3

Examining Item Content and Type by Gender

Overview

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

Using a Measure of Gender Difference

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

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

Exhibit 3.1-3.2

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

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

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

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

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

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

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

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

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

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

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

Characteristics of Mathematics Items with Large Gender Differences Internationally

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

Exhibit 3.3-3.4

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

Exhibit 3.5

Exhibit 3.6

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

Exhibit 3.7-3.8

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

Exhibit 3.9

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

Example 4

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

A. $5 - 3n$

B. $3n$

C. $n - 5$

D. $3n - 5$

E. $3(n - 5)$

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

▲ = Gender difference statistically significant at .05 level

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

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

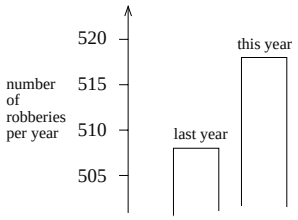
Exhibit 3.7 Example 5 - Male Higher-Performance Item - Mathematics Literacy
Final Year of Secondary School*

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

Example 5

A TV reporter showed this graph and said:

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



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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

Example 6

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

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

A. 4 hours

Ⓑ $3\frac{1}{2}$ hours

C. 3 hours

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

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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.

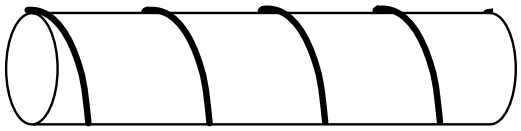
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

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

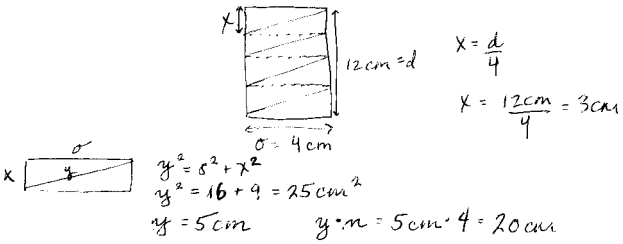
Country	Percent Correct	
	Males	Females
Australia	14 (3.4)	13 (5.4)
Austria	17 (5.6)	3 (2.4)
Canada	17 (2.7)	7 (2.3)
Cyprus	0 (0.0)	0 (0.0)
Czech Republic	▲ 15 (3.5)	3 (1.5)
France	6 (2.6)	2 (1.2)
Germany	▲ 15 (3.7)	2 (0.7)
Italy	10 (5.5)	0 (0.0)
Lithuania	▲ 28 (3.7)	7 (1.4)
Russian Federation	16 (3.6)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

Example 7

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



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



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

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.

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

Characteristics of Science Items with Large Gender Differences Internationally

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

Exhibit 3.10

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

Exhibit 3.11

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

Exhibit 3.12

Exhibit 3.13

Exhibit 3.14

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

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

Example 8

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

A. They have a high water content.

B. They are the best source of protein.

C. They are rich in minerals and vitamins.

D. They are the best source of carbohydrates.

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

▲ = Gender difference statistically significant at .05 level

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

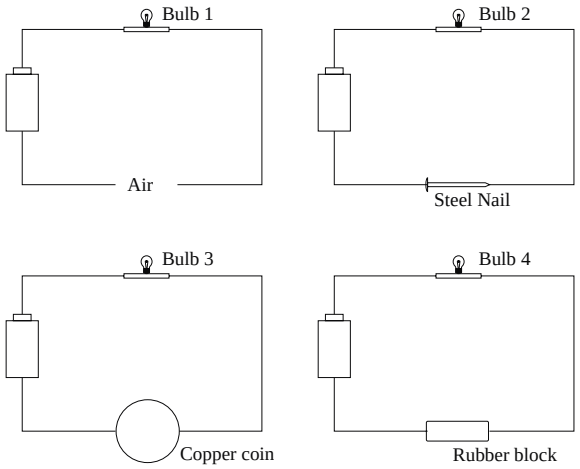
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

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

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

Example 9

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



Which of the bulbs will light?

A. 1 and 2 only

B. 2 and 3 only

C. 3 and 4 only

D. 1, 2, and 3 only

E. 2, 3, and 4 only

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

▲ = Gender difference statistically significant at .05 level

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

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

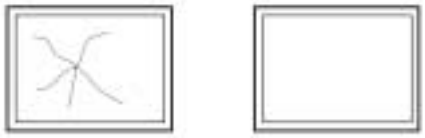
( ) Standard errors appear in parentheses. Results are rounded to the nearest whole number.

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

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

Example 11

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



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

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

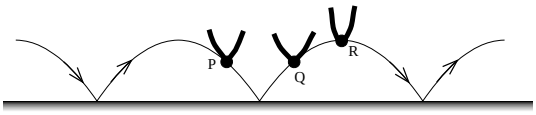
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

▲ = Gender difference statistically significant at .05 level

* See Appendix A for characteristics of students sampled.

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

Exploring the Results of Linked Items

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

Exhibit 3.15

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

Exhibit 3.16

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

Exhibit 3.17

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

Exhibit 3.18

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

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

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

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

▲ = Gender difference statistically significant at .05 level

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

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

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

Gender Differences by Cognitive Demand

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

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

Exhibit 3.19-3.20

Exhibit 3.21-3.22

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

Exhibit 3.23

Exhibit 3.24

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

Exhibit 3.25-3.26

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

* See Appendix A for characteristics of students sampled.

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

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

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

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

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

* See Appendix A for characteristics of students sampled.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

* See Appendix A for characteristics of students sampled.

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

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

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

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

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

* See Appendix A for characteristics of students sampled.

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

Gender Differences by Item Format

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

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

Exhibit 3.27-3.28

Exhibit 3.29

Exhibit 3.30

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

Exhibit 3.31

Exhibit 3.32

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

Exhibit 3.33

Exhibit 3.34

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

* See Appendix A for characteristics of students sampled.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

* See Appendix A for characteristics of students sampled.

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

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

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

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

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

* See Appendix A for characteristics of students sampled.

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

Summary

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

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

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

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