Chapter 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 five content areas at the eighth grade: life science, chemistry, physics, earth science, and environmental science, and for three at the fourth grade: life science, physical science, and earth science. Relative achievement is shown among the content areas for each country and results are presented by gender. Trends from 1999 are shown for the eighth grade (insufficient items are available from 1995 to report trends within content areas).

The TIMSS 2003 science assessments at the eighth and fourth grades were designed to allow as fair comparisons as possible among participating countries. Considerable effort was devoted to updating the science framework newly published in the *TIMSS Assessment Frameworks and Specifications 2003*.[1] IEA gratefully acknowledges the generous support of the US National Science Foundation in helping to fund this work, which took about two years, including a special international expert panel, iterative reviews by the NRCs, and a curriculum questionnaire completed by the countries. The effort focused on specifying

1 Mullis, I.V.S., Martin, M.O., Smith, T.A., Garden, R.A., Gregory, K.D., Gonzalez, E.J., Chrostowski, S..J, and O'Connor, K.M. (2003), *TIMSS Assessment Frameworks and Specifications 2003 (2nd Edition)*, Chestnut Hill, MA: Boston College. Please see Appendix A for more information about the framework and test development process.

the particular topics and subtopics to be assessed at each grade within each content area. Following on the framework development, also with additional funding from the US National Science Foundation, an enormous, collaborative test development effort involving the participating countries occurred at both grades to reflect the framework and its new emphasis on problem solving and inquiry. Nevertheless, curriculum data collected as part of TIMSS[2] indicate differences in the grade level at which particular topics are introduced and in the teaching emphases given some topics. In addition, within countries there can be variation among teachers in the relative emphasis given particular topics.

The TIMSS 2003 science tests were designed to enable reporting by five content areas in accordance with the TIMSS science framework. These areas, with their main topics, are:

Life science

1. Types, characteristics, and classification of living things
2. Structure, function, and life processes in organisms
3. Cells and their functions
4. Development and life cycles of organisms
5. Reproduction and heredity
6. Diversity, adaptation, and natural selection
7. Ecosystems
8. Human health.

At grade 4, cells and their functions is not included.

Chemistry

1. Classification and composition of matter
2. Particulate structure of matter
3. Properties and uses of water

2 Chapter 5 contains information about the official curriculum in each country as well as teachers' reports about the topics students have been taught. Appendix C provides an analysis of the match between the test and curriculum in different TIMSS 2003 countries and the effect of this match on the results.

4. Acids and bases
5. Chemical change.

At grade 4, chemistry is not reported separately, but combined with physics as physical science. At this grade level, the particulate structure of matter and acids and bases are not included.

Physics

1. Physical states and changes in matter
2. Energy types, sources, and conversions
3. Heat and temperature
4. Light
5. Sound and vibration
6. Electricity and magnetism
7. Forces and motion.

At grade 4, physics is not reported separately, but combined with chemistry as physical science. At this grade level, sound and vibration is not included.

Earth science

1. Earth's structure and physical features
2. Earth's processes, cycles, and history
3. Earth in the solar system and the universe.

Environmental science

1. Changes in population
2. Use and conservation of natural resources
3. Changes in environments.

Environmental science is not assessed at grade 4. However, there were a few items in the fourth-grade assessment that addressed the use and conservation of natural resources and changes in environments. These were reported as part of life science.

How Does Achievement Differ Across Science Content Areas?

Exhibit 3.1 presents average achievement in each of the five science content areas at the eighth grade and in the three content areas at the fourth grade. Countries are displayed in alphabetical order, and symbols indicate whether a country's performance is statistically significantly above or below the international average. To provide a basis of comparison for the performance of each country in each content area, the international average for each content area was scaled to be 474, the same as the overall international average.

At both grades, the countries scoring highest in the overall science assessment tended also to be the highest-scoring countries (though not always in the same rank order) in each of the major content areas. Correspondingly, countries scoring lowest on the overall test tended to have low average performance across all content areas.

At the eighth grade, the differences in average achievement between the highest- and lowest-performing countries were greatest for physics (340 scale-score points), next for life science (319), then earth science (311), chemistry (308), and environmental science (307). In contrast to the consistency in performance across content areas displayed by the higher- and lower-performing countries overall, performance varied substantially for some middle-performing countries. For example, Bulgaria performed significantly above the international average in physics and earth science, below average in environmental science, and about the international average in life science and chemistry.

At the fourth grade with fewer and less variable countries, the differences in achievement within the content areas were smaller between the highest- and lowest-performing countries. The largest

