CHAPTER 3

3

Average Achievement in the Science Content Areas

Chapter 3 presents results by the major content areas in science to provide information about the possible effects of curricular variation on average achievement. Average performance is provided for six content areas: earth science; life science; physics; chemistry; environmental and resource issues; scientific inquiry and the nature of science. Information on trends also is provided for earth science, life science, physics, and chemistry.

Curriculum data collected as part of TIMSS 1995 and TIMSS 1999 indicate differences among countries in the structure of the science curriculum, especially in the grades at which topics are introduced, the relative emphasis given to topics, the time allocated to science education, and the expectations placed upon the students. The TIMSS curriculum frameworks were constructed to be powerful organizing tools, rich enough to make possible comparative analyses of curriculum and curriculum change in a wide variety of settings and from a variety of curriculum perspectives. The TIMSS 1999 science assessment, based upon the science framework, was designed to allow as fair comparisons as possible among participating countries, and maintained a common structure with TIMSS 1995 enabling the tracking of changes over time.[1]

To facilitate comparative analyses of the science data, the TIMSS 1999 science test for the eighth grade was designed to enable reporting by six content areas in accordance with the TIMSS science framework.[2] These areas, with their main topics, are:

- **Earth science**

  Includes earth features, earth processes, and earth in the universe

- **Life science**

  Includes diversity, organization and structure of living things; life processes and systems enabling life functions; life spirals, genetic continuity and diversity; interactions of living things; and human biology and health

- **Physics**

  Includes physical properties and transformations; energy and physical processes; and forces and motion

- **Chemistry**

  Includes classification and structure of matter; chemical properties; and chemical transformations

- **Environmental and resource issues**

  Includes pollution; conservation of land, water, and sea resources; conservation of material and energy resources; world population; food supply and production; and effects of natural disasters

1 Please see the test development section of Appendix A for more information about the test development process. Appendix C provides an analysis of the match between the test and curriculum in the different TIMSS countries and the effect of this match on the TIMSS results.

2 In TIMSS 1995, there were five reporting categories. Environmental issues and the nature of science was included as a combined reporting category, reflecting only 14 total items across the two combined content areas. For TIMSS 1999, additional items were developed in each of these two content areas, permitting the reporting of achievement results separately for the environmental and resource issues and the scientific inquiry and the nature of science categories.

- **Scientific inquiry and the nature of science**

  Includes the nature of scientific knowledge; the scientific enterprise; interactions of science, technology, mathematics, and society; and the tools, procedures, and processes used in conducting scientific investigations.

Chapter 3 presents average achievement for the six major content areas covered by the TIMSS 1999 science test. Gender differences in each content area are shown, and trends in achievement between 1995 and 1999 are presented for those countries that participated in both TIMSS assessments.

How Does Achievement Differ Across Science Content Areas?

3.1

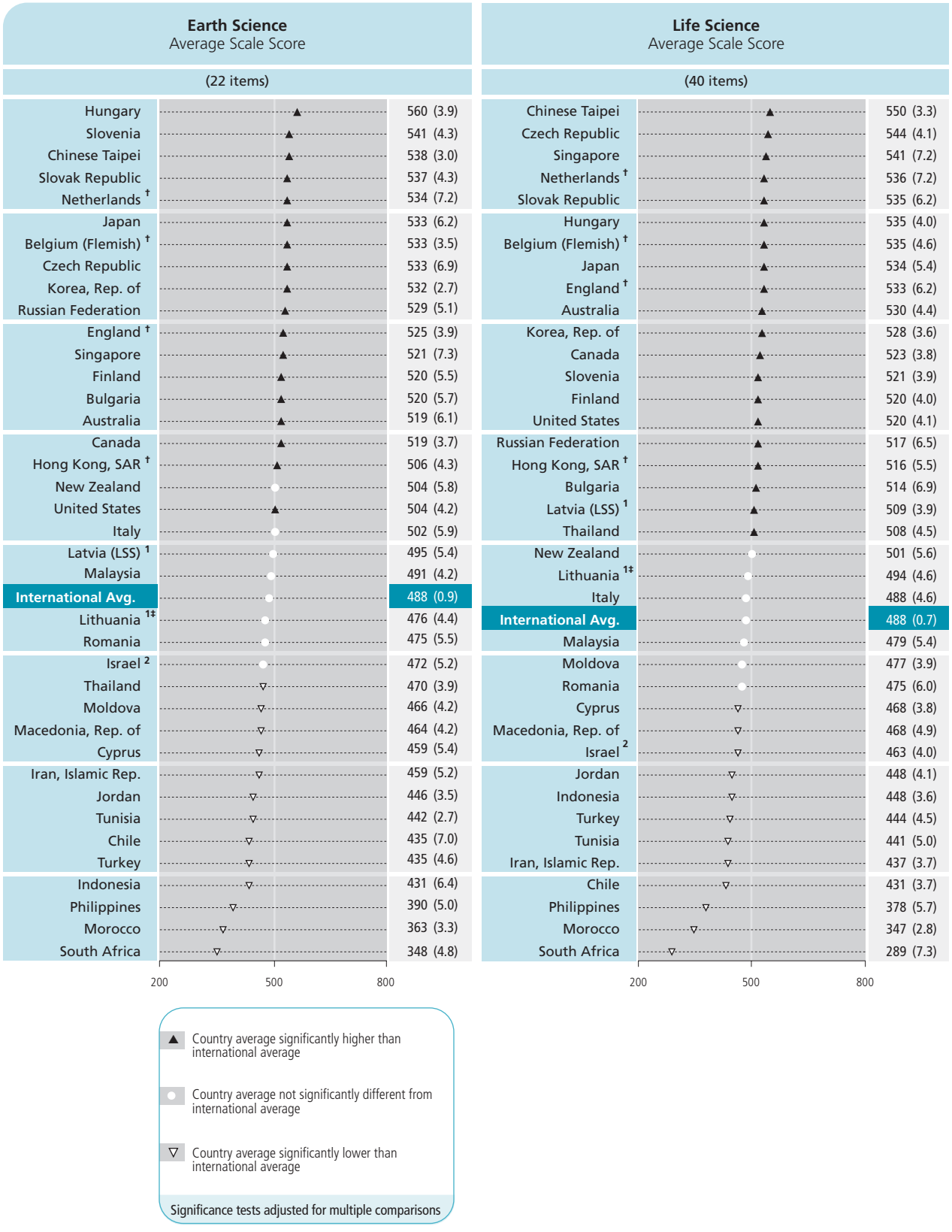
Exhibit 3.1 presents average achievement in each of the six science content areas. Countries are displayed in decreasing order of achievement for each content area, and symbols indicate whether a country's performance is statistically significantly above or below the international average. To allow comparison of the relative performance of each country in each content area, the international average for each content area was scaled to be 488, the same as the overall international average.

