predicted exactly | -5 (1.1) | 0 | 5 |
| Recognizes that weather and occurrences of natural disasters cannot be predicted exactly | -5 (0.7) | 0 | 8 |
| Writes down one example of computer uses for work description of one way oil spills harm the environment | -5 (1.1) | 0 | 3 |
| Recognizes that an animal's breathing/heart rate may increase when it is frightened | -5 (1.2) | 0 | 3 |
| Recognizes that sunlight and rain are required to cause rainbows | -5 (1.2) | 0 | 4 |
| Identifies the butterfly as the adult stage of the caterpillar | -5 (2.2) | 0 | 2 |

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

* Fourth grade in most countries; see Appendix A for information about the grades tested in each country.

## Exhibit C.6 Items with the Largest Gender Difference Index (GDI) in Science
### Eighth Grade*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Demonstrates some understanding of fluid properties by drawing the liquid surface on a frame-of-reference diagram depicting a rotated container | 21 (0.9) | 32 | 0 |
| Identifies a ray diagram depicting light passing through a magnifying lens | 18 (0.6) | 32 | 0 |
| Applies concept of electrical circuits and knowledge of conductors/insulators to interpret diagrams and identify complete circuits made with components of different materials (metals, air, rubber) | 17 (1.2) | 20 | 0 |
| Interprets a diagram of the earth's layers and identifies the center as the hottest | 14 (0.9) | 27 | 0 |
| Applies knowledge of the need for oxygen/air for burning to explain why a carbon dioxide extinguisher extinguishes a fire | 13 (0.9) | 21 | 0 |
| Recognizes that burning wood releases energy | 13 (0.6) | 28 | 0 |
| Recognizes proportional relationship between voltage and current (Ohm's Law) and provides missing information to complete a voltage/current table | 13 (1.0) | 23 | 0 |
| Interprets a contour map and identifies direction of river flow from higher to lower elevation | 13 (0.6) | 30 | 0 |
| Applies knowledge of circular motion and interprets diagram to identify that an object will move in a straight line when released a circular path from | 12 (0.9) | 18 | 0 |
| Recognizes that the moon is visible because of reflected sunlight | 12 (0.8) | 26 | 0 |
| Recognizes the relationship between global warming and the increase in carbon dioxide levels in the atmosphere | 12 (0.6) | 32 | 0 |
| Identifies the diagram depicting the correct arrangement of batteries in a flashlight | 12 (0.9) | 17 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Recognizes that a human inherits traits from both parents | -10 (0.9) | 0 | 21 |
| Recognizes that traits are transferred to offspring through the sperm and egg | -8 (0.8) | 0 | 15 |
| Extracts relevant information from a data table of planetary conditions to draw a conclusion and describe a condition hostile to human life | -8 (1.3) | 1 | 7 |
| Identifies the meal with the most nutrients | -8 (1.2) | 0 | 10 |
| Recognizes the nutritional value of fruits and vegetables as a source of vitamins and minerals | -8 (1.3) | 0 | 6 |
| Demonstrates knowledge of contagious disease by describing one way that influenza may be caught | -8 (1.1) | 0 | 6 |
| From a list of organs, identifies the heart as the organ not situated in the abdomen | -7 (0.5) | 2 | 18 |
| Recognizes that repeated scientific measurements should produce similar but not identical results | -6 (1.0) | 1 | 9 |
| Describes at least a partial procedure for investigating the effect of exercise on heart rate (includes at least 2 of 3 required elements: pre- and post-measurements, exercise step, and use of timing device) | -5 (1.2) | 0 | 10 |
| Describes one reason for the uneven availability of water resources for human usage | -5 (1.1) | 0 | 4 |

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

* Eighth Grade in most countries; see Appendix A for information about the grades tested in each country.

## Exhibit C.7 Items with the Largest Gender Difference Index (GDI) in Science Literacy
### Final Year of Secondary School*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Understands the relationship between distance and perceived size of an object | 25 (0.8) | 19 | 0 |
| Understands the law of conservation of energy | 22 (1.4) | 17 | 0 |
| Identifies a practical example of energy changing states | 19 (0.9) | 19 | 0 |
| Explains the relationship between mass, acceleration, and force | 19 (0.9) | 19 | 0 |
| Identifies how carbon dioxide causes the greenhouse effect | 14 (0.9) | 16 | 0 |
| Understands the concept of leverage as appled to a scale | 14 (0.8) | 19 | 0 |
| Identifies how a battery works with a light bulb | 13 (1.0) | 16 | 0 |
| Identifies one of the principal causes of acid rain | 13 (0.9) | 15 | 0 |
| Can draw a diagram of the water cycle | 13 (1.2) | 12 | 0 |
| Understands the concept of radioactive half-life | 11 (0.9) | 14 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Can explain how blood types interact with one another | -8 (1.4) | 0 | 5 |
| Demonstrates knowledge of contagious disease by describing one way that influenza may be caught | -8 (1.1) | 0 | 6 |
| Identifies the meal with the most nutrients | -6 (1.6) | 0 | 6 |
| Recognizes that traits are transferred to offspring through the sperm and egg | -5 (1.4) | 0 | 5 |
| Recognizes the nutritional value of fruits and vegetables as a source of vitamins and minerals | -5 (1.6) | 0 | 3 |

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

* See Appendix A for information about the grades tested in each country.