Exhibit 3.1: Average Achievement in Science Content Areas

Countries	Average Scale Scores for Science Content Areas				
	Life Science	Chemistry	Physics	Earth Science	Environmental Science
Armenia	453 (3.3) ▼	466 (4.2) ▼	479 (3.2)	460 (3.7) ▼	417 (4.4) ▼
Australia	532 (3.8) ▲	506 (3.8) ▲	521 (3.7) ▲	531 (4.2) ▲	536 (3.4) ▲
Bahrain	445 (1.9) ▼	441 (2.6) ▼	443 (2.0) ▼	440 (2.4) ▼	439 (3.1) ▼
Belgium (Flemish)	526 (2.4) ▲	503 (2.0) ▲	514 (2.5) ▲	508 (2.5) ▲	523 (2.7) ▲
Botswana	370 (2.7) ▼	348 (3.1) ▼	371 (3.2) ▼	361 (3.1) ▼	381 (3.3) ▼
Bulgaria	474 (5.2)	482 (5.7)	485 (5.0) ▲	491 (4.9) ▲	464 (5.0) ▼
Chile	427 (2.7) ▼	405 (3.3) ▼	401 (3.1) ▼	435 (3.1) ▼	436 (2.9) ▼
Chinese Taipei	563 (3.1) ▲	584 (4.0) ▲	569 (3.3) ▲	548 (3.1) ▲	560 (3.1) ▲
Cyprus	437 (2.2) ▼	443 (2.6) ▼	450 (1.7) ▼	447 (2.1) ▼	441 (2.3) ▼
Egypt	425 (3.7) ▼	442 (3.8) ▼	414 (4.1) ▼	403 (4.4) ▼	430 (4.0) ▼
Estonia	547 (2.4) ▲	552 (2.1) ▲	544 (2.4) ▲	558 (2.9) ▲	540 (2.2) ▲
Ghana	256 (5.6) ▼	276 (6.6) ▼	239 (5.4) ▼	254 (5.6) ▼	267 (6.2) ▼
† Hong Kong, SAR	551 (2.9) ▲	542 (2.6) ▲	555 (2.8) ▲	549 (2.9) ▲	555 (2.6) ▲
Hungary	536 (2.7) ▲	560 (3.1) ▲	536 (2.7) ▲	537 (3.1) ▲	528 (2.9) ▲
1 Indonesia	424 (3.9) ▼	391 (3.8) ▼	430 (4.0) ▼	431 (3.8) ▼	454 (3.4) ▼
Iran, Islamic Rep. of	447 (2.6) ▼	445 (2.7) ▼	445 (3.0) ▼	468 (2.9) ▼	487 (2.1) ▲
2 Israel	491 (3.0) ▲	499 (3.4) ▲	484 (2.9) ▲	485 (3.0) ▲	486 (2.9) ▲
Italy	498 (3.2) ▲	487 (3.3) ▲	470 (3.2)	513 (3.2) ▲	497 (3.0) ▲
Japan	549 (2.0) ▲	552 (2.1) ▲	564 (1.9) ▲	530 (2.1) ▲	537 (2.0) ▲
Jordan	475 (4.0)	478 (4.4)	465 (3.8) ▼	472 (4.0)	492 (3.2) ▲
◆◆ Korea, Rep. of	558 (1.6) ▲	529 (2.5) ▲	579 (1.6) ▲	540 (1.9) ▲	544 (1.4) ▲
Latvia	511 (2.5) ▲	514 (3.2) ▲	512 (2.4) ▲	514 (2.8) ▲	508 (3.3) ▲
Lebanon	360 (5.0) ▼	433 (4.9) ▼	419 (4.0) ▼	395 (4.0) ▼	374 (5.1) ▼
1 Lithuania	517 (2.4) ▲	534 (2.3) ▲	519 (2.7) ▲	512 (2.7) ▲	507 (2.0) ▲
2 Macedonia, Rep. of	448 (3.8) ▼	467 (3.9) ▼	458 (3.1) ▼	440 (4.3) ▼	442 (3.7) ▼
Malaysia	504 (3.7) ▲	514 (3.8) ▲	519 (3.6) ▲	502 (3.8) ▲	513 (3.2) ▲
Moldova, Rep. of	466 (3.7) ▼	479 (3.9)	479 (3.7)	475 (4.0)	454 (3.8) ▼
1 ‡ Morocco	390 (2.6) ▼	402 (2.7) ▼	410 (2.7) ▼	397 (3.4) ▼	396 (3.3) ▼
† Netherlands	536 (3.3) ▲	514 (2.6) ▲	538 (3.4) ▲	534 (3.2) ▲	539 (2.8) ▲
New Zealand	523 (5.1) ▲	501 (5.6) ▲	515 (4.7) ▲	525 (4.8) ▲	525 (3.9) ▲
Norway	496 (2.5) ▲	485 (3.0) ▲	488 (2.6) ▲	517 (2.7) ▲	496 (2.2) ▲
Palestinian Nat'l Auth.	435 (3.6) ▼	444 (3.9) ▼	432 (3.6) ▼	439 (3.0) ▼	444 (3.7) ▼
Philippines	387 (5.8) ▼	342 (6.1) ▼	380 (4.7) ▼	377 (5.7) ▼	403 (5.4) ▼
Romania	471 (4.8)	474 (4.9)	473 (4.1)	469 (5.2)	472 (4.7)
Russian Federation	514 (3.3) ▲	527 (4.0) ▲	511 (3.4) ▲	518 (3.3) ▲	491 (3.2) ▲
Saudi Arabia	412 (3.9) ▼	382 (4.8) ▼	394 (3.9) ▼	394 (4.0) ▼	410 (3.8) ▼
† Scotland	512 (3.3) ▲	499 (3.2) ▲	515 (3.0) ▲	515 (3.8) ▲	511 (3.5) ▲
1 Serbia	468 (2.6) ▼	474 (3.2)	471 (2.6)	471 (3.0)	457 (2.4) ▼
Singapore	569 (4.0) ▲	582 (4.2) ▲	579 (3.4) ▲	549 (3.9) ▲	568 (3.8) ▲
Slovak Republic	514 (2.9) ▲	519 (3.6) ▲	519 (2.9) ▲	523 (3.3) ▲	509 (2.8) ▲
Slovenia	521 (2.2) ▲	532 (2.6) ▲	509 (1.8) ▲	523 (2.2) ▲	515 (2.2) ▲
South Africa	250 (6.0) ▼	285 (5.9) ▼	244 (6.2) ▼	247 (6.3) ▼	261 (6.6) ▼
Sweden	528 (2.7) ▲	526 (2.6) ▲	525 (2.9) ▲	532 (3.3) ▲	499 (2.6) ▲
Tunisia	417 (2.0) ▼	413 (2.5) ▼	386 (2.5) ▼	408 (2.0) ▼	436 (2.2) ▼
‡ United States	537 (3.0) ▲	513 (3.2) ▲	515 (2.9) ▲	532 (2.9) ▲	533 (2.9) ▲
‡ England	543 (3.9) ▲	527 (4.2) ▲	545 (3.5) ▲	544 (4.1) ▲	540 (4.2) ▲
International Avg.	474 (0.5)	474 (0.5)	474 (0.5)	474 (0.5)	474 (0.5)
Benchmarking Participants					
Basque Country, Spain	492 (2.6) ▲	472 (3.1)	483 (3.4) ▲	506 (2.9) ▲	494 (2.7) ▲
Indiana State, US	540 (4.5) ▲	516 (5.4) ▲	516 (4.4) ▲	536 (5.2) ▲	538 (4.0) ▲
Ontario Province, Can.	537 (2.9) ▲	507 (3.0) ▲	530 (3.1) ▲	533 (3.2) ▲	542 (2.4) ▲
Quebec Province, Can.	525 (3.2) ▲	517 (2.8) ▲	524 (2.6) ▲	550 (2.8) ▲	531 (2.9) ▲

▲ Country average significantly higher than international average

▼ Country average significantly lower than international average

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, 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's Trends in International Mathematics and Science Study (TIMSS) 2003

