

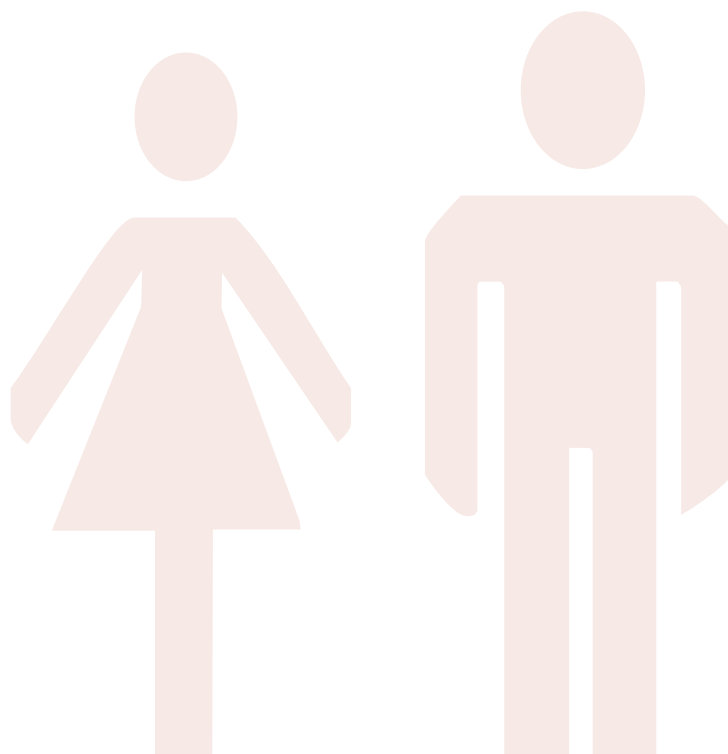
International Association for the Evaluation of Educational Achievement

Gender Differences in Achievement

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

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July 2000



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Gender Differences in Achievement, IEA's Third International Mathematics and Science Study / by Ina V.S. Mullis, Michael O. Martin, Edward G. Fierros, Amie L. Goldberg, and Steven E. Stemler

Publisher: International Study Center, Lynch School of Education, Boston College.

Library of Congress Catalog Card Number: 00-106039

ISBN 1-889938-12-2

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This report also is available on the World Wide Web: <http://www.timss.org>

Funding for the international coordination of TIMSS was provided by the U.S. National Center for Education Statistics, the U.S. National Science Foundation, the IEA, and the Canadian government. Each participating country provided funding for the national implementation of TIMSS.

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Printed and bound in the United States

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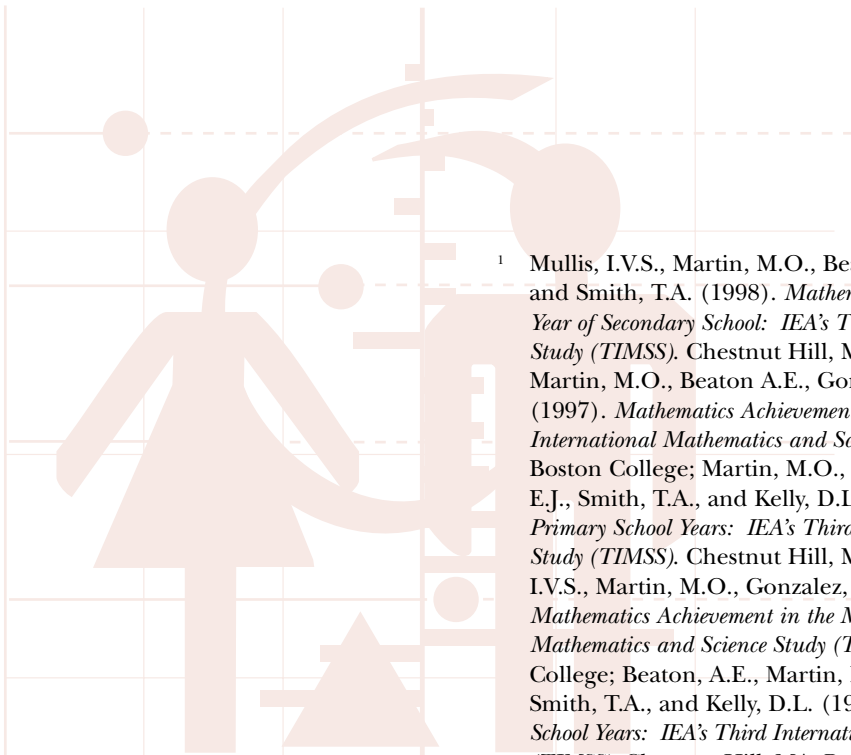
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Summary of Results

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.

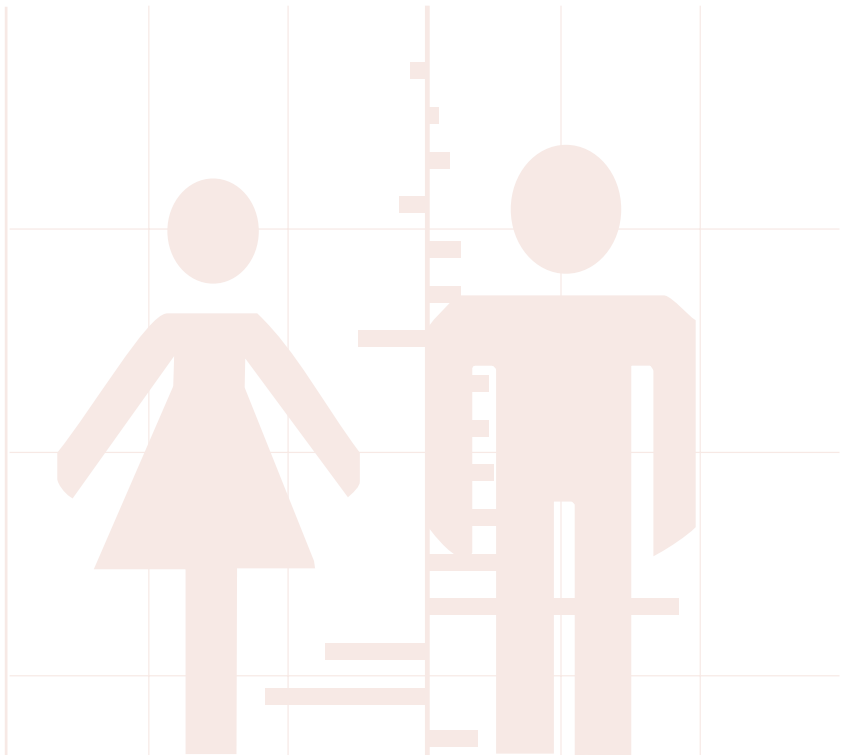
1

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 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.

Exhibit 1.1

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 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 1.2

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.

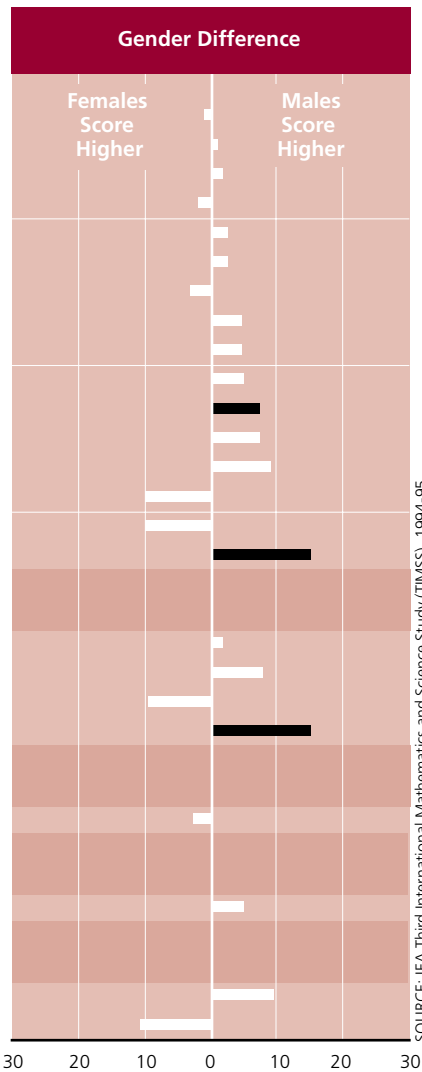
Exhibit 1.3

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)

International Averages		
Males	Females	Difference
535	533	2
(Averages of all country means)		



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 differences may appear inconsistent.

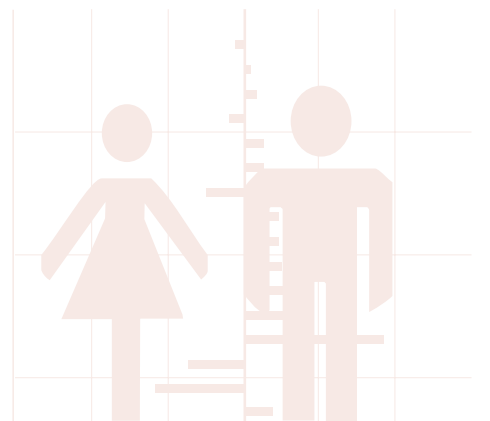


Exhibit 1.2
**Average Percent Correct for Males and Females by Mathematics Content Areas
Fourth Grade***

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)
¹² 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
**Average Percent Correct for Males and Females by Mathematics Content Areas
Fourth Grade***
(Continued)

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)
¹² 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).