There was a broad range in average achievement within each content area. The largest range was for physics, in which Singapore had an average scale score of 570 and South Africa one of 308, a range of 262 scale-score points. Life science also had a broad range, from 550 for Chinese Taipei to 289 for South Africa. The smallest range was for earth science, in which Hungary had an average scale score of 560 and South Africa one of 348, a range of 212 scale-score points. The range for chemistry was similar, from 563 for Chinese Taipei to 350 for South Africa.

Countries that performed significantly above or below the international average on the science test as a whole also tended to perform above or below the international average on each content area test. Similarly, countries that performed near the international average on the overall science test also tended to perform at about the international average on each content area test, with only one or two exceptions. For example, Latvia (LSS) was significantly above the international average in life science and at the international average for the other content areas. New Zealand performed at about the international average on each content area test, with the exception of scientific inquiry and the nature of science, on which it scored above the international average.

Exhibits B.1 through B.6 in Appendix B compare average achievement among individual countries for each of the content areas, respectively. The exhibits show whether or not the differences in average achievement between pairs of countries are statistically significant.

Exhibit 3.1 Average Achievement in Science Content Areas



SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

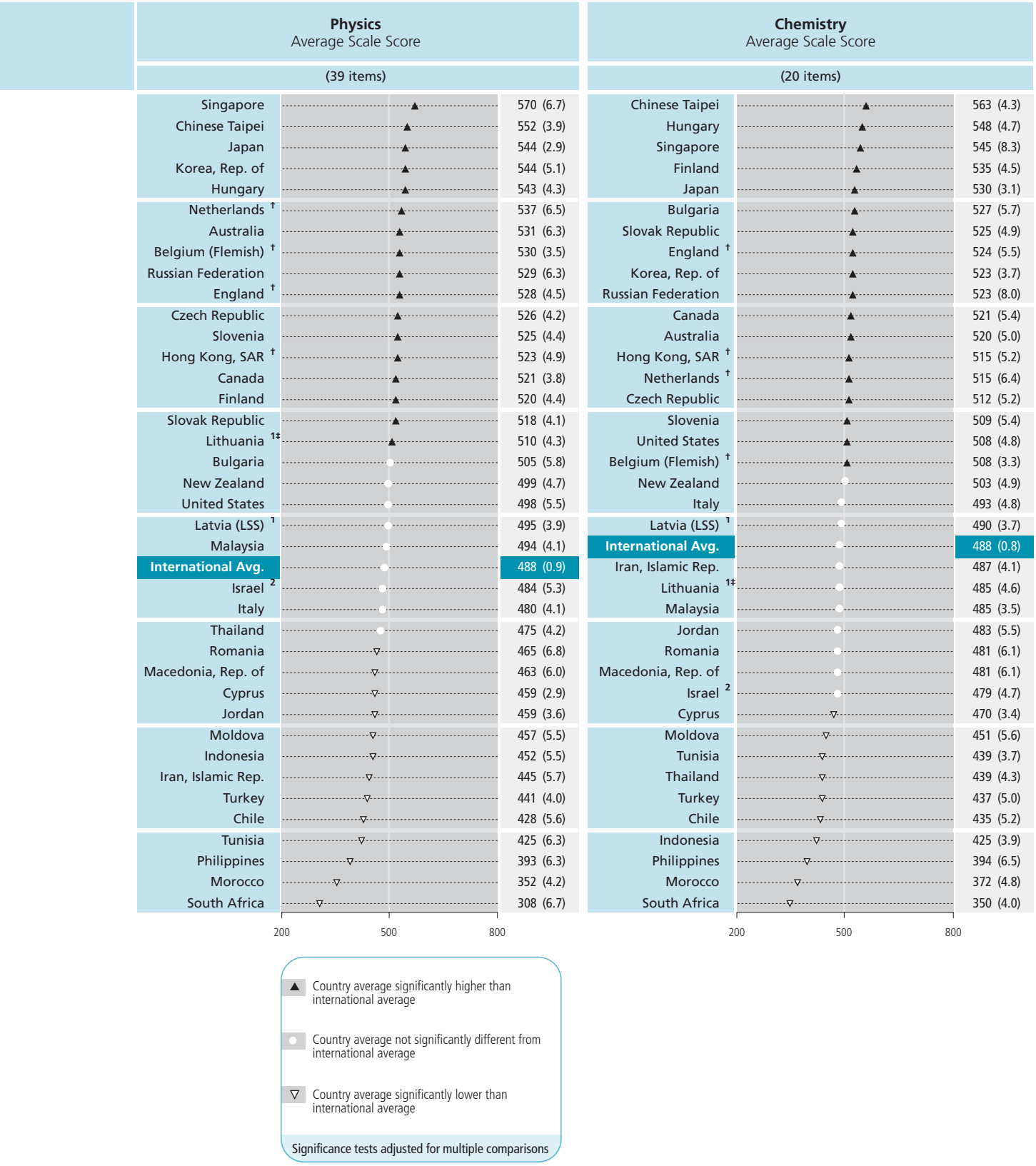
† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.8).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.5). Because coverage falls below 65%, Latvia is annotated LSS for Latvian-Speaking Schools only.