Exhibit 3.1 Average Achievement in Science Content Areas

Countries	Average Scale Scores for Science Content Areas		
	Life Science	Physical Science	Earth Science
Armenia	435 (4.4) ▼	429 (4.3) ▼	450 (3.6) ▼
† Australia	523 (3.8) ▲	518 (3.9) ▲	518 (4.1) ▲
Belgium (Flemish)	524 (1.7) ▲	507 (2.3) ▲	522 (1.7) ▲
Chinese Taipei	540 (1.6) ▲	554 (2.0) ▲	559 (2.6) ▲
Cyprus	482 (2.1) ▼	479 (2.3) ▼	487 (2.5)
† England	532 (3.1) ▲	546 (3.2) ▲	535 (3.5) ▲
† Hong Kong, SAR	535 (2.6) ▲	548 (2.7) ▲	536 (2.7) ▲
Hungary	536 (2.5) ▲	526 (2.7) ▲	526 (3.7) ▲
Iran, Islamic Rep. of	424 (4.6) ▼	419 (4.5) ▼	428 (3.0) ▼
Italy	521 (3.5) ▲	512 (3.5) ▲	519 (3.7) ▲
Japan	530 (1.3) ▲	557 (1.7) ▲	535 (1.9) ▲
Latvia	531 (2.3) ▲	532 (2.6) ▲	534 (2.9) ▲
1 Lithuania	516 (2.0) ▲	512 (2.5) ▲	503 (3.2) ▲
Moldova, Rep. of	504 (3.9) ▲	489 (3.9)	505 (4.9) ▲
Morocco	300 (6.1) ▼	308 (7.0) ▼	311 (6.1) ▼
† Netherlands	547 (1.8) ▲	505 (1.9) ▲	503 (2.3) ▲
New Zealand	520 (2.3) ▲	516 (2.3) ▲	522 (2.3) ▲
Norway	480 (2.2) ▼	456 (2.3) ▼	473 (2.8) ▼
Philippines	330 (9.0) ▼	343 (9.6) ▼	324 (9.2) ▼
Russian Federation	526 (4.7) ▲	527 (5.2) ▲	527 (6.0) ▲
† Scotland	506 (3.1) ▲	503 (2.6) ▲	498 (2.6) ▲
Singapore	558 (5.0) ▲	577 (5.9) ▲	538 (5.2) ▲
Slovenia	489 (2.9)	497 (2.3) ▲	490 (2.7)
Tunisia	290 (5.9) ▼	324 (5.3) ▼	336 (4.8) ▼
† United States	537 (2.2) ▲	531 (2.3) ▲	535 (2.5) ▲
International Avg.	489 (0.7)	489 (0.8)	489 (0.8)
Benchmarking Participants			
Indiana State, US	554 (2.9) ▲	546 (3.5) ▲	552 (3.6) ▲
Ontario Province, Can.	541 (3.6) ▲	537 (3.5) ▲	539 (3.8) ▲
Quebec Province, Can.	503 (2.2) ▲	497 (2.4) ▲	507 (2.7) ▲

▲ Country average significantly higher than international average

▼ Country average significantly lower than international average

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

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

difference – 269 scale-score points – was in physical science. For the other two content areas, the differences were 268 for life science, and 248 for earth science.

In Appendix B, Exhibits B.1 through B.5 for the eighth grade and Exhibits B.6 through B.8 for the fourth grade 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.

In Which Content Areas Are Countries Relatively Strong or Weak?

To highlight relative strengths and weaknesses within each country, Exhibit 3.2 profiles the relative average achievement in science content areas within each country at the eighth and fourth grades. For each country, Exhibit 3.2 displays the difference between average performance in each content area and average performance overall. The profiles reveal that at the eighth grade, many countries performed relatively better or worse in one or more content areas than they did overall. For example, it can be seen that Armenia performed relatively worse in environmental science than in the other four content areas. With just three content areas at the fourth grade, there also were fewer performance differences between the content areas. One example, however, is the Netherlands, which performed relatively better in life science than in physical science or earth science.

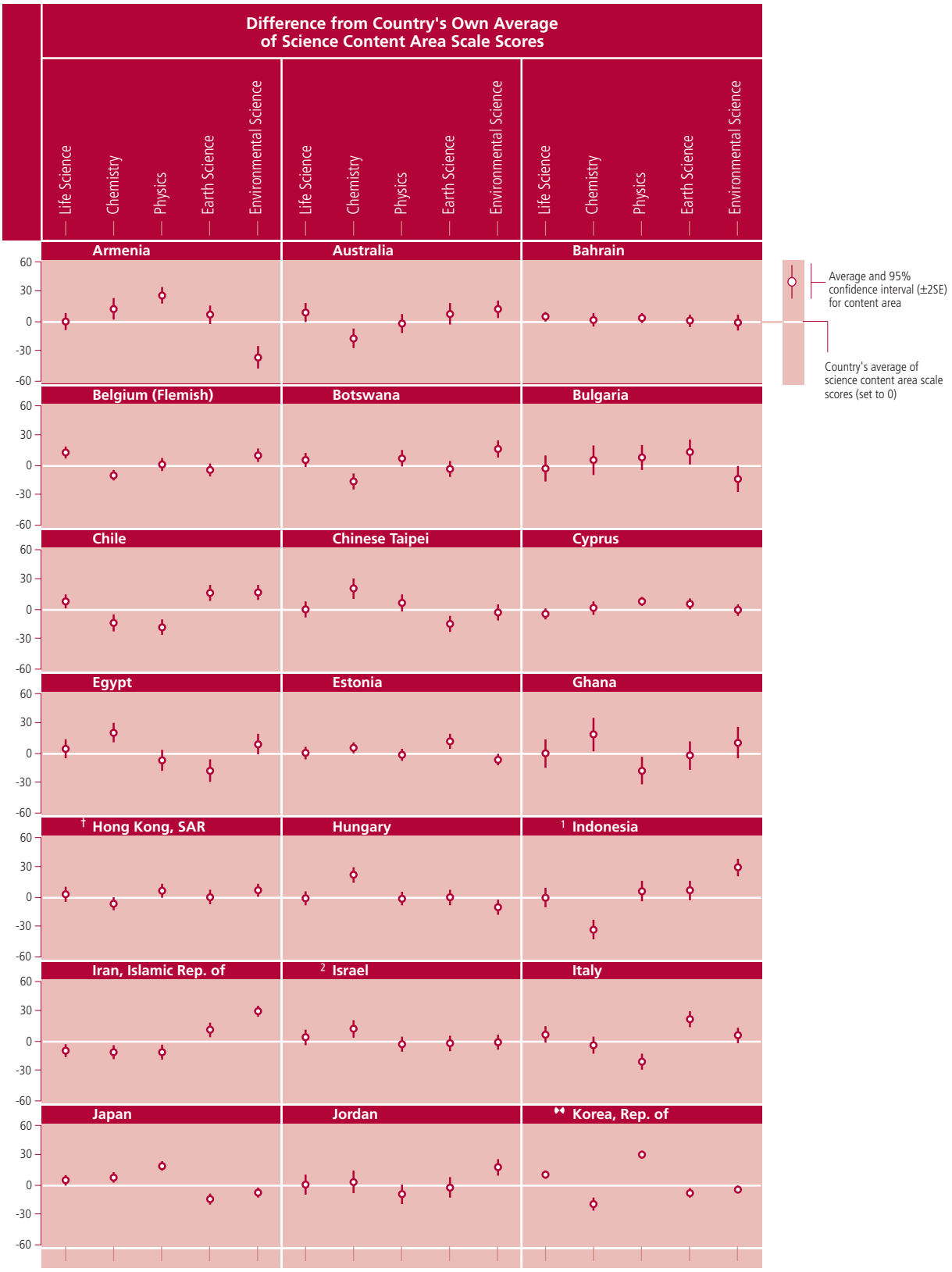
Differences in relative performance may be related to one or more factors, such as emphases in intended curricula or widely used textbooks, strengths or weaknesses in curriculum implementation, and the grade level at which topics are introduced. Differences in the match between the implemented curriculum and content measured by the test may also be a factor.