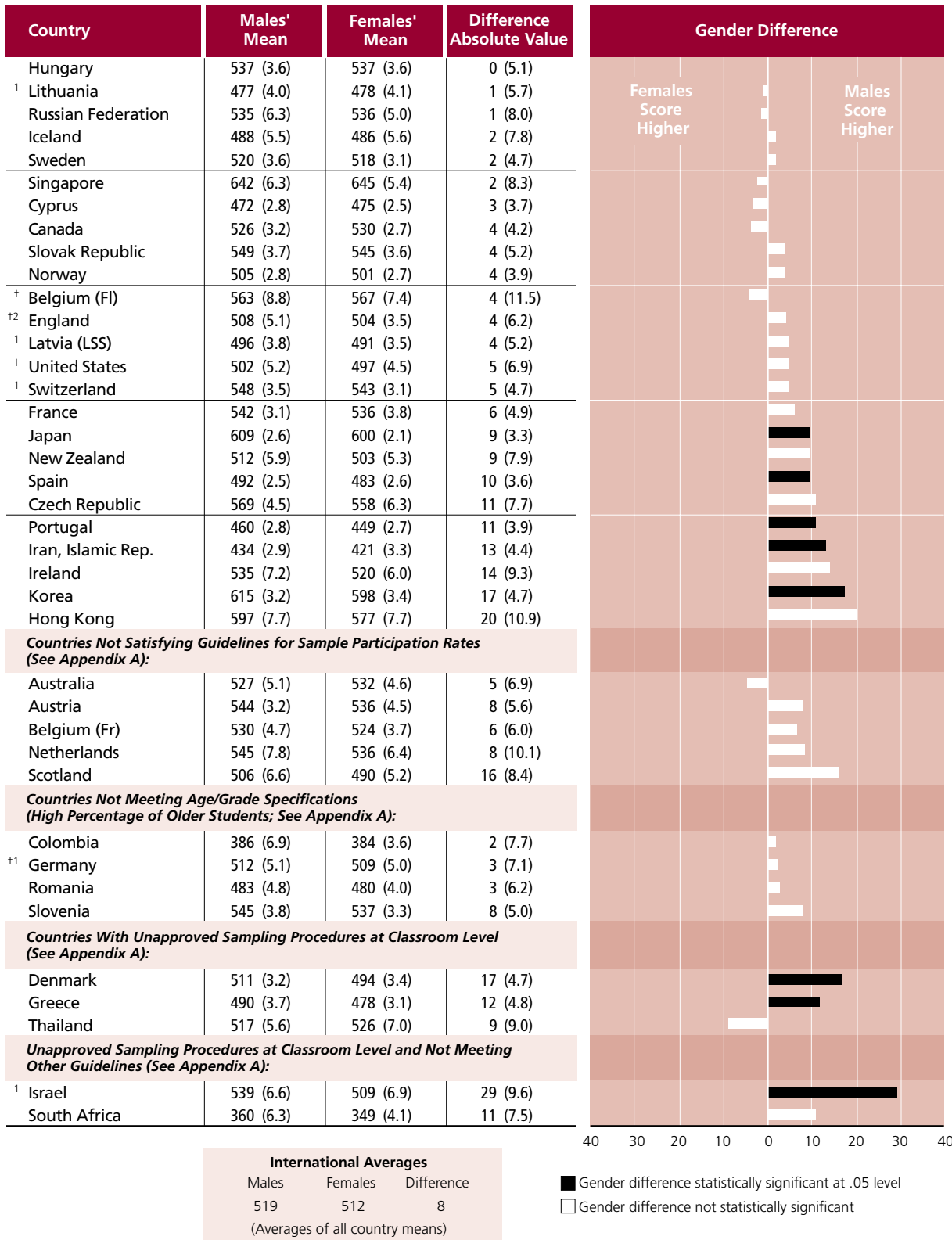
¹ National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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*



* 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.

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

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
¹ 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)
¹² 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)
¹ 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)
¹¹ 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

* 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.

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

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

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)
¹² 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)
¹¹ 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

* 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.

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

Exhibit 1.5

Gender Differences in Mathematics Literacy Final Year of Secondary School*

Country	Males		Females		Difference	TCI	Gender Difference
	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.

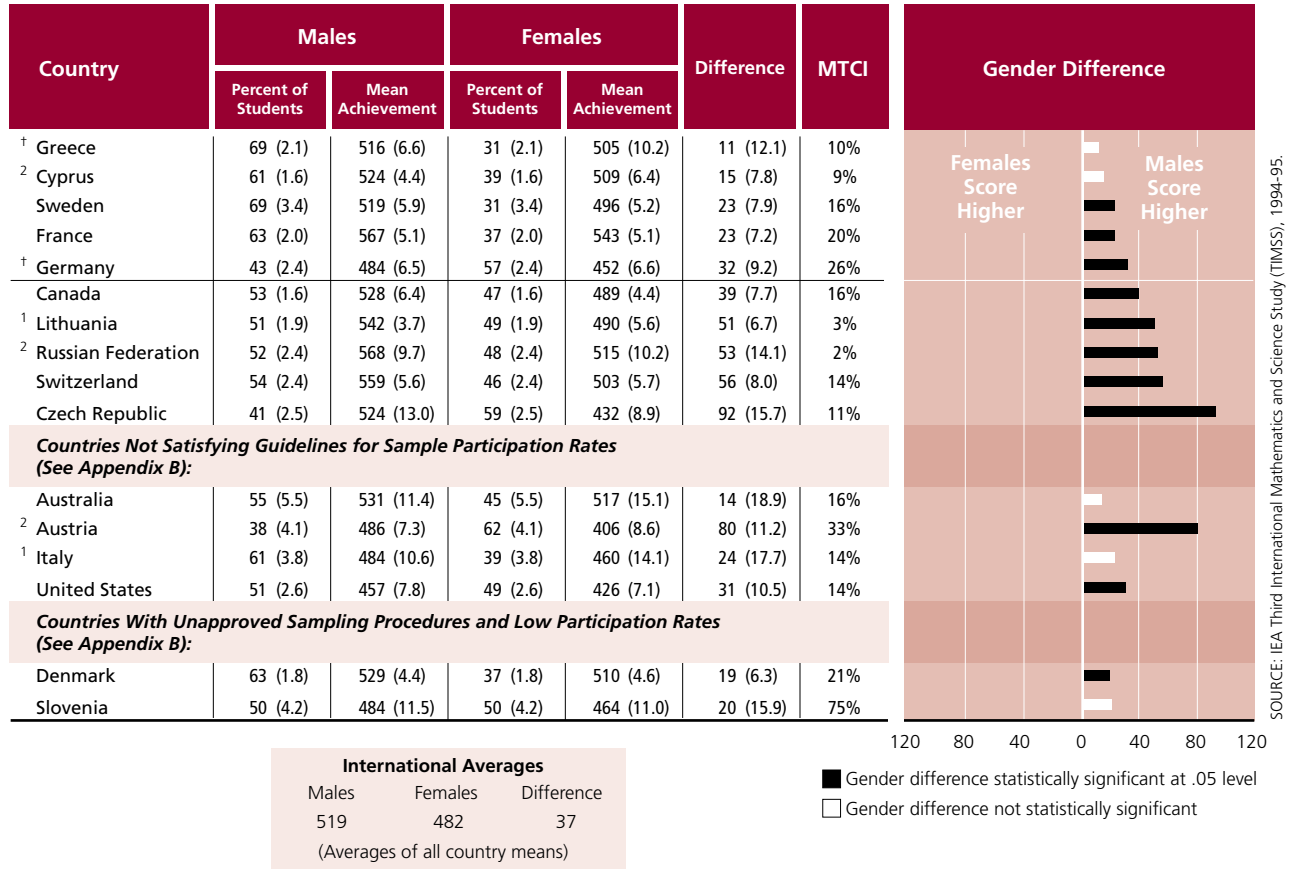
International Averages		
Males	Females	Difference
518	485	33
(Averages of all country means)		

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*



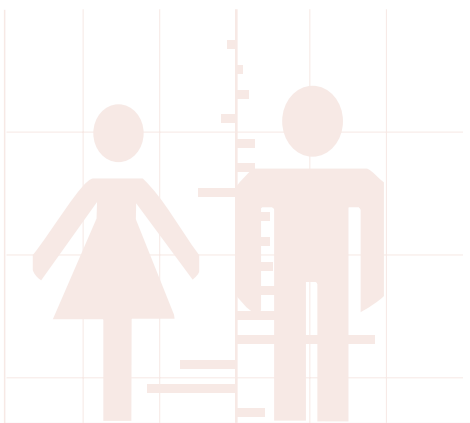
* See Appendix A for characteristics of students tested.

[†] 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.

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.