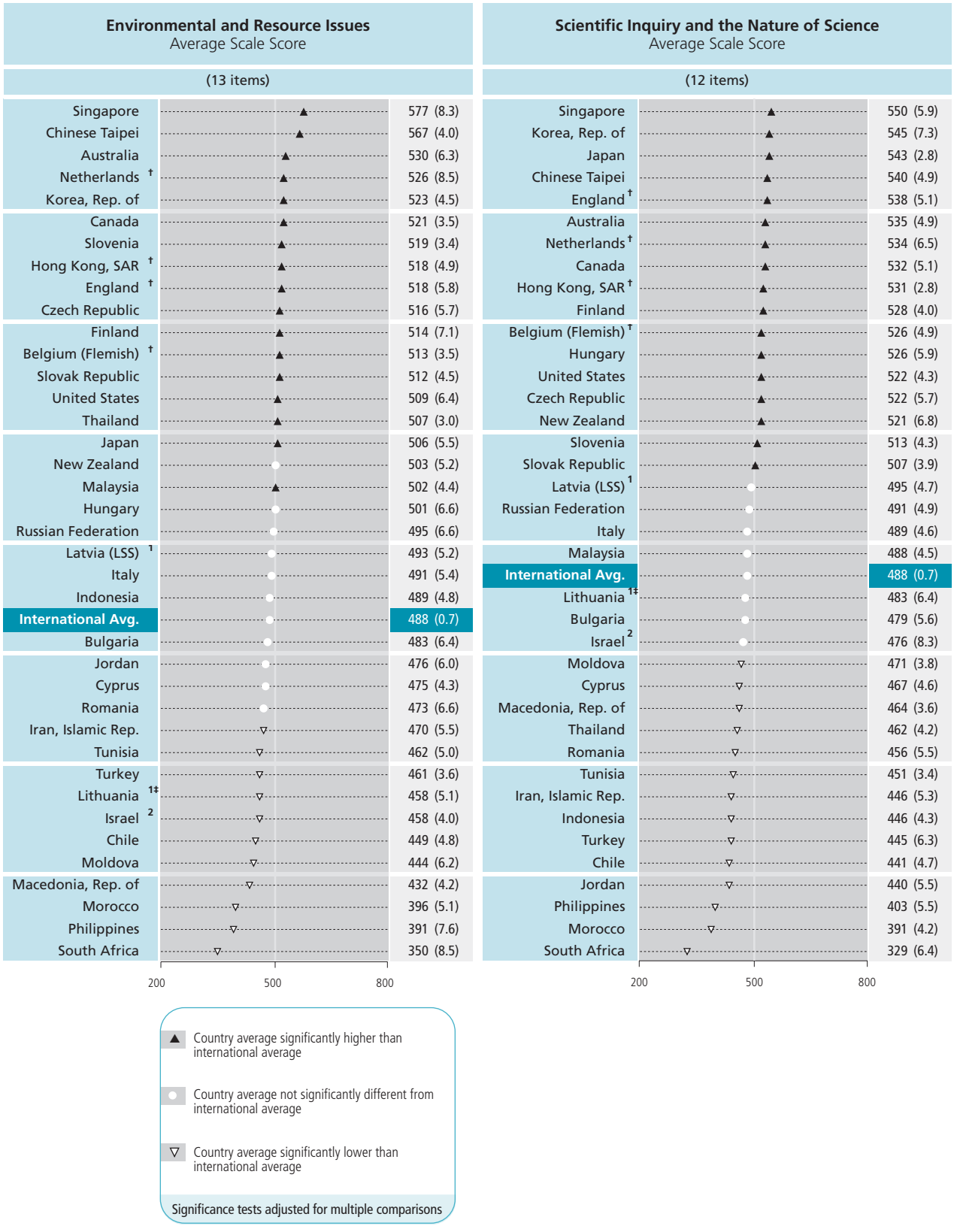
2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.5).

‡ Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year.

( ) 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), 1998-1999.



SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

In Which Content Areas Are Countries Relatively Strong or Weak?

3.2

Exhibit 3.2 profiles the relative performance in science content areas within each country, highlighting any variation in performance. For each country, Exhibit 3.2 displays the difference between average performance in each content area and average performance overall. The profiles reveal that many countries performed relatively better or worse in some content areas than in others. For example, students in Bulgaria performed relatively better in chemistry, but less well in environmental and resource issues and in scientific inquiry and the nature of science.

The profiles of relative performance show substantially more variation across the content areas in some countries than in others. For example, in Indonesia, South Africa, and Thailand, there were differences of more than 61 scale-score points (approximately two-thirds of a standard deviation) between the highest and lowest content area averages. In contrast, in countries such as Australia, Cyprus, England, Finland, Hong Kong, Israel, Latvia (LSS), Malaysia, New Zealand, and the Philippines, the difference in average achievement across content areas was 25 scale-score points or less.