The profiles of relative performance reveal more variation across the content areas in some countries than in others. Average

achievement across content areas showed considerable variation in some countries. For example, at the eighth grade, variation of 60 or more scale-score points (one area at least 30 above and one 30 below) was found in Lebanon, the Philippines, and Indonesia. On the other hand, there were only a small number of scale points of difference between highest and lowest content area means in some countries at the eighth grade, with good examples being Latvia, Romania, Bahrain, and Cyprus. For the latter group of countries, the TIMSS 2003 data indicate a greater balance in science content covered through the grades. At the fourth grade, no countries had differences as large as 60 points, even though several had a particular strength or weakness. Generally, countries had comparable levels of performance across the three fourth-grade content areas.

Exhibit 3.2: Profiles of Within-Country Relative Performance in Science Content Areas
(Continued...)

SCIENCE Grade 8



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

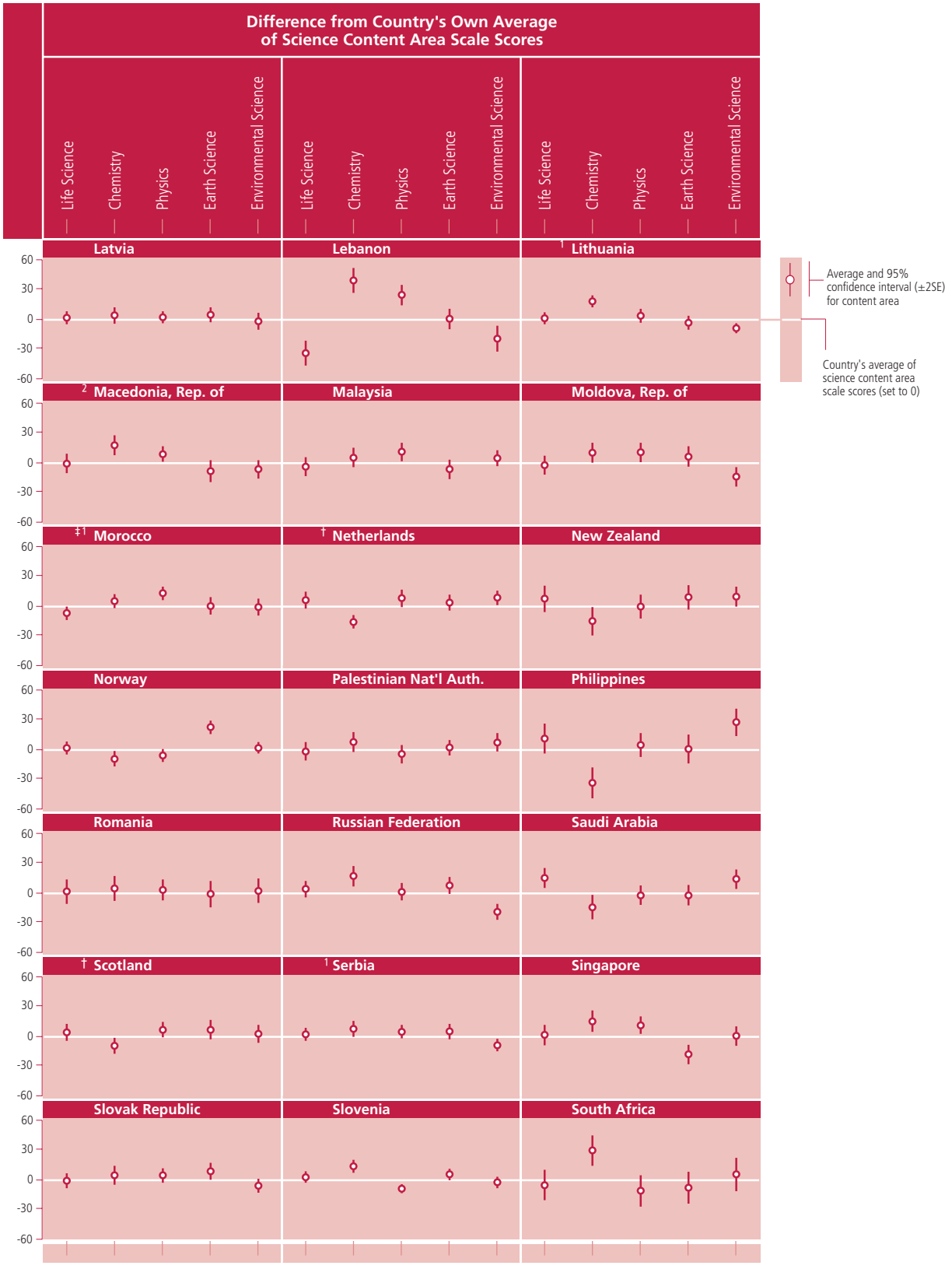
† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, at the beginning of the next school year.