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 1.7

Exhibit 1.8

Exhibit 1.9

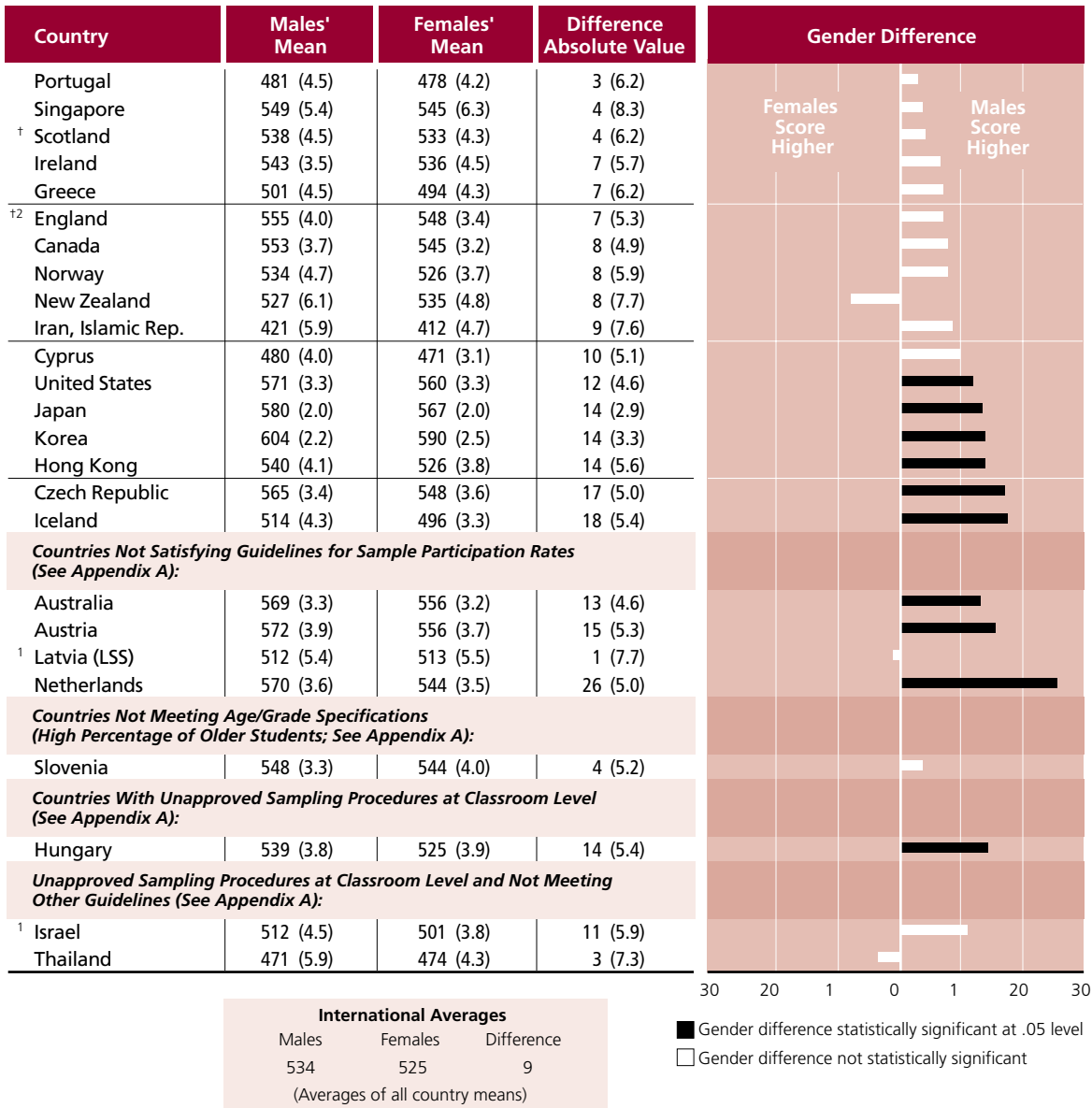
Exhibit 1.10

Exhibit 1.11

Exhibit 1.12

Exhibit 1.7

Gender Differences in Science Achievement Fourth Grade*



* 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.

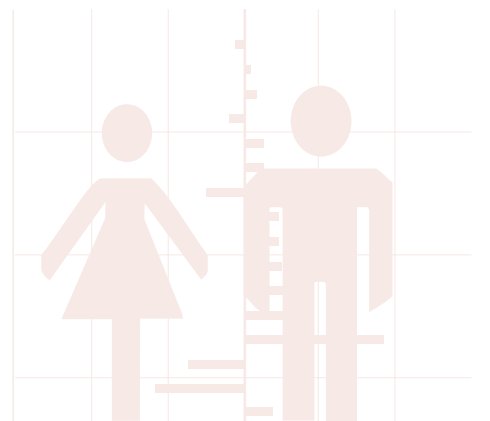


Exhibit 1.8
**Average Percent Correct for Males and Females by Science Content Areas
Fourth Grade***

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)
¹² 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)

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.

† 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
**Average Percent Correct for Males and Females by Science Content Areas
Fourth Grade***
(Continued)

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)
¹² 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).

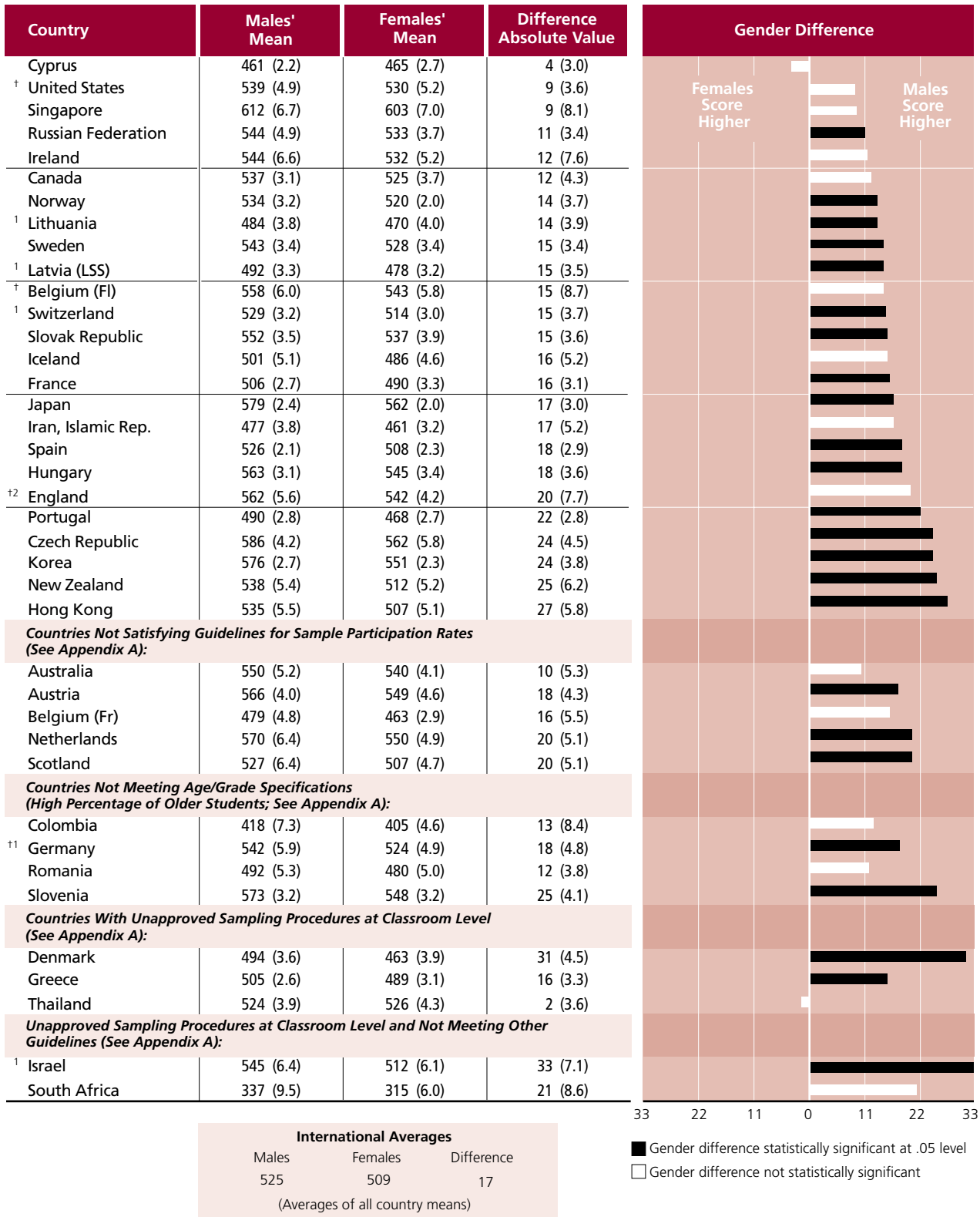
¹ National Desired Population does not cover all of International Desired Population (see Appendix A). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

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*



* 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.

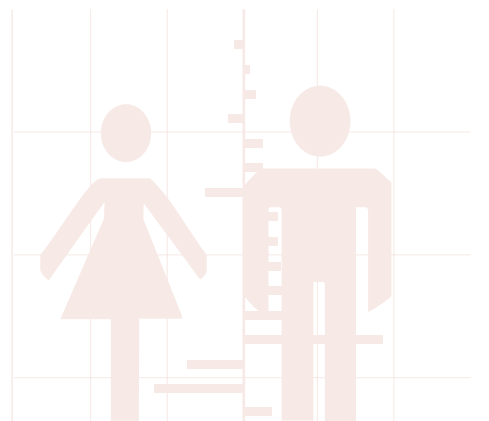


Exhibit 1.10
**Average Percent Correct for Males and Females by Science Content Areas
Eighth Grade***

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

* 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.

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

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

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)
¹² 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)
¹¹ 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

* 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.