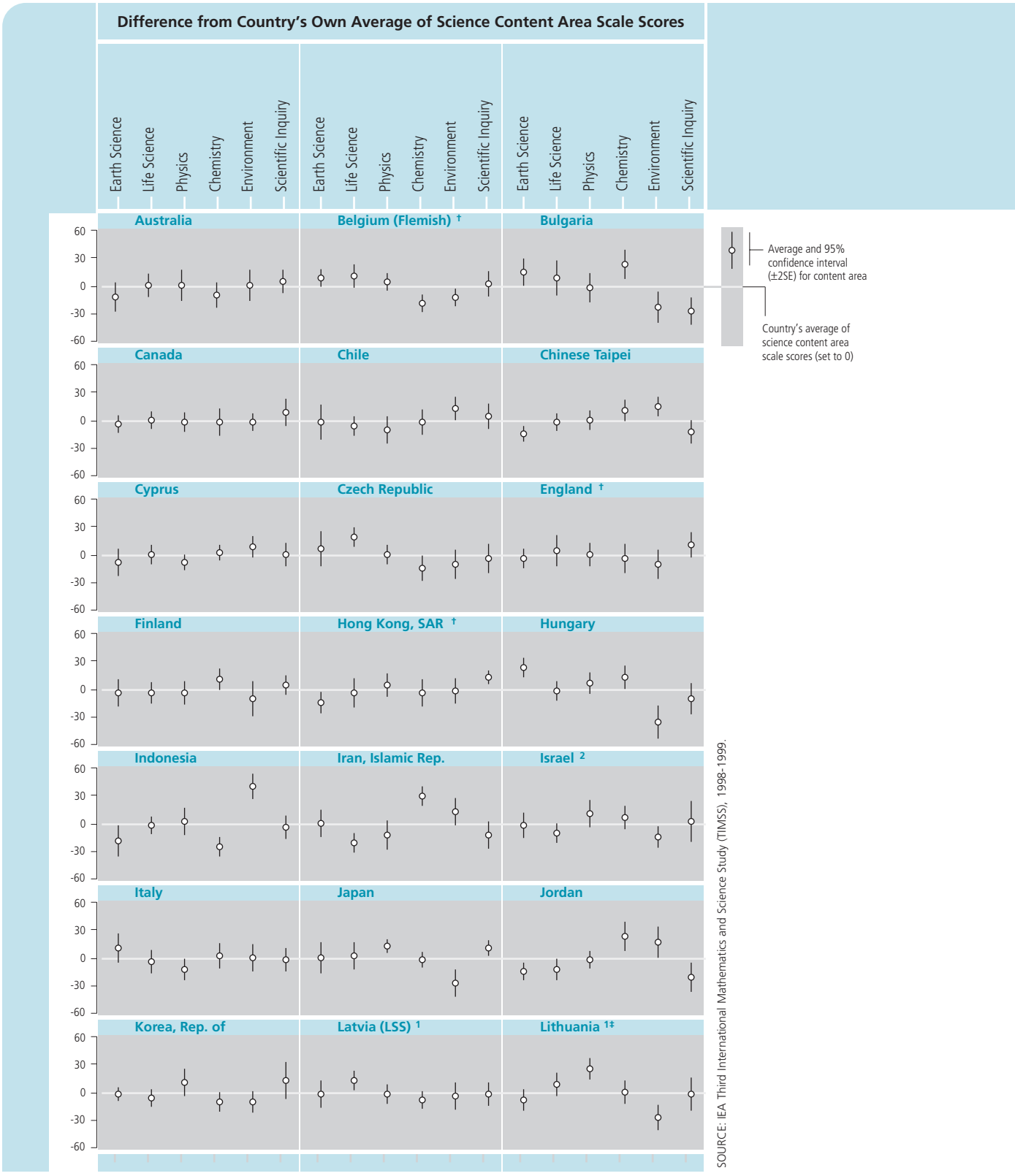
Across countries, earth science, life science, and physics were the content areas that least often featured either relatively strong or weak performance. In comparison, relatively stronger or weaker performance in chemistry, environmental and resource issues, and scientific inquiry and the nature of science were observed for a larger number of countries. Of the eight countries in which performance in chemistry was relatively strong, five were countries where the sciences were taught as separate subjects (generally earth science, biology, physics, and chemistry) by the eighth grade. These countries were Bulgaria, Chinese Taipei, Finland, Hungary, and Macedonia. In contrast, student performance was relatively lower in environmental and resource issues among several separate science countries, including Bulgaria, Hungary, Lithuania, Macedonia, and the Russian Federation.

Several high-performing countries had relatively better performance in some content areas than in others. For example, Hungarian students were relatively stronger in earth science and weaker in environmental and resource issues, while students in Chinese Taipei showed the opposite pattern in these subjects. In some countries, the relatively poorer performance in a particular content area may be at least partially accounted for by curricular differences. For example, Chinese Taipei does not teach earth science until ninth grade, while Hungary teaches science as separate subjects (geography, biology, physics, and chemistry) at the

eighth grade (see Exhibit 5.1). Students in Singapore had relatively higher performance in physics and environmental and resource issues, and relatively lower performance in earth science. In contrast, students in Japan had lower performance in environmental and resource issues than in other science content areas.

Exhibit 3.2 Overleaf

Exhibit 3.2 Profiles of Relative Performance in Science Content Areas



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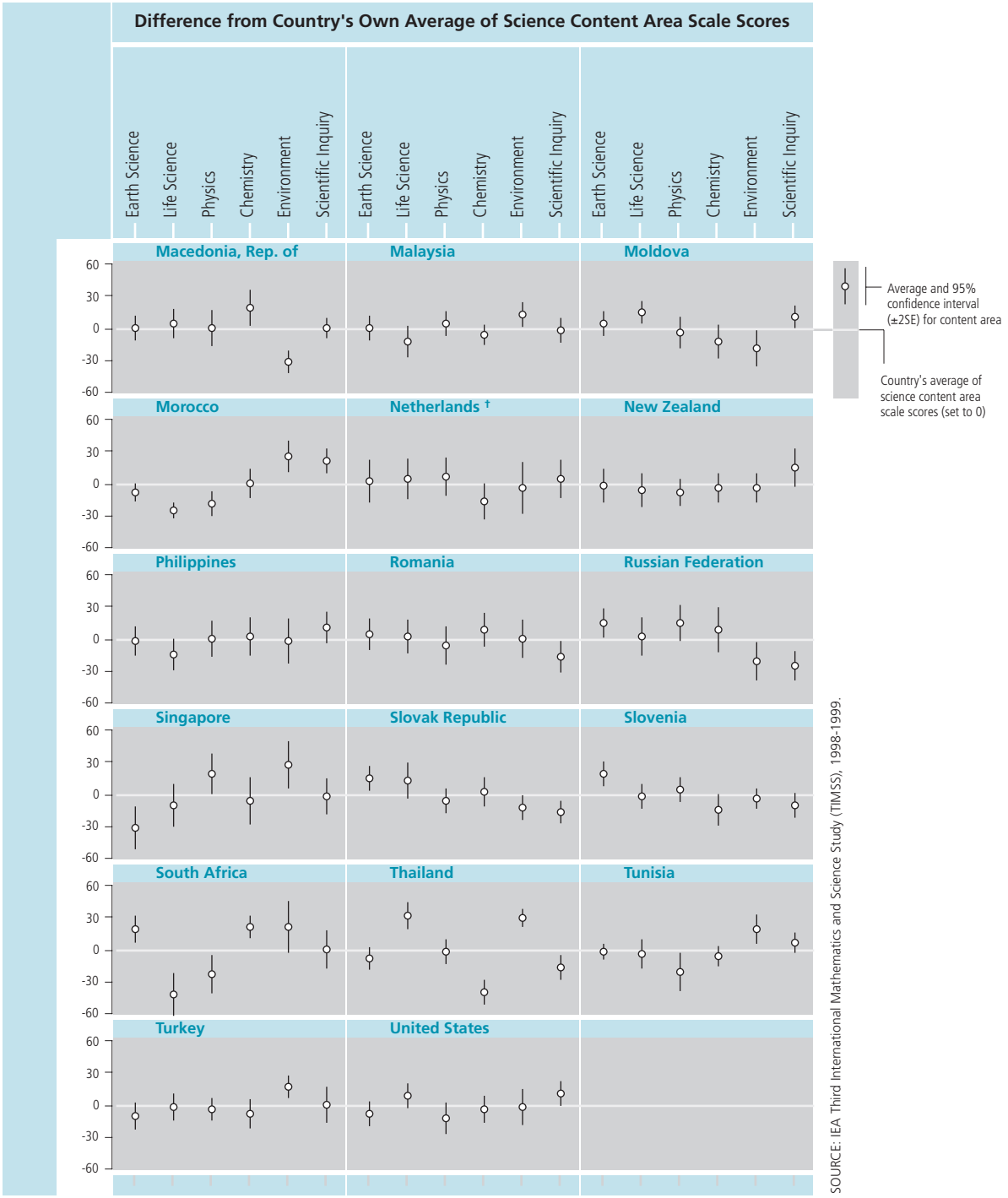