Exhibit 3.2: Profiles of Within-Country Relative Performance in Science Content Areas
(...Continued)



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

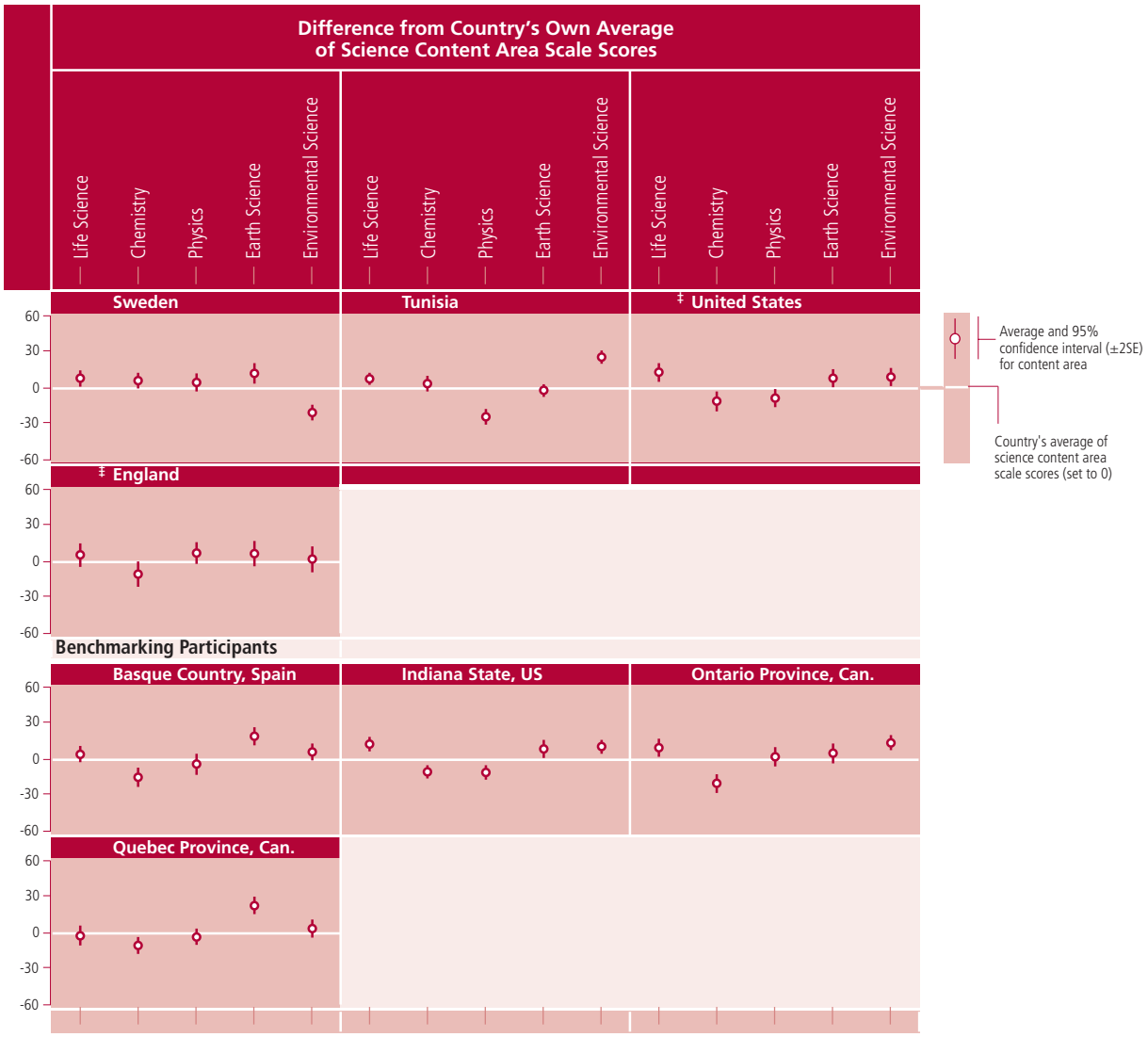
† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

Exhibit 3.2: Profiles of Within-Country Relative Performance in Science Content Areas