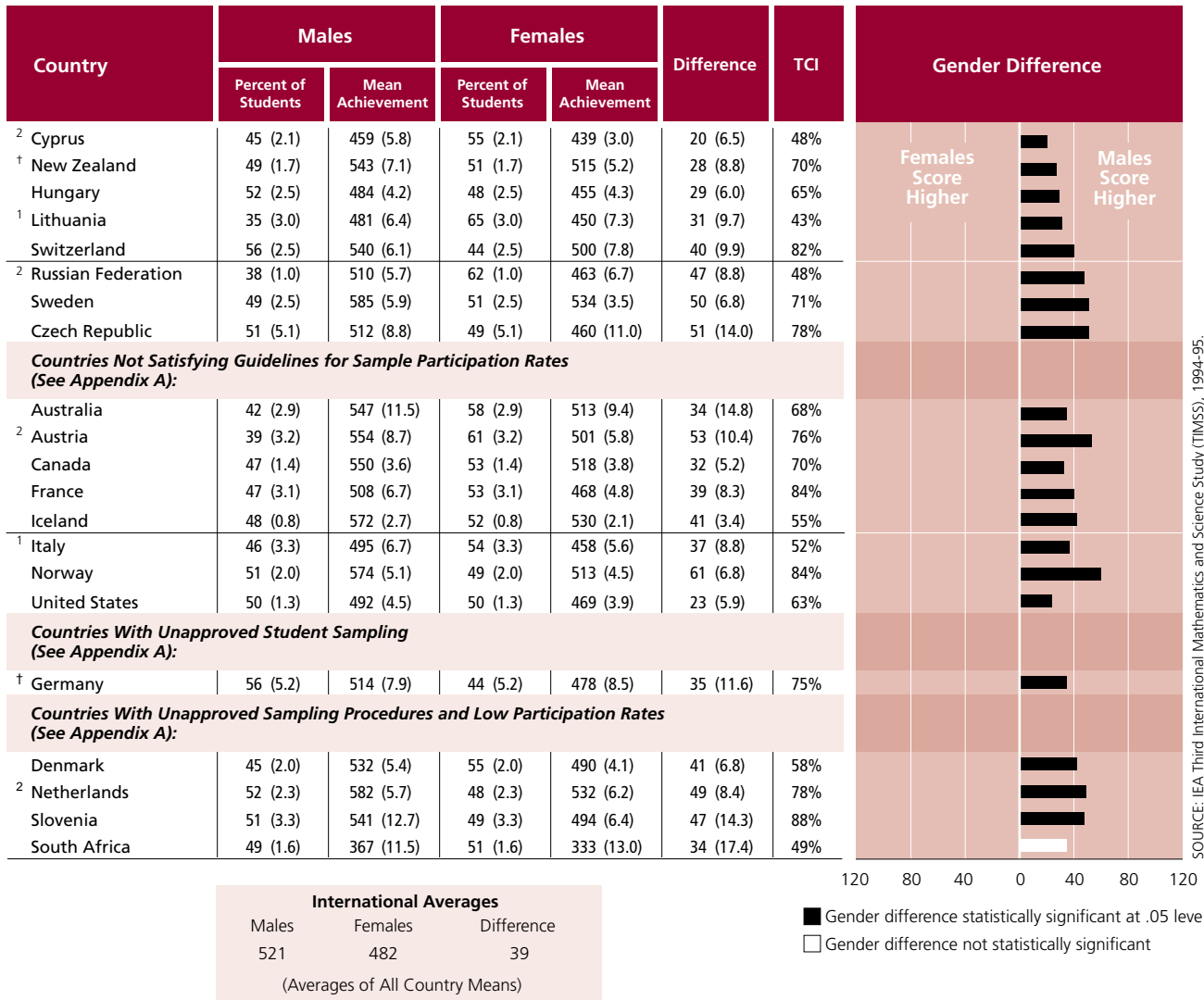
² National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

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

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

Exhibit 1.11

Gender Differences in Science Literacy Final Year of Secondary School*



* See Appendix A for characteristics of students tested.

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

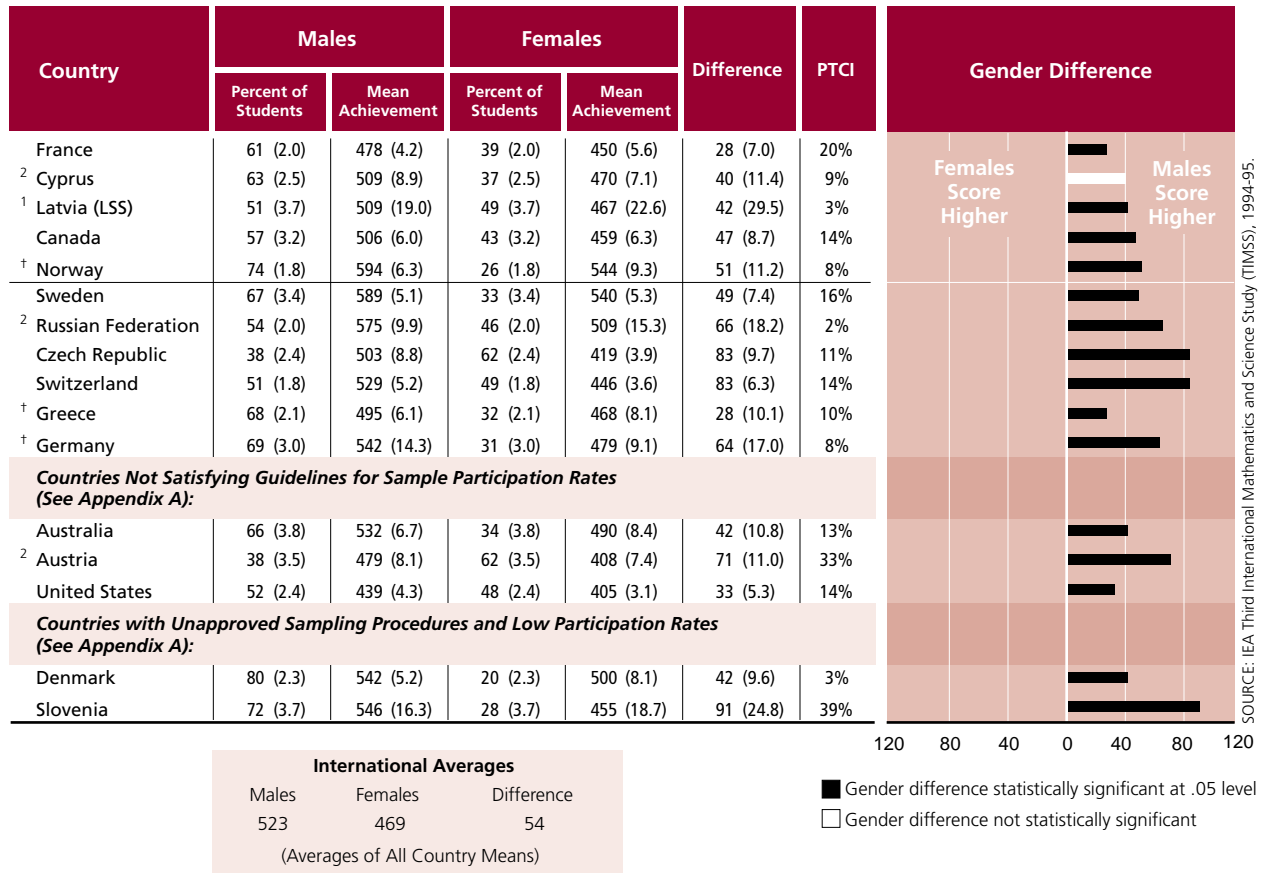
¹ National Desired Population does not cover all of International Desired Population (see Appendix A).

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*



* 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.

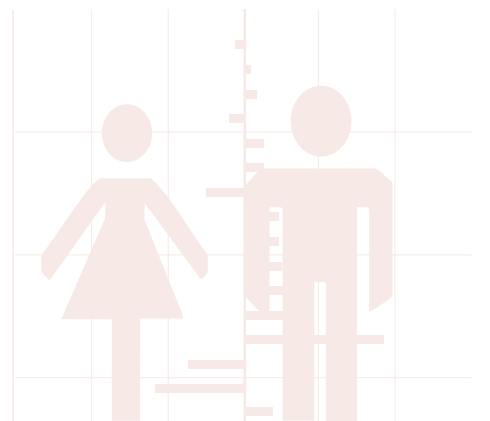
² National Defined Population covers less than 90 percent of National Desired Population (see Appendix A).

() 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.