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

What Are the Gender Differences in Achievement for the Content Areas?

3.3

The average achievement in science content areas by gender is shown in Exhibit 3.3. In two content areas, life science and scientific inquiry and the nature of science, there were no statistically significant gender differences, either across all countries or within each country. However, boys outperformed girls on average internationally in each of the other content areas. The gender difference was greatest in physics, in which boys scored higher than girls by 21 scale-score points on average internationally; in 12 countries boys performed significantly higher than girls. The next largest gender difference was in earth science, in which boys outperformed girls by 17 scale-score points on average internationally; in six countries boys performed significantly higher than girls.

An important stage of item selection for the TIMSS 1995 and TIMSS 1999 tests was the examination of item statistics to detect items that differentiated between groups, including girls and boys, at the country level. Such items were scrutinized and retained when there was no apparent source of gender bias. It is therefore likely that the absence of significant gender differences in the averages for girls and boys in a country is due partly to a balance between items on which one or the other gender tends to perform better. It is also reasonable to assume that where significant differences do occur, they result from gender differences in one or more of those factors in student backgrounds and schooling that have consistently been found to affect achievement in science.

On average across countries, boys had higher achievement than girls in earth science, physics, chemistry, and environmental and resource issues. Although not statistically significant, the average performance for boys in life science exceeded that for girls in 20 of the 38 countries, whereas in scientific inquiry and the nature of science the girls had higher averages than boys in 24 countries. Even though the differences were not statistically significant, it is also interesting to note that in Jordan girls registered a slightly higher average achievement than boys in all content areas.

The patterns in the performance of girls and boys found in TIMSS 1999 are consistent with previous IEA science assessments. Girls tended to perform about the same as boys in life science in both TIMSS 1995 and the Second International Science Study (SISS),[3] while boys were markedly stronger in earth science, physics, and chemistry.

3 Postlethwaite T.N. and Wiley, D.E. (1992), *The IEA Study of Science II: Science Achievement in Twenty-Three Countries*, New York: Pergamon Press; Beaton, A.E., Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Smith, T.A and Kelly, D.L. (1996a), *Science Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS)*, Chestnut Hill, MA: Boston College.

Exhibit 3.3 Overleaf

Exhibit 3.3 Average Achievement in Science Content Areas by Gender

	Average Scale Scores for Science Content Areas					
	Earth Science		Life Science		Physics	
	Girls	Boys	Girls	Boys	Girls	Boys
Australia	507 (6.0)	532 (10.9)	531 (6.1)	529 (6.1)	519 (8.2)	542 (6.7)
Belgium (Flemish) †	521 (5.7)	544 (8.1)	530 (5.9)	539 (8.1)	521 (4.1)	539 (7.3)
Bulgaria	514 (6.3)	525 (7.3)	515 (8.6)	513 (7.9)	495 (6.8)	515 (6.9)
Canada	510 (8.6)	528 (3.0)	523 (5.0)	523 (4.6)	512 (4.3)	530 (4.9) ▲
Chile	420 (8.6)	451 (8.2) ▲	430 (3.6)	433 (6.4)	416 (5.9)	439 (6.8) ▲
Chinese Taipei	529 (7.4)	546 (7.0)	543 (3.8)	557 (6.5)	542 (6.6)	563 (6.8)
Cyprus	450 (6.4)	468 (6.6)	473 (4.2)	463 (5.5)	451 (5.3)	468 (2.7)
Czech Republic	513 (8.2)	554 (9.2) ▲	537 (4.8)	552 (5.7)	510 (6.2)	544 (6.8) ▲
England †	514 (6.2)	536 (6.4)	525 (6.9)	540 (7.2)	513 (5.8)	543 (5.3) ▲
Finland	517 (6.1)	523 (6.1)	520 (5.5)	520 (8.2)	508 (4.6)	532 (6.0) ▲
Hong Kong, SAR †	499 (6.1)	513 (6.2)	512 (8.6)	520 (7.4)	514 (5.8)	532 (6.0)
Hungary	545 (6.4)	574 (7.0)	534 (6.4)	536 (4.6)	529 (6.2)	556 (5.7)
Indonesia	418 (9.6)	445 (5.5)	450 (5.0)	447 (5.3)	440 (5.2)	465 (8.2)
Iran, Islamic Rep.	439 (6.9)	472 (5.7) ▲	430 (6.8)	443 (5.1)	419 (6.5)	464 (8.2) ▲
Israel [2]	462 (6.8)	481 (6.7)	463 (4.8)	463 (4.8)	475 (7.2)	493 (7.2)
Italy	493 (6.5)	512 (6.8)	482 (6.5)	494 (5.1)	469 (5.5)	490 (7.1)
Japan	527 (7.9)	539 (8.0)	532 (6.4)	536 (5.7)	537 (4.6)	552 (2.7)
Jordan	450 (4.2)	443 (5.3)	463 (6.9)	435 (5.6)	462 (4.8)	456 (6.2)
Korea, Rep. of	525 (4.0)	539 (4.2)	520 (5.6)	536 (3.3)	534 (6.5)	553 (5.7)
Latvia (LSS) [1]	488 (6.6)	504 (6.4)	511 (4.0)	507 (5.5)	481 (3.9)	510 (5.0) ▲
Lithuania [1‡]	465 (7.4)	488 (5.2)	492 (6.7)	496 (5.3)	496 (6.3)	525 (6.0)
Macedonia, Rep. of	460 (7.1)	467 (5.0)	472 (5.1)	463 (7.7)	455 (7.0)	471 (5.9) ▲
Malaysia	485 (5.1)	497 (5.2)	477 (9.5)	481 (6.1)	484 (4.6)	506 (7.5)
Moldova	461 (4.2)	471 (6.4)	476 (5.5)	478 (6.8)	446 (6.8)	470 (8.9)
Morocco	359 (4.1)	365 (3.6)	347 (3.9)	347 (3.5)	339 (6.3)	361 (5.2)
Netherlands †	525 (8.5)	544 (10.2)	535 (9.6)	537 (7.8)	524 (6.6)	550 (7.7) ▲
New Zealand	499 (8.6)	510 (7.9)	506 (6.4)	496 (7.7)	494 (4.9)	504 (6.4)
Philippines	391 (6.1)	388 (6.2)	390 (7.0)	364 (6.6)	389 (7.6)	397 (6.6)
Romania	471 (7.0)	479 (6.2)	476 (7.0)	473 (7.0)	460 (8.3)	469 (6.4)
Russian Federation	518 (7.4)	541 (6.3)	513 (8.6)	522 (7.6)	518 (7.3)	542 (7.5)
Singapore	510 (7.0)	532 (9.9)	536 (7.9)	546 (9.8)	557 (6.9)	581 (8.4)
Slovak Republic	523 (5.1)	551 (6.4) ▲	532 (6.9)	537 (7.4)	505 (5.4)	530 (5.4) ▲
Slovenia	535 (6.4)	547 (5.8)	522 (5.4)	520 (6.5)	514 (4.5)	538 (7.3)
South Africa	338 (4.7)	359 (6.3) ▲	289 (10.3)	290 (11.4)	291 (9.1)	328 (6.7) ▲
Thailand	469 (4.4)	472 (4.7)	511 (4.9)	505 (4.8)	470 (4.7)	480 (5.6)
Tunisia	430 (6.1)	454 (7.3)	437 (6.1)	446 (4.5)	412 (8.9)	438 (4.4) ▲
Turkey	431 (6.6)	438 (7.6)	452 (6.1)	438 (5.1)	438 (8.6)	444 (6.3)
United States	490 (5.2)	518 (5.5) ▲	518 (4.4)	522 (5.0)	488 (6.7)	509 (6.8)
International Avg.	479 (1.1)	496 (1.1) ▲	487 (1.0)	488 (1.1)	477 (1.0)	498 (1.1) ▲