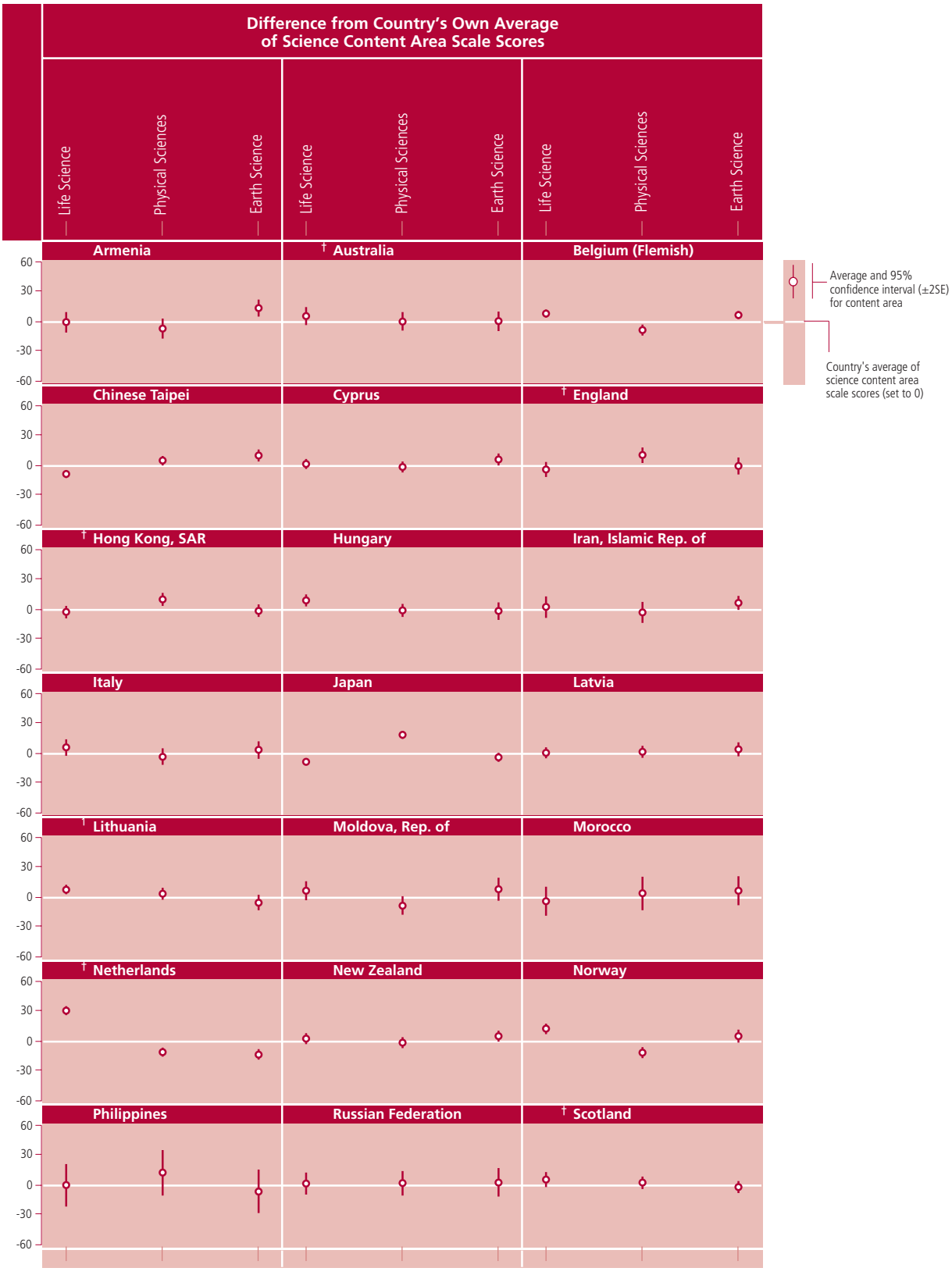


SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

Exhibit 3.2: Profiles of Within-Country Relative Performance in Science Content Areas

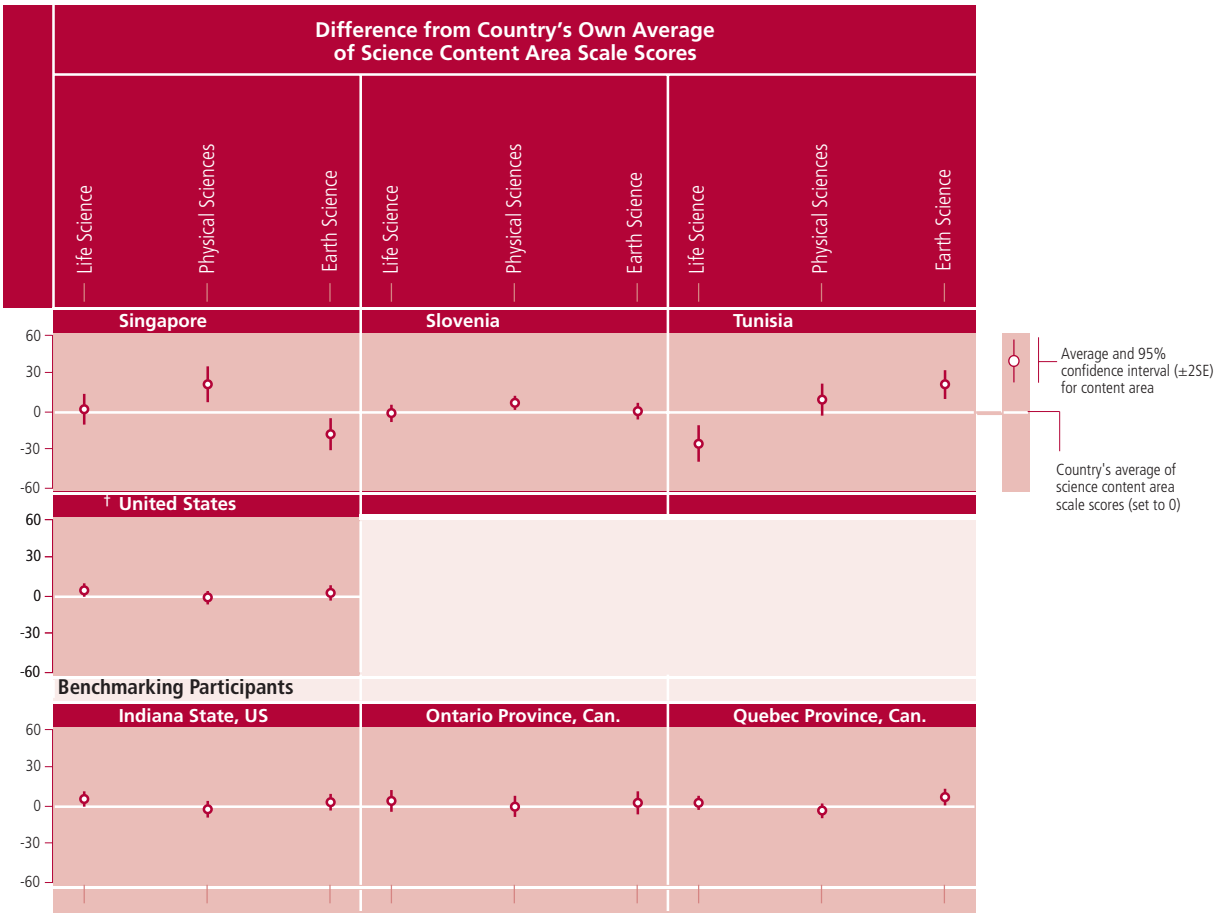


SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

Exhibit 3.2: Profiles of Within-Country Relative Performance in Science Content Areas



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

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

Exhibit 3.3 displays average achievement in science content areas by gender for the eighth and fourth grades. Perhaps not surprising in view of the gender differences favoring boys in overall science eighth-grade achievement described in chapter 1, boys outperformed girls on average in four of the five content areas at this grade level. The most striking results were the large number of significant differences favoring boys in earth science and in physics.[3] In earth science, boys had higher average achievement than the girls in 34 countries and all four benchmarking participants whereas the girls had higher achievement in only 2 countries. On average internationally, the boys had an advantage of 16 points. In physics, boys had higher average achievement than the girls in 30 countries and 4 benchmarking participants compared to the girls having higher achievement in only 4 countries. The overall difference was 12 points higher for boys, on average. In environmental science, with a 4-point advantage on average, boys performed significantly higher in 20 countries and 2 benchmarking entities and girls in 7 countries. Although there was no difference in average performance in chemistry, boys performed better than girls in 12 countries and all 4 benchmarking participants whereas girls did better in just 8 countries. The most even gender balance was in life science, where girls outperformed boys by 3 points on average, and had higher average achievement in about the same number of countries – girls outperformed boys in 13 countries; boys outperformed girls in 12 countries. For each TIMSS assessment, examining item statistics to detect any gender bias is an important stage of item selection. It is therefore reasonable to assume that where significant differences do occur, they result from differences in performance rather than problem situations favoring one gender or the other.