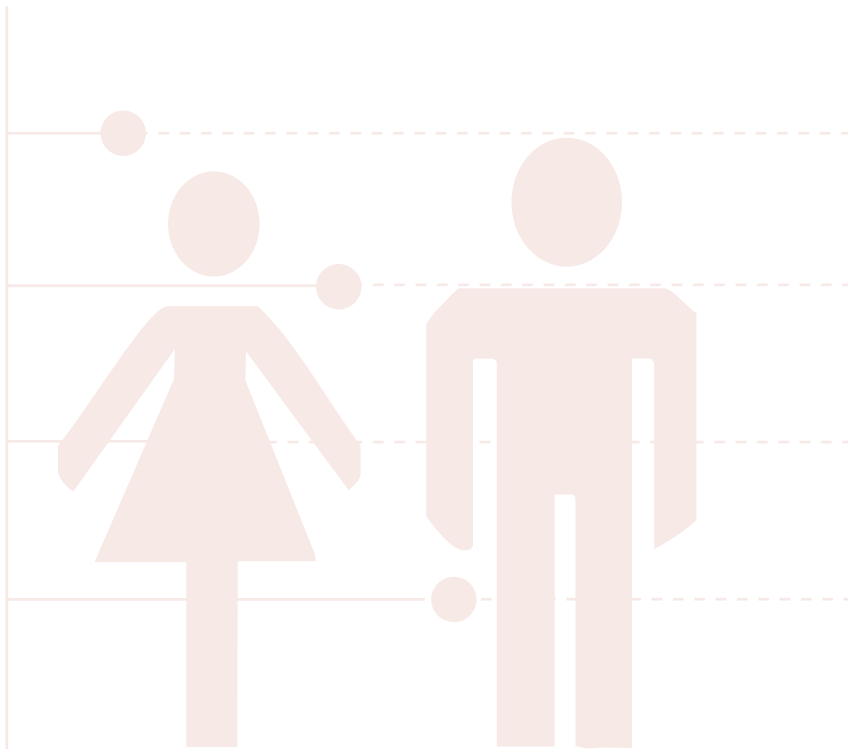


2

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).

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 2.1-2.4

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.

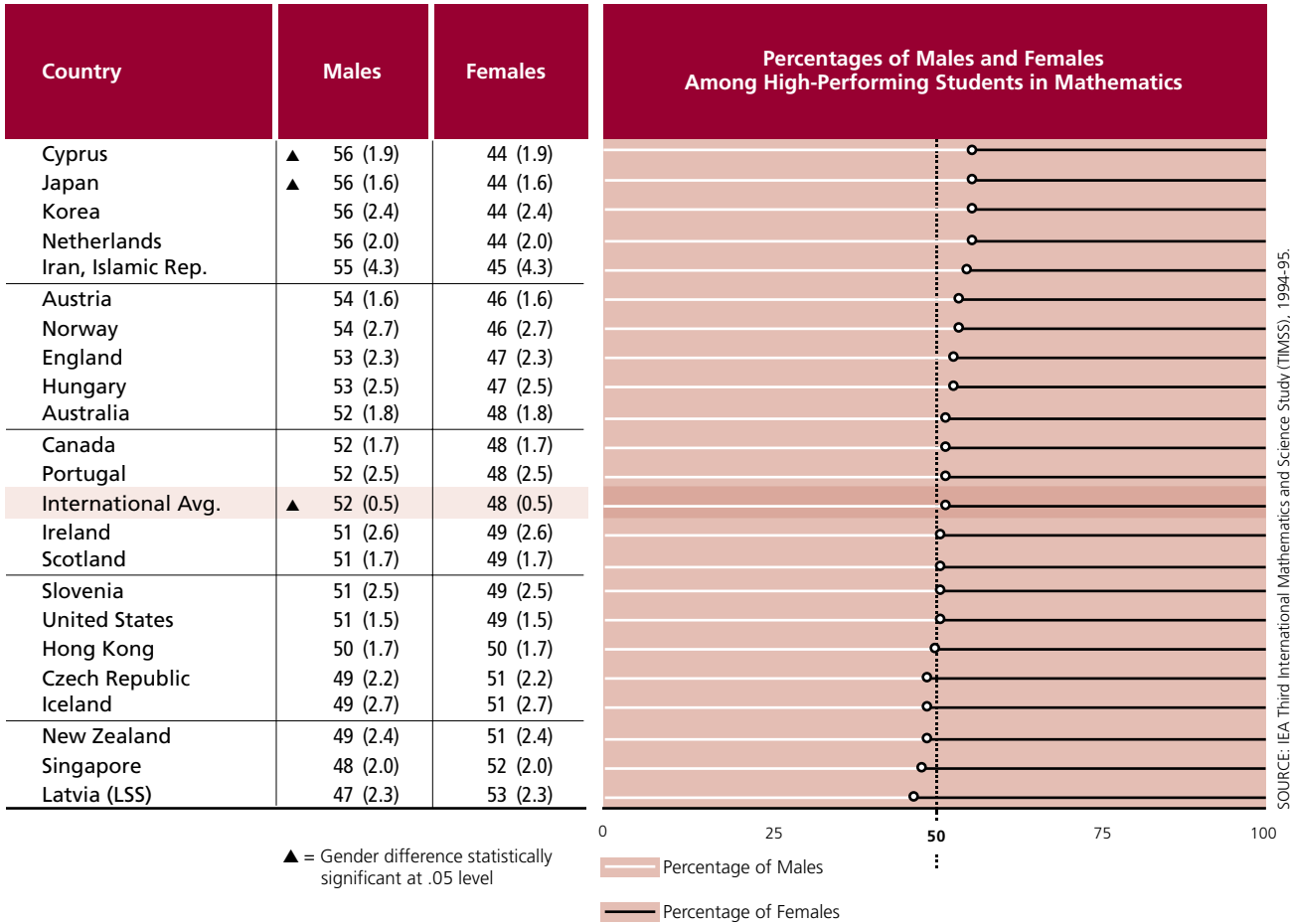
Exhibit 2.5-2.8

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 Students¹ in Mathematics Fourth Grade*



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 Students¹ in Mathematics Eighth Grade*



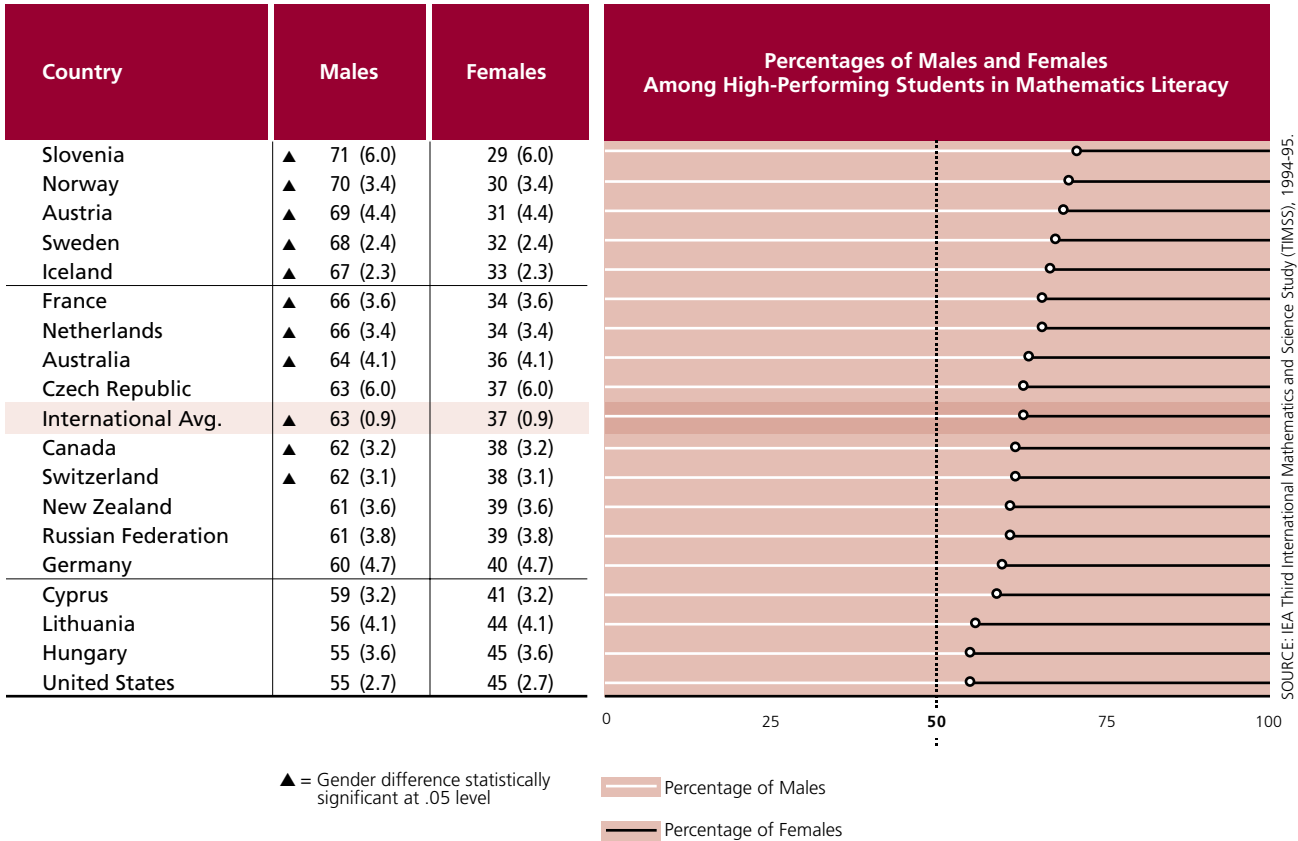
¹ High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* 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 Students¹ in Mathematics Literacy Final Year of Secondary School*