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

▲ Significantly higher than other gender

Significance tests adjusted for multiple comparisons

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.8).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.5). 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 Exhibit A.5).

‡ Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of next school year.

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

	Average Scale Scores for Science Content Areas					
	Chemistry		Enviromental and Resource Issues		Scientific Inquiry and the Nature of Science	
	Girls	Boys	Girls	Boys	Girls	Boys
Australia	504 (5.6)	536 (7.5) ▲	521 (7.0)	540 (9.0)	540 (8.3)	529 (3.9)
Belgium (Flemish) †	500 (6.6)	515 (6.4)	503 (5.3)	523 (8.1)	528 (5.7)	524 (7.2)
Bulgaria	521 (5.9)	533 (6.8)	474 (8.8)	493 (9.8)	482 (5.7)	476 (8.1)
Canada	512 (6.3)	531 (7.4)	514 (4.8)	529 (6.0)	535 (5.4)	530 (5.3)
Chile	423 (8.0)	447 (5.1)	439 (6.8)	460 (6.0)	439 (8.6)	442 (7.6)
Chinese Taipei	555 (4.1)	571 (8.3)	555 (6.7)	579 (4.9)	544 (5.3)	537 (5.4)
Cyprus	461 (4.9)	478 (3.6)	470 (5.1)	481 (4.5)	474 (4.7)	461 (6.2)
Czech Republic	492 (6.7)	532 (8.8) ▲	502 (5.8)	530 (7.1) ▲	524 (4.9)	519 (8.9)
England †	503 (6.8)	543 (6.6) ▲	503 (7.5)	532 (5.6) ▲	536 (5.7)	540 (8.3)
Finland	526 (4.2)	544 (6.6)	513 (11.2)	515 (5.5)	532 (5.4)	524 (7.1)
Hong Kong, SAR †	508 (8.3)	522 (4.5)	510 (5.4)	526 (6.2)	535 (3.2)	527 (4.0)
Hungary	534 (6.8)	563 (5.9) ▲	488 (8.7)	515 (7.1)	522 (5.9)	531 (7.0)
Indonesia	418 (5.1)	433 (4.2)	486 (5.8)	492 (6.1)	449 (8.2)	442 (5.0)
Iran, Islamic Rep.	475 (6.4)	495 (4.1)	461 (7.6)	477 (6.7)	439 (3.8)	451 (7.9)
Israel 2	471 (6.7)	488 (8.6)	454 (5.8)	462 (6.6)	475 (10.4)	477 (8.5)
Italy	485 (7.0)	501 (5.1)	482 (6.4)	499 (4.9) ▲	486 (5.4)	492 (5.8)
Japan	522 (5.0)	537 (2.7)	500 (8.6)	511 (5.9)	546 (6.3)	540 (5.9)
Jordan	490 (6.3)	477 (6.8)	484 (6.9)	470 (8.5)	451 (5.4)	431 (8.0)
Korea, Rep. of	515 (9.1)	532 (5.5)	516 (3.0)	529 (7.5)	547 (10.1)	544 (6.5)
Latvia (LSS) 1	479 (4.6)	501 (5.0) ▲	487 (4.8)	500 (7.5)	495 (5.9)	495 (8.4)
Lithuania 1‡	475 (4.9)	496 (7.1)	444 (6.6)	474 (7.4)	486 (6.0)	479 (8.0)
Macedonia, Rep. of	481 (8.2)	480 (8.0)	430 (6.0)	434 (4.3)	463 (5.0)	465 (5.5)
Malaysia	482 (7.8)	488 (6.7)	501 (5.4)	503 (8.8)	485 (6.4)	492 (7.4)
Moldova	447 (6.2)	456 (6.1)	440 (8.3)	449 (9.7)	467 (6.2)	476 (7.1)
Morocco	372 (8.7)	371 (4.3)	394 (6.9)	397 (4.9)	390 (6.5)	391 (5.9)
Netherlands †	505 (7.3)	526 (7.5)	517 (10.4)	536 (9.0)	539 (8.8)	530 (9.1)
New Zealand	497 (7.6)	509 (6.3)	499 (6.7)	506 (6.6)	530 (6.6)	513 (11.4)
Philippines	396 (6.4)	392 (10.2)	397 (7.4)	383 (10.1)	412 (6.0)	393 (6.8)
Romania	480 (9.0)	482 (6.6)	473 (6.8)	473 (8.1)	457 (6.8)	455 (6.9)
Russian Federation	516 (9.9)	531 (7.6)	490 (7.5)	499 (9.5)	491 (4.3)	491 (9.5)
Singapore	535 (9.8)	554 (11.3)	570 (10.1)	584 (11.5)	552 (6.5)	548 (6.6)
Slovak Republic	514 (5.1)	536 (5.9) ▲	504 (7.0)	520 (5.0)	509 (6.0)	506 (8.0)
Slovenia	502 (6.3)	516 (9.4)	508 (6.9)	531 (7.7)	516 (4.4)	509 (6.4)
South Africa	342 (4.3)	359 (5.6)	341 (8.8)	359 (10.4)	321 (6.3)	339 (9.0)
Thailand	435 (5.3)	444 (6.8)	507 (4.2)	506 (4.6)	463 (6.7)	461 (6.3)
Tunisia	428 (4.3)	452 (6.8)	451 (4.9)	474 (6.0) ▲	448 (6.6)	454 (5.5)
Turkey	436 (5.5)	437 (6.1)	457 (6.7)	464 (7.0)	452 (8.2)	441 (5.8)
United States	495 (6.1)	520 (7.0)	500 (7.0)	519 (9.6)	521 (5.4)	523 (6.2)
International Avg.	480 (1.1)	495 (1.1) ▲	481 (1.1)	494 (1.2) ▲	489 (1.0)	486 (1.2)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