At the fourth grade, gender differences in science content areas were much less pronounced, and there was a more even balance between boys' and girls' achievement levels. In both life science and

3 The results for TIMSS 2003 show many more significant differences than TIMSS 1999 because a Bonferroni correction was applied in 1999 across countries leading to extremely conservative estimates given the large number of countries.

physical science, girls had significantly higher achievement than boys (4 points in life science and 2 points in physical science). Girls performed better in life science than boys in 7 countries, whereas boys performed better in only one. In physical science, girls performed better than boys in six countries, and boys performed better in four countries. In earth science, however, the boy-girl difference was reversed, with boys having slightly higher average achievement overall (a 2-point difference). Boys performed better than girls in 9 countries, whereas girls performed better in 4 countries.

In some respects, the patterns in the performance of girls and boys found in TIMSS 2003 are consistent with previous IEA science assessments. Girls tended to perform about the same as boys in life science in both previous TIMSS assessments and the Second International Science Study (SISS),[4] while boys were markedly stronger in earth science and physics in previous studies.

4 Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Gregory, K.D., Smith, T.A., Chrostowki, S.J., Garden, R.A., and O'Connor, K.M. (2000), *TIMSS 1999 International Science Report: Findings from IEA's Repeat of the Third International Mathematics and Science Study at the Eighth Grade*, Chestnut Hill: MA: Boston College; Beaton, A.E., Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. (1996), *Science Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS)*, Chestnut Hill, MA: Boston College; Postlethwaite, T.N. and Wiley, D.E. (1992), *The IEA Study of Science II: Science Achievement in Twenty-Three Countries*, New York: Pergamon Press.

Exhibit 3.3: Average Achievement in Science Content Areas by Gender

Countries	Average Scale Scores for Science Content Areas											
	Life Science				Chemistry				Physics			
	Girls		Boys		Girls		Boys		Girls		Boys	
Armenia	462 (4.1)	▲	444 (3.1)		474 (5.0)	▲	456 (4.1)		481 (3.9)		478 (3.3)	
Australia	527 (4.6)		538 (4.5)		498 (5.1)		515 (4.9)	▲	510 (4.5)		532 (4.5)	▲
Bahrain	465 (2.8)	▲	424 (2.8)		458 (5.0)	▲	424 (2.3)		454 (2.8)	▲	432 (2.7)	
Belgium (Flemish)	521 (3.3)		532 (3.3)	▲	497 (3.0)		509 (3.5)	▲	501 (3.0)		528 (3.1)	▲
Botswana	374 (3.0)	▲	366 (3.3)		350 (3.5)		346 (3.8)		361 (3.6)		382 (3.6)	▲
Bulgaria	472 (6.1)		477 (5.2)		476 (7.2)		488 (5.7)	▲	474 (5.6)		495 (5.4)	▲
Chile	419 (3.0)		434 (3.5)	▲	394 (4.2)		415 (4.0)	▲	382 (3.4)		418 (3.6)	▲
Chinese Taipei	563 (3.6)		562 (3.4)		589 (4.3)	▲	579 (4.6)		568 (3.6)		571 (3.8)	
Cyprus	448 (2.9)	▲	427 (3.2)		446 (3.2)	▲	439 (2.9)		448 (2.2)		451 (2.3)	
Egypt	429 (4.6)		422 (5.2)		442 (4.6)		441 (6.0)		412 (4.7)		415 (6.1)	
Estonia	543 (2.8)		550 (2.9)	▲	552 (2.4)		551 (2.8)		551 (3.3)	▲	538 (2.3)	
Ghana	240 (7.1)		269 (6.1)	▲	267 (7.4)		283 (7.9)	▲	213 (7.0)		260 (6.9)	▲
† Hong Kong, SAR	550 (3.2)		552 (3.7)		541 (3.2)		543 (3.4)		549 (3.6)		561 (3.6)	▲
Hungary	531 (3.4)		542 (3.2)	▲	551 (3.4)		569 (3.7)	▲	522 (3.5)		551 (3.3)	▲
1 Indonesia	422 (4.0)		425 (4.3)		393 (4.3)		389 (4.4)		417 (4.2)		443 (4.6)	▲
Iran, Islamic Rep. of	454 (4.5)	▲	442 (3.5)		449 (5.4)		442 (4.5)		440 (4.6)		449 (4.2)	
2 Israel	486 (3.3)		497 (4.2)	▲	496 (4.3)		503 (4.1)		475 (3.3)		494 (3.9)	▲
Italy	496 (3.1)		499 (4.1)		486 (3.4)		487 (4.2)		459 (3.0)		481 (3.8)	▲
Japan	547 (3.1)		551 (3.0)		549 (3.8)		555 (2.4)		560 (3.3)		568 (2.9)	
Jordan	493 (4.8)	▲	458 (5.3)		496 (5.2)	▲	460 (6.2)		474 (4.8)	▲	457 (5.5)	
◆◆ Korea, Rep. of	555 (1.9)		562 (2.1)	▲	527 (3.0)		531 (2.8)		575 (2.7)		582 (1.8)	▲
Latvia	515 (3.0)	▲	508 (2.8)		513 (5.0)		514 (4.9)		503 (3.1)		520 (2.9)	▲
Lebanon	366 (5.6)	▲	352 (6.4)		436 (5.6)		430 (5.9)		413 (4.6)		426 (5.4)	▲
1 Lithuania	518 (2.9)		515 (2.9)		531 (2.8)		537 (3.3)		515 (2.7)		523 (3.2)	▲
2 Macedonia, Rep. of	460 (4.1)	▲	436 (4.5)		475 (4.2)	▲	459 (4.5)		457 (3.5)		458 (3.7)	
Malaysia	504 (4.3)		504 (4.2)		513 (4.9)		514 (4.9)		512 (4.3)		527 (3.9)	▲
Moldova, Rep. of	475 (4.2)	▲	456 (3.9)		482 (4.5)		475 (4.6)		479 (4.1)		478 (4.1)	
1 ‡ Morocco	388 (3.8)		392 (3.4)		399 (3.8)		405 (3.6)		400 (3.3)		422 (3.9)	▲
† Netherlands	534 (3.4)		539 (4.7)		510 (3.3)		519 (3.4)	▲	529 (3.8)		548 (3.8)	▲
New Zealand	525 (5.1)		521 (6.8)		496 (5.7)		506 (7.3)		512 (4.7)		519 (5.9)	
Norway	497 (2.6)		494 (3.1)		479 (3.4)		490 (3.5)	▲	483 (2.9)		492 (3.1)	▲
Palestinian Nat'l Auth.	443 (3.7)	▲	426 (6.0)		454 (3.9)	▲	433 (6.7)		436 (4.1)		427 (5.6)	
Philippines	395 (5.9)	▲	377 (6.5)		348 (6.2)		334 (8.2)		377 (4.9)		385 (5.3)	▲
Romania	473 (5.3)		470 (4.9)		477 (5.4)		471 (5.3)		465 (4.5)		481 (4.2)	▲
Russian Federation	515 (3.6)		513 (3.8)		526 (4.4)		529 (4.4)		502 (3.8)		520 (3.8)	▲
Saudi Arabia	419 (6.7)		406 (4.8)		398 (8.9)	▲	370 (6.1)		405 (7.2)	▲	385 (4.9)	
† Scotland	511 (4.1)		514 (3.7)		497 (4.2)		501 (3.4)		509 (4.0)		521 (3.4)	▲
1 Serbia	468 (3.2)		469 (3.3)		477 (4.2)		471 (4.2)		463 (3.5)		478 (2.6)	▲
Singapore	571 (3.7)		566 (4.8)		584 (4.0)		581 (5.1)		578 (3.4)		579 (4.0)	
Slovak Republic	512 (3.6)		515 (3.1)		514 (4.5)		524 (3.6)	▲	506 (3.3)		531 (3.2)	▲
Slovenia	522 (2.8)		519 (3.6)		531 (3.7)		533 (2.8)		502 (2.4)		515 (2.5)	▲
South Africa	249 (6.8)		249 (7.0)		282 (6.6)		287 (6.4)		237 (7.3)		251 (7.4)	
Sweden	531 (3.2)	▲	524 (2.9)		524 (3.1)		528 (2.8)		517 (3.5)		532 (2.9)	▲
Tunisia	412 (2.2)		423 (2.4)	▲	405 (2.5)		422 (3.3)	▲	371 (2.9)		402 (3.2)	▲
‡ United States	534 (3.2)		540 (3.3)	▲	506 (3.4)		519 (3.5)	▲	509 (3.5)		523 (3.0)	▲
‡ England	545 (4.3)		541 (5.2)		521 (5.3)		533 (5.1)	▲	537 (4.1)		552 (4.6)	▲
International Avg.	476 (0.6)	▲	473 (0.6)		474 (0.6)		474 (0.6)		468 (0.6)		480 (0.6)	▲
Benchmarking Participants												
Basque Country, Spain	490 (3.2)		494 (3.5)		466 (3.4)		478 (4.7)	▲	474 (4.1)		492 (3.5)	▲
Indiana State, US	534 (4.7)		545 (5.1)	▲	508 (5.1)		525 (6.7)	▲	505 (4.6)		526 (5.4)	▲
Ontario Province, Can.	533 (3.3)		542 (3.5)	▲	501 (3.3)		514 (3.6)	▲	524 (3.4)		536 (3.7)	▲
Quebec Province, Can.	520 (3.9)		530 (3.6)	▲	511 (3.4)		523 (3.0)	▲	514 (2.8)		534 (3.5)	▲