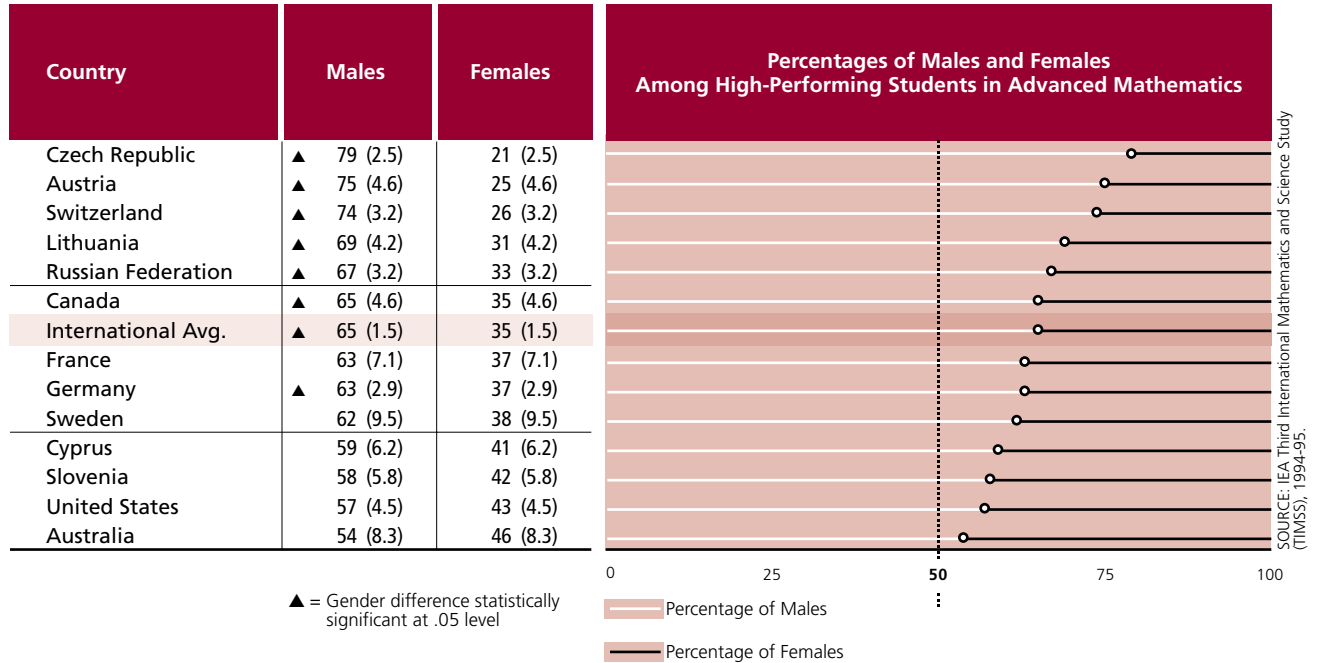
¹ High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* 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 Students¹ in Advanced Mathematics Final Year of Secondary School*



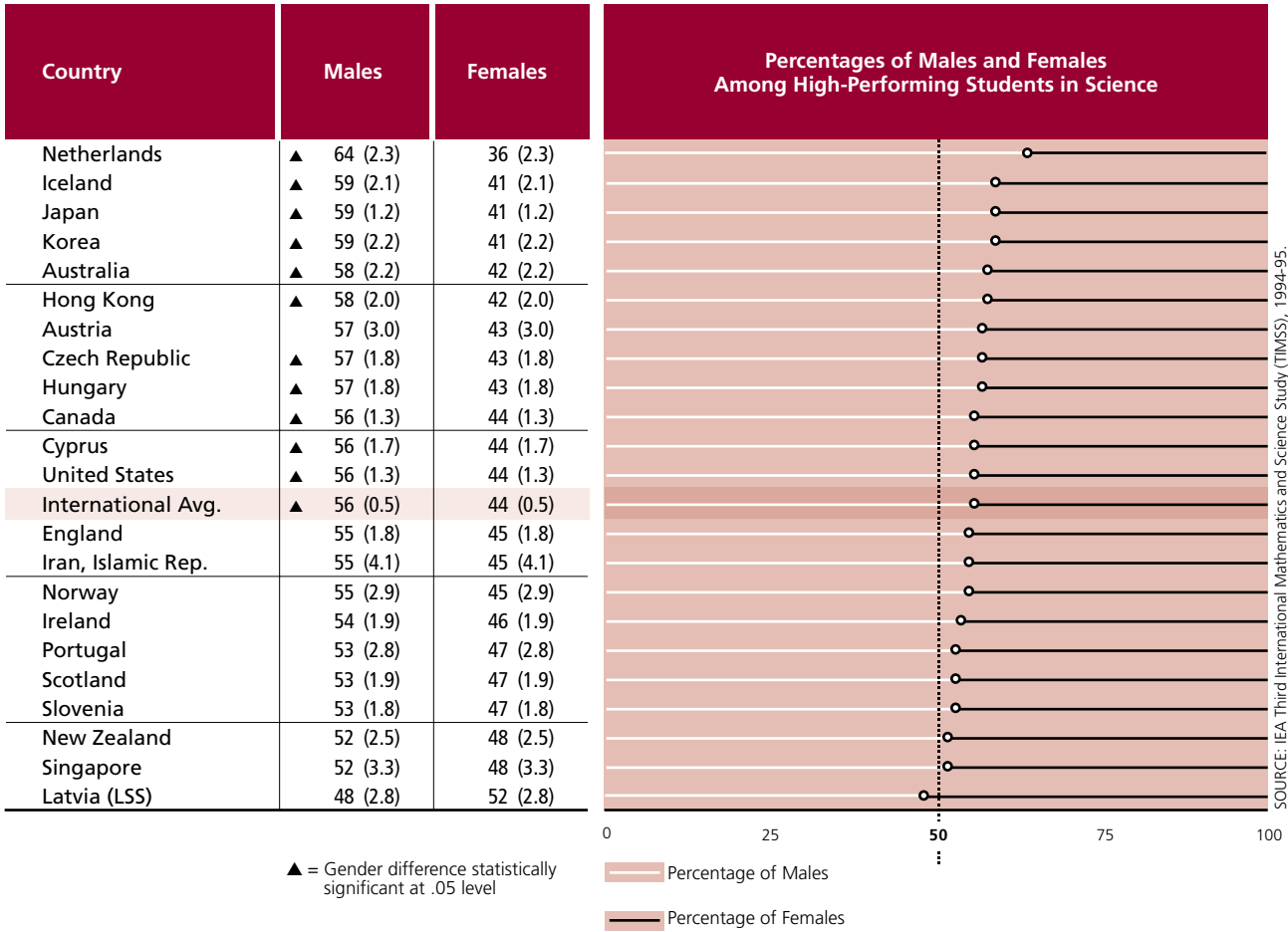
¹ High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* 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 Students¹ in Science
Fourth Grade***



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 Students¹ in Science Eighth Grade*



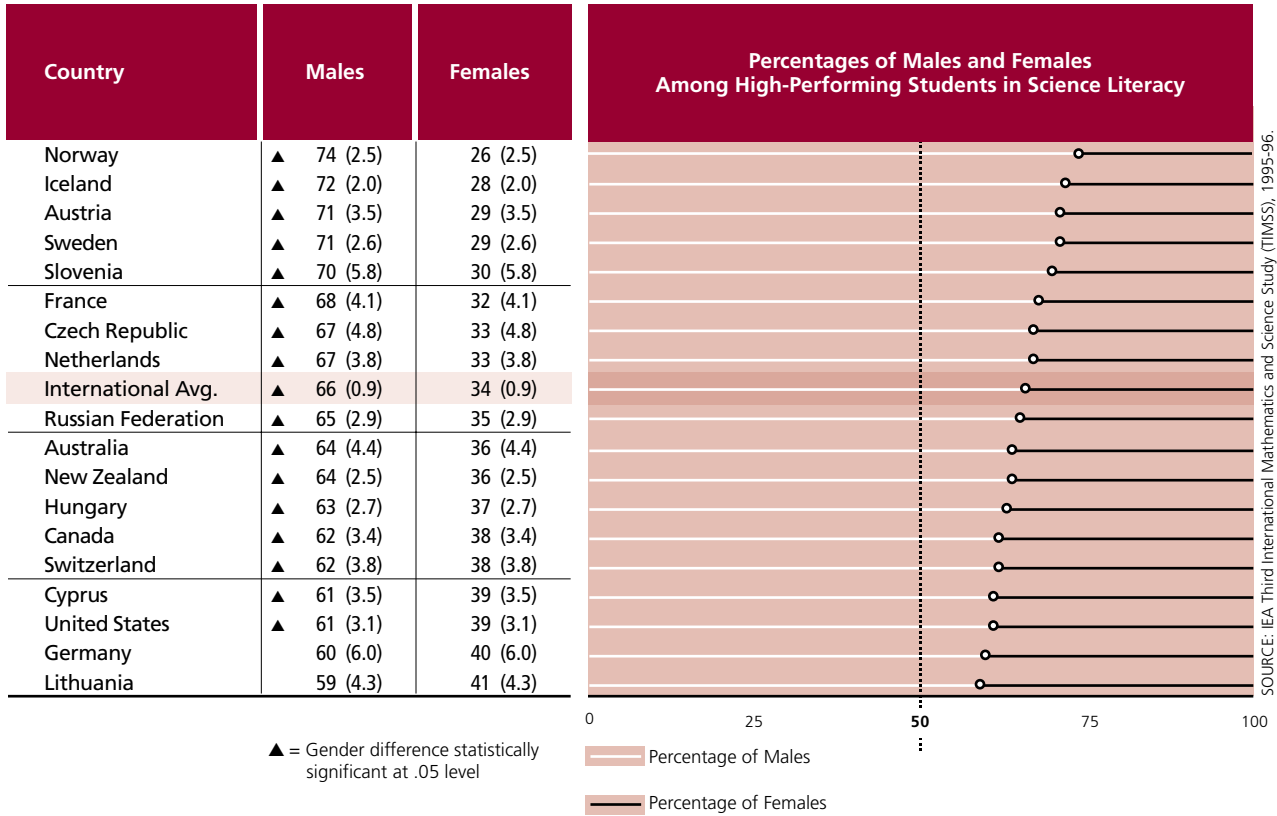
1 High-performing students are defined as those students scoring at or above the 75th percentile for their country. Percentages have been adjusted to account for male-female imbalances in the total sample.