▲ Significantly higher than other gender

Significance tests adjusted for multiple comparisons

What Changes Have Occurred in Content Area Achievement?

3.4

To examine changes in achievement in the science content areas, Exhibit 3.4 shows the average percent correct for eighth-grade students in 1995 and 1999 for items given in both the 1995 and 1999 TIMSS assessments, and the difference in performance between assessments. Data are presented for the four content areas of earth science, life science, physics, and chemistry.[4] This content area trend analysis uses average percent correct rather than average scale score because there were insufficient items to reliably link the results for both assessments to the TIMSS scale.

Changes in average achievement at a national level are not easy to bring about and inevitably take place over several years. Amending official curricula, producing relevant supporting resources, and changing teacher practice all take time, even under the most favorable conditions. TIMSS 1999 is only the second in what is expected to become a series of international surveys designed to reveal trends in achievement in mathematics and science. It is not surprising, therefore, that the trend data contained in Exhibit 3.4 reveal only a few significant changes in average achievement in the content areas. It is likely that the next TIMSS administration scheduled for 2003 will show more significant changes in achievement.

Still, even during the four years between 1995 and 1999, statistically significant improvements occurred for Canada in all four content areas and for Hungary and Latvia (LSS) in two content areas. The Slovak Republic increased significantly in life science but decreased significantly in physics. Hong Kong and Japan showed significant increases in earth science and Slovenia showed a decrease. Cyprus increased in physics, and the Czech Republic decreased. A small but significant increase in the international average for life science, the only content area with a significant change between 1995 and 1999, may be a result of increasing emphasis on learning about plants and animals in the early grades.

4 There were insufficient items in environmental and resource issues and in scientific inquiry and the nature of science to report trends.

Exhibit 3.4 Overleaf

Exhibit 3.4 Trends in Average Percent Correct in Science Content Areas

	Average Percent Correct in Science Content Areas[1]						
	Total Science Trend Items[2] (48 items)			Earth Science Trend Items (11 items)			Life Science Trend Items (13 items)		
	1995	1999		1995	1999		1995	1999	
Australia	67 (0.6)	69 (0.7)	●	64 (0.7)	64 (0.9)	●	75 (0.6)	76 (0.7)	●
Belgium (Flemish)	69 (0.8)	69 (0.4)	●	68 (0.8)	67 (0.5)	●	76 (1.0)	77 (0.5)	●
Bulgaria	74 (0.9)	72 (0.8)	●	70 (1.1)	68 (1.0)	●	82 (0.8)	80 (0.8)	●
Canada	65 (0.4)	68 (0.3)	▲	61 (0.6)	64 (0.5)	▲	72 (0.5)	75 (0.4)	▲
Cyprus	56 (0.4)	57 (0.3)	●	53 (0.5)	53 (0.4)	●	67 (0.6)	67 (0.5)	●
Czech Republic	74 (0.7)	72 (0.6)	●	73 (0.9)	69 (0.8)	●	84 (0.7)	83 (0.6)	●
England	68 (0.5)	70 (0.6)	●	63 (0.7)	65 (0.7)	●	75 (0.6)	77 (0.7)	●
Hong Kong, SAR	66 (0.8)	69 (0.5)	●	60 (0.8)	63 (0.5)	▲	77 (0.9)	79 (0.6)	●
Hungary	73 (0.5)	76 (0.5)	▲	74 (0.7)	76 (0.7)	●	81 (0.6)	82 (0.5)	●
Iran, Islamic Rep.	59 (0.5)	57 (0.7)	●	57 (0.6)	55 (0.7)	●	62 (0.6)	60 (0.6)	●
Italy	65 (0.7)	64 (0.8)	●	62 (0.9)	62 (1.0)	●	72 (0.8)	72 (0.8)	●
Japan	71 (0.3)	72 (0.3)	●	65 (0.4)	68 (0.4)	▲	77 (0.4)	78 (0.4)	●
Korea, Rep. of	71 (0.4)	72 (0.3)	●	70 (0.5)	71 (0.4)	●	76 (0.5)	76 (0.4)	●
Latvia (LSS)	63 (0.5)	65 (0.5)	▲	61 (0.8)	64 (0.8)	●	71 (0.7)	75 (0.6)	▲
Lithuania	62 (0.7)	65 (0.7)	●	58 (0.9)	60 (0.8)	●	68 (0.8)	71 (0.7)	●
Netherlands	71 (1.0)	71 (1.1)	●	65 (1.4)	68 (1.3)	●	81 (1.0)	81 (1.3)	●
New Zealand	64 (0.7)	63 (0.7)	●	59 (0.8)	59 (0.8)	●	70 (0.9)	70 (0.9)	●
Romania	62 (0.9)	62 (0.8)	●	61 (1.0)	60 (1.0)	●	69 (1.0)	68 (0.8)	●
Russian Federation	69 (0.8)	72 (1.1)	●	65 (0.7)	67 (1.2)	●	75 (0.8)	77 (1.1)	●
Singapore	74 (0.9)	71 (1.2)	●	64 (1.0)	61 (1.0)	●	80 (0.9)	78 (1.3)	●
Slovak Republic	70 (0.6)	71 (0.6)	●	67 (0.8)	67 (0.8)	●	76 (0.6)	84 (0.6)	▲
Slovenia	72 (0.5)	70 (0.5)	●	76 (0.6)	73 (0.6)	▼	76 (0.5)	76 (0.6)	●
United States	66 (0.7)	67 (0.6)	●	62 (0.8)	62 (0.7)	●	75 (0.8)	76 (0.8)	●
International Avg. §	68 (0.1)	68 (0.1)	●	64 (0.2)	65 (0.2)	●	75 (0.2)	76 (0.2)	▲
Countries with Unapproved Sampling Procedures at the Classroom Level in 1995									
Israel	67 (0.9)	63 (0.8)	●	61 (1.0)	57 (0.9)	●	74 (1.1)	68 (0.9)	▼
South Africa	37 (1.1)	35 (0.7)	●	34 (1.0)	34 (0.5)	●	38 (1.4)	37 (0.9)	●
Thailand	65 (0.8)	58 (0.8)	▼	63 (0.9)	52 (0.9)	▼	79 (0.7)	72 (0.8)	▼