## Exhibit C.8 Items with the Largest Gender Difference Index (GDI) in Physics
### Final Year of Secondary School*

| Male Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Can explain how to set up an experiment to test a scientific hypothesis | 27 (2.7) | 9 | 0 |
| Calculates the tension in thread between two points | 27 (1.1) | 13 | 0 |
| Explains why a television is a particle accelerator | 27 (3.0) | 8 | 0 |
| Interprets graphical information based on experimental data | 26 (2.7) | 11 | 0 |
| Diagrams the direction of motion based on wave propagation | 25 (2.8) | 10 | 0 |
| Uses graphical information to help interpret the velocity of light | 24 (2.8) | 10 | 0 |
| Demonstrates understanding of the concept of magnetism to solve a word problem | 23 (5.6) | 6 | 0 |
| Diagrams the path of alpha particles, gamma rays, and electrons | 22 (3.1) | 7 | 0 |
| Solves a word problem requiring knowledge of spring force | 21 (2.9) | 6 | 0 |
| Knows how the speed of light is affected by passing through certain materials | 20 (1.4) | 12 | 0 |
| Can diagram acceleration and momentum based on a word problem | 20 (3.8) | 5 | 0 |

| Female Higher-Performing Items<br>Item Label | Mean Gender Difference Index (GDI) | Countries Where Males Performed Higher | Countries Where Females Performed Higher |
|---|---|---|---|
| Identifies the cause of Frauhofer lines | -5 (2.2) | 0 | 1 |

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

* See Appendix A for information about the grades tested in each country.

# Appendix D

## Acknowledgments

TIMSS was truly a collaborative effort among hundreds of individuals around the world. Staff from the national research centers, the international management, advisors, and funding agencies worked closely to design and implement the most ambitious study of international comparative achievement ever undertaken. TIMSS would not have been possible without the tireless efforts of all involved. Below, the individuals and organizations are acknowledged for their contributions. Given that implementing TIMSS has spanned more than seven years and involved so many people and organizations, this list may not pay heed to all who contributed throughout the life of the project. Any omission is inadvertent. TIMSS also acknowledges the students, teachers, and school principals who contributed their time and effort to the study. This report would not be possible without them.

### Management and Operations

Since 1993, TIMSS has been directed by the International Study Center at Boston College in the United States. Prior to this, the study was coordinated by the International Coordinating Center at the University of British Columbia in Canada. Although the study was directed centrally by the International Study Center and its staff members implemented various parts of TIMSS, important activities also were carried out in centers around the world. The data were processed centrally by the IEA Data Processing Center in Hamburg, Germany. Statistics Canada was responsible for collecting and evaluating the sampling documentation from each country and for calculating the sampling weights. The Australian Council for Educational Research conducted the scaling of the achievement data.

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## National Research Coordinators

The TIMSS National Research Coordinators and their staff had the enormous task of implementing the TIMSS design in their countries. This required obtaining funding for the project; participating in the development of the instruments and procedures; conducting field tests; participating in and conducting training sessions; translating the instruments and procedural manuals into the local language; selecting the sample of schools and students; working with the schools to arrange for the testing; arranging for data collection, coding, and data entry; preparing the data files for submission to the IEA Data Processing Center; contributing to the development of the international reports; and preparing national reports. The way in which the national centers operated and the resources that were available varied considerably across the TIMSS countries. In some countries, the tasks were conducted centrally, while in others, various components were subcontracted to other organizations. In some countries, resources were more than adequate, while in others, the national centers were operating with limited resources. Of course, across the life of the project, some NRCs have changed. This list attempts to include all past NRCs who served for a significant period of time as well as all the present NRCs. All of the TIMSS National Research Coordinators and their staff members are to be commended for their professionalism and their dedication in conducting all aspects of TIMSS.

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## TIMSS Advisory Committees

The International Study Center was supported in its work by several advisory committees. The International Steering Committee provided guidance to the International Study Director on policy issues and general direction of the study. The TIMSS Technical Advisory Committee provided guidance on issues related to design, sampling, instrument construction, analysis, and reporting, ensuring that the TIMSS methodologies and procedures were technically sound. The Subject Matter Advisory Committee ensured that current thinking in mathematics and science education were addressed by TIMSS, and was instrumental in the development of the TIMSS tests. The Free-Response Item Coding Committee developed the coding rubrics for the free-response items. The Performance Assessment Committee worked with the Performance Assessment Coordinator to develop the TIMSS performance assessment. The Quality Assurance Committee helped to develop the quality assurance program.

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