* 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 Students¹ in Science Literacy Final Year of Secondary School*



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.

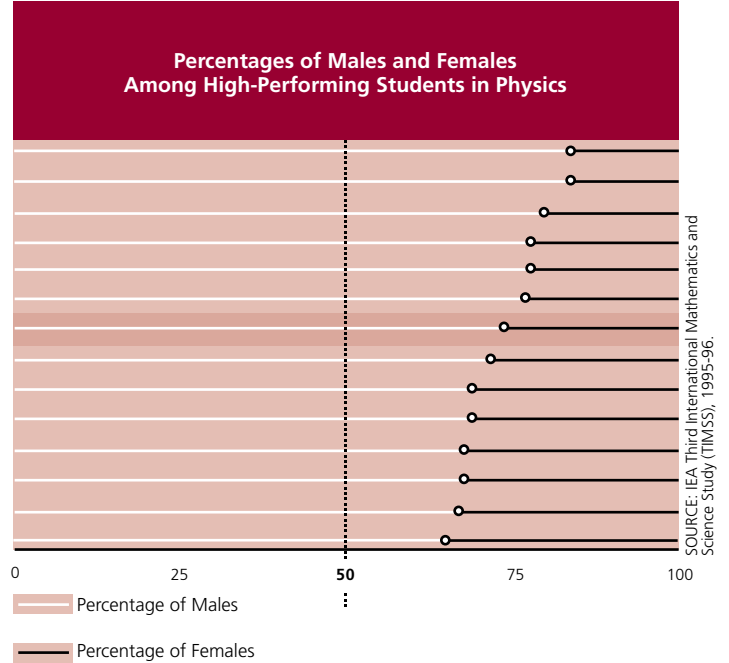
() Standard errors appear in parenthesis. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 2.8

Percentages by Gender of High Performing Students¹ 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)

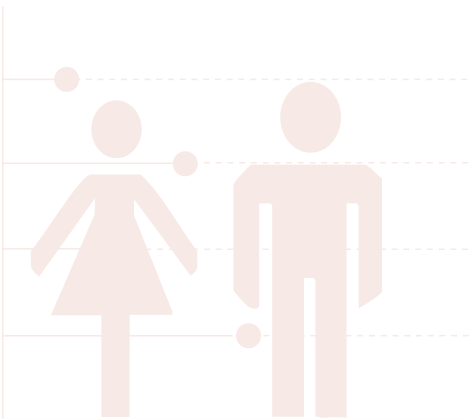
▲ = Gender difference statistically significant at .05 level



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.

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 2.9-2.12

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 2.13-2.16

Exhibit 2.9
Percentages of Males and Females at Upper and Lower Mathematics Benchmarks² - 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 Benchmarks² - 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 Benchmarks² - 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 Benchmarks² - 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 Benchmarks²
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 Benchmarks²
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 Benchmarks²
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 Benchmarks²
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.

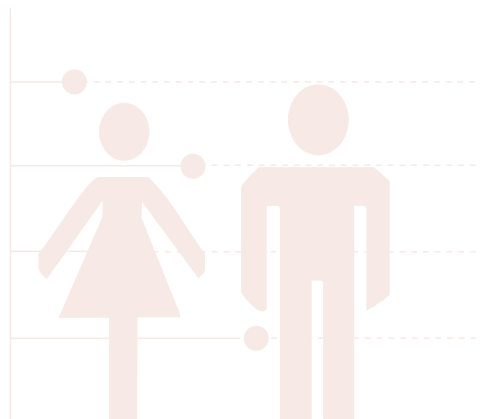
* See Appendix A for characteristics of students sampled.

() 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.

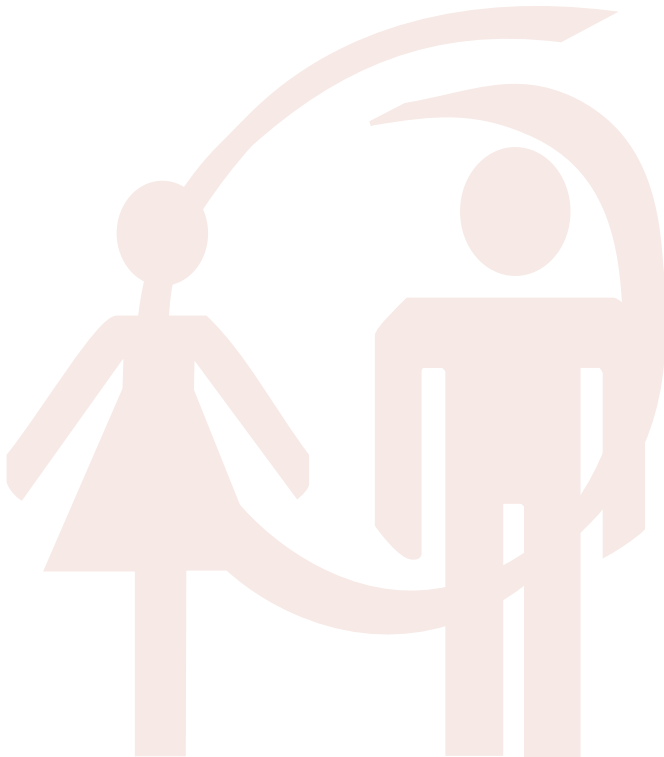


3

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.

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.

Exhibit 3.1-3.2

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 of 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)	<p>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?</p> <p>Answer: _____ 5:30 _____</p>
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)	

▲ = Gender difference statistically significant at .05 level

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.

() 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)	<p>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?</p> <p>Answer: _____ 20</p>
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)	
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)	

▲ = 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)	<p>Subtract: $2.201 - 0.753 =$</p> <p>Ⓐ 1.448</p> <p>B. 1.458</p> <p>C. 1.548</p> <p>D. 1.558</p>
Austria	81 (3.5)	85 (2.9)	
Belgium (Fl)	72 (3.5)	▲ 91 (2.1)	
Belgium (Fr)	71 (4.4)	84 (3.3)	
Bulgaria	67 (4.4)	71 (3.7)	
Canada	75 (2.7)	87 (2.6)	
Colombia	47 (5.8)	63 (4.1)	
Cyprus	58 (4.3)	70 (3.3)	
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)	

▲ = 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***

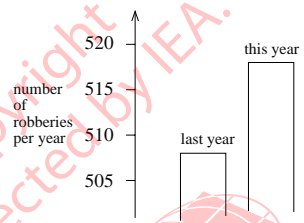
Country	Percent Correct		Example 4
	Males	Females	
Australia	43 (2.9)	47 (2.8)	<p>Juan has 5 fewer hats than Maria, and Clarissa has 3 times as many hats as Juan. If Maria has n hats, which of these represents the number of hats that Clarissa has?</p> <p>A. $5 - 3n$</p> <p>B. $3n$</p> <p>C. $n - 5$</p> <p>D. $3n - 5$</p> <p><input checked="" type="radio"/> E. $3(n - 5)$</p>
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)	

▲ = 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		Example 5
	Males	Females	
Australia	▲ 37 (5.3)	19 (2.8)	<p>A TV reporter showed this graph and said:</p> <p>“There’s been a huge increase in the number of robberies this year.”</p>  <p>Do you consider the reporter’s statement to be a reasonable interpretation of the graph? Briefly explain.</p> <p><i>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.</i></p>
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)	


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		Example 6
	Males	Females	
Australia	76 (2.6)	68 (2.8)	<p>A 45 000-litre water tank is to be filled at the rate of 220 liters per minute.</p> <p>Estimate, to the nearest half an hour, how long it will take to fill the tank.</p> <p>A. 4 hours</p> <p><input checked="" type="radio"/> B. $3\frac{1}{2}$ hours</p> <p>C. 3 hours</p> <p>D. $2\frac{1}{2}$ hours</p> 
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)	

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

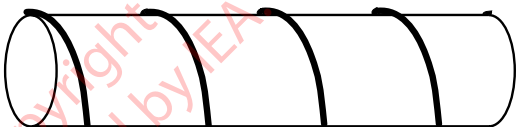
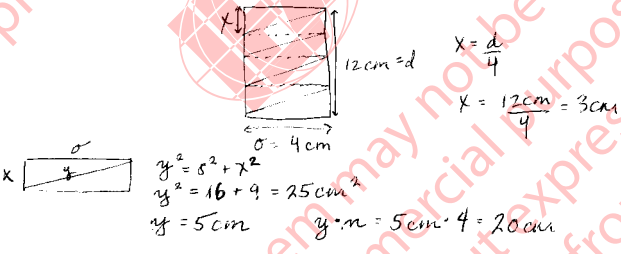
▲ = Gender difference statistically significant at .05 level

* 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		Example 7
	Males	Females	
Australia	14 (3.4)	13 (5.4)	<p>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.</p>  <p>Find the length of the string. Show all your work.</p> 
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)	

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

Country	Percent Correct		Example 8
	Males	Females	
Australia	61 (2.6)	▲ 74 (2.2)	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.
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)	

▲ = 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		Example 9
	Males	Females	
Australia	▲ 88 (1.8)	78 (2.2)	<p>The following diagrams show a flashlight battery and a bulb connected by wires to various substances.</p> <p>Which of the bulbs will light?</p> <p>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</p>
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)	

▲ = 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

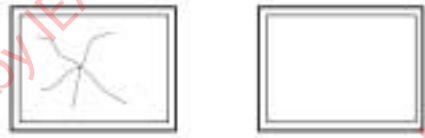
**Example 10 - Female Higher-Performance Item - Science Literacy
Final Year of Secondary School***

Country	Percent Correct		Example 10
	Males	Females	
Australia	57 (4.9)	63 (3.2)	<p>José caught influenza. Write down one way he could have caught it.</p> <p><i>If a friend in school has a cold and if he is sneezing on him and coughing on him.</i></p> 
Austria	76 (3.3)	85 (1.8)	
Canada	67 (2.1)	63 (3.2)	
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.