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

▲ 1999 significantly higher than 1995

● No significant difference between 1995 and 1999

▼ 1999 significantly lower than 1995

Significance tests adjusted for multiple comparisons

1 Applies only to items that appeared on both the 1995 and 1999 assessments.

2 Environmental and Resource Issues and Scientific Inquiry and the Nature of Science scales had too few items for computing trends; however, the four items from these scales are included in the results for the total science trend.

§ International average is for countries that participated and met sampling guidelines in both 1995 and 1999.

Trend notes: Because coverage fell below 65% in 1995 and 1999, Latvia is annotated LSS for Latvian-Speaking Schools only. Lithuania tested later in 1999 than in 1995, at the beginning of the next school year. In 1995, Italy and Israel were unable to cover their International Desired Population; 1999 data are based on their comparable populations.

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

	Average Percent Correct in Science Content Areas[1]							
	Physics Trend Items (15 items)			Chemistry Trend Items (5 items)				
	1995	1999		1995	1999			
Australia	62 (0.6)	64 (0.7)	●	71 (0.9)	72 (1.0)	●		
Belgium (Flemish)	64 (0.9)	63 (0.4)	●	72 (0.8)	70 (0.5)	●		
Bulgaria	69 (1.1)	67 (0.9)	●	80 (1.4)	76 (1.1)	●		
Canada	61 (0.5)	64 (0.4)	▲	71 (0.6)	74 (0.6)	▲		
Cyprus	50 (0.4)	53 (0.4)	▲	62 (0.7)	61 (0.6)	●		
Czech Republic	68 (0.6)	65 (0.7)	▼	72 (1.0)	70 (0.9)	●		
England	65 (0.6)	65 (0.7)	●	72 (1.0)	73 (0.9)	●		
Hong Kong, SAR	62 (0.8)	64 (0.5)	●	68 (1.3)	72 (0.9)	●		
Hungary	63 (0.5)	69 (0.6)	▲	78 (0.8)	83 (0.6)	▲		
Iran, Islamic Rep.	56 (0.7)	54 (0.8)	●	66 (0.7)	64 (0.9)	●		
Italy	59 (0.7)	58 (0.9)	●	68 (1.1)	66 (1.2)	●		
Japan	69 (0.3)	69 (0.3)	●	74 (0.6)	74 (0.6)	●		
Korea, Rep. of	68 (0.4)	69 (0.4)	●	72 (0.7)	73 (0.5)	●		
Latvia (LSS)	56 (0.6)	57 (0.6)	●	62 (0.8)	68 (0.8)	▲		
Lithuania	58 (0.7)	61 (0.7)	●	68 (1.0)	70 (1.2)	●		
Netherlands	66 (0.8)	66 (1.0)	●	72 (1.2)	73 (1.2)	●		
New Zealand	59 (0.6)	58 (0.6)	●	70 (1.1)	68 (1.0)	●		
Romania	57 (1.0)	57 (0.9)	●	65 (1.1)	65 (1.2)	●		
Russian Federation	66 (1.1)	68 (1.3)	●	74 (1.4)	77 (1.3)	●		
Singapore	74 (0.8)	72 (1.0)	●	81 (1.1)	76 (1.6)	●		
Slovak Republic	65 (0.7)	62 (0.7)	▼	77 (0.8)	74 (1.0)	●		
Slovenia	65 (0.6)	63 (0.5)	●	72 (1.0)	71 (0.8)	●		
United States	61 (0.6)	62 (0.6)	●	72 (1.2)	72 (1.0)	●		
International Avg. [§]	63 (0.1)	63 (0.2)	●	71 (0.2)	71 (0.2)	●		
Countries with Unapproved Sampling Procedures at the Classroom Level in 1995								
Israel	62 (0.9)	62 (0.7)	●	73 (1.3)	69 (1.2)	●		
South Africa	37 (1.2)	34 (0.7)	●	38 (1.3)	35 (1.0)	●		
Thailand	59 (0.9)	53 (0.8)	▼	50 (1.1)	45 (1.0)	▼		

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

▲ 1999 significantly higher than 1995

● No significant difference between 1995 and 1999

▼ 1999 significantly lower than 1995

Significance tests adjusted for multiple comparisons