Country	Percent Correct		Example 11
	Males	Females	
Australia	▲ 83 (2.4)	65 (2.7)	<p>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.</p>  <p>What is one important reason why the impact of the stone cracks the window but the impact of the tennis ball does not?</p> <p><i>The tennis ball has air or a hollow inside, you'd see leaving when it hits the window but the rock is solid and just hits with full force.</i></p>
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)	

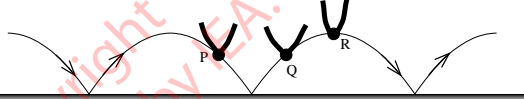
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

▲ = 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)	<p>The figure shows the trajectory of a ball bouncing on a floor, with negligible air resistance.</p>  <p>Draw arrows on the figure showing the direction of the acceleration of the ball at points P, Q and R.</p>
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 Science Study (TIMSS), 1994-95.

▲ = Gender difference statistically significant at .05 level

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* 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 Items¹
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 Items¹
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 Items¹
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 Items¹
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 Frameworks⁷ 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).

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).

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.

⁷ Robitaille, D.F., McKnight, C.C., Schmidt, W.H., Britton, 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 3.19-3.20

Exhibit 3.21-3.22

Exhibit 3.23

Exhibit 3.24

Exhibit 3.25-3.26

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.

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.

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 3.27-3.28

Exhibit 3.29

Exhibit 3.30

Exhibit 3.31

Exhibit 3.32

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.

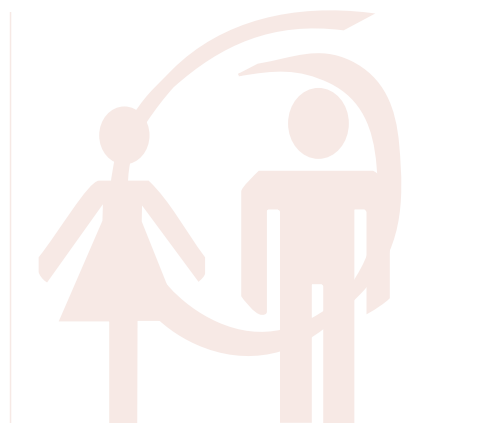
Summary

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.

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.

Exhibit 4.1-4.2

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 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

Exhibit 4.3

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*. Mahwah, 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.

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 4.4

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.

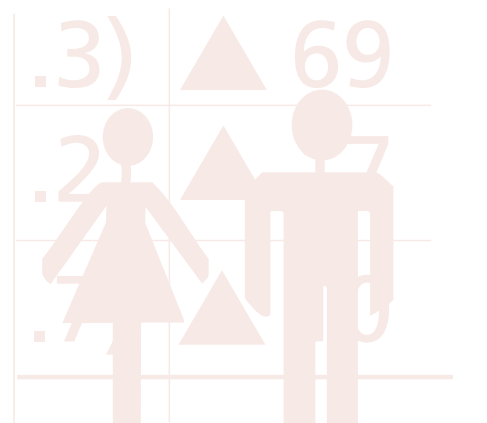


Exhibit 4.5
Students' Reports by Gender on the Importance of Doing Well in Various Activities - Eighth Grade*

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

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.

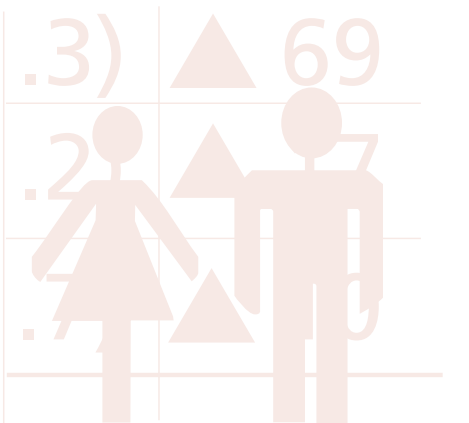


Exhibit 4.6 shows the responses given by students in the final year of secondary school to the questions about the importance of doing well in mathematics and science. As the data reveal, the response patterns by gender shift dramatically between the fourth grade and the final-year of secondary school. 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.

Exhibit 4.6

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

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 because achievement 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 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

Exhibit 4.10

Exhibit 4.11

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(FI), 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.

**TIMSS Design and
Procedures**

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:

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

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

β = 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
<i>Australia</i>	177	6492	3240	3252
<i>Austria</i>	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
<i>Hungary</i>	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
<i>Latvia (LSS)</i>	125	2216	1128	1088
<i>Netherlands</i>	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
<i>Slovenia</i>	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
<i>Australia</i>	161	7251	3529	3722
<i>Austria</i>	123	2706	1385	1321
Belgium (Fl)	141	2894	1457	1437
<i>Belgium (Fr)</i>	119	2560	1269	1291
Canada	364	8225	4137	4088
<i>Colombia</i>	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
<i>Germany</i>	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
<i>Netherlands</i>	94	1957	980	977
New Zealand	149	3683	1908	1775
Norway	146	3267	1633	1634
Portugal	142	3391	1728	1663
<i>Romania</i>	163	3723	1809	1914
Russian Federation	174	4022	1871	2151
<i>Scotland</i>	124	2815	1457	1358
Singapore	137	4641	2334	2307
Slovak Republic	145	3501	1716	1785
<i>Slovenia</i>	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
<i>Australia</i>	87	1941	775	1166
<i>Austria</i>	169	1919	878	1041
<i>Canada</i>	337	5205	2672	2533
Cyprus	28	531	251	280
Czech Republic	150	2167	1115	1052
<i>France</i>	56	1572	813	759
<i>Germany</i>	150	2179	1071	1108
Hungary	204	4912	2370	2542
<i>Iceland</i>	30	1687	800	887
Lithuania	142	2886	948	1938
<i>Netherlands</i>	79	1470	745	725
New Zealand	79	1763	852	911
<i>Norway</i>	131	2518	1190	1328
Russian Federation	163	2289	841	1448
<i>Slovenia</i>	78	1563	828	735
Sweden	145	3068	1462	1606
Switzerland	383	3283	1660	1623
<i>United States</i>	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
<i>Australia</i>	83	645	360	285
<i>Austria</i>	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
<i>Slovenia</i>	72	1521	746	775
Sweden	101	1001	644	357
Switzerland	197	1389	766	623
<i>United States</i>	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
<i>Australia</i>	85	661	417	244
<i>Austria</i>	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
<i>Slovenia</i>	51	726	566	160
Sweden	101	1012	651	361
Switzerland	197	1359	727	632
<i>United States</i>	203	3114	1617	1497

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

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 (German)			0	0
(French and Italian)			7	7
			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.

- 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.
- 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.
- 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.
- 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.
- New Zealand: The majority of students begin primary school on or near their 5th birthday so the "years of formal schooling" vary.
- 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 Students¹
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 Students¹
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 Students¹
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 Students¹ 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 Students¹
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 Students¹
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 Students¹
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 Students¹
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 Students¹
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 Students¹ 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 Students¹
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 Students¹ 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)	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)	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)	525 (0.7)	523 (0.7)	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 Students¹ 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 Students¹ 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 Students¹
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 Students¹
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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 applied 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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
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	Mean Gender Difference Index (GDI)	Countries Where Males Performed Higher	Countries Where Females Performed Higher
Item Label			
Identifies the cause of Fraunhofer 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.

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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Funding for the International Study Center was provided by the National Center for Education Statistics of the U.S. Department of Education, the U.S. National Science Foundation, and the International Association for the Evaluation for Educational Achievement. Eugene Owen and Lois Peak of the National Center for Education Statistics and Larry Suter of the National Science Foundation each played a crucial role in making TIMSS possible and for ensuring the quality of the study. Funding for the International Coordinating Center was provided by the Applied Research Branch of the Strategic Policy Group of the Canadian Ministry of Human Resources Development. This initial source of funding was vital to initiate the TIMSS project. Tjeerd Plomp, Chair of the IEA and of the TIMSS Steering Committee, has been a constant source of support throughout TIMSS. It should be noted that each country provided its own funding for the implementation of the study at the national level.

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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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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Typography

This book was set in ITC New Baskerville, designed by George W. Jones, and Frutiger, designed by Adrian Frutiger for Linotype-Hell, released by Adobe.

Cover Design

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Book Design and Information Graphics

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Layout, Production and Illustration

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