▲ Significantly higher than other gender

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, 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's Trends in International Mathematics and Science Study (TIMSS) 2003

Exhibit 3.3: Average Achievement in Science Content Areas by Gender

Countries	Average Scale Scores for Science Content Areas			
	Earth Science		Environmental Science	
	Girls	Boys	Girls	Boys
Armenia	464 (4.2) ▲	455 (3.8)	425 (5.1) ▲	408 (4.3)
Australia	516 (4.8)	547 (4.9) ▲	528 (4.4)	543 (4.0) ▲
Bahrain	445 (1.9)	436 (4.6)	452 (2.7) ▲	425 (5.6)
Belgium (Flemish)	494 (2.9)	525 (3.8) ▲	512 (3.4)	536 (3.5) ▲
Botswana	354 (4.7)	367 (4.1) ▲	385 (3.5) ▲	376 (4.1)
Bulgaria	477 (5.7)	503 (5.3) ▲	455 (6.4)	471 (4.9) ▲
Chile	413 (3.4)	455 (3.5) ▲	424 (3.0)	446 (3.8) ▲
Chinese Taipei	542 (3.2)	554 (3.9) ▲	561 (3.5)	558 (3.2)
Cyprus	442 (2.8)	452 (3.3) ▲	442 (2.8)	439 (3.0)
Egypt	397 (4.7)	409 (6.9)	435 (5.0)	426 (5.4)
Estonia	560 (4.4)	556 (3.2)	540 (2.7)	539 (2.7)
Ghana	230 (7.0)	274 (6.9) ▲	256 (6.7)	276 (7.1) ▲
† Hong Kong, SAR	539 (3.4)	558 (3.5) ▲	554 (3.0)	557 (3.6)
Hungary	520 (3.7)	555 (4.3) ▲	515 (3.4)	541 (3.4) ▲
1 Indonesia	424 (4.2)	438 (4.2) ▲	451 (4.1)	457 (4.0)
Iran, Islamic Rep. of	464 (4.2)	470 (4.1)	488 (3.1)	486 (3.1)
2 Israel	475 (3.2)	496 (3.9) ▲	476 (2.7)	497 (4.6) ▲
Italy	504 (3.1)	523 (4.2) ▲	494 (3.3)	500 (3.9)
Japan	524 (3.4)	536 (2.9) ▲	533 (2.8)	540 (2.9)
Jordan	479 (4.2) ▲	466 (5.5)	507 (4.1) ▲	479 (4.7)
◆◆ Korea, Rep. of	527 (2.0)	552 (2.4) ▲	538 (2.0)	548 (1.7) ▲
Latvia	504 (3.5)	524 (2.9) ▲	503 (3.4)	513 (4.0) ▲
Lebanon	389 (5.0)	402 (4.8) ▲	371 (6.2)	379 (7.0)
1 Lithuania	504 (3.4)	520 (3.1) ▲	504 (2.6)	509 (2.6)
2 Macedonia, Rep. of	438 (6.1)	443 (4.8)	443 (4.7)	442 (4.2)
Malaysia	494 (4.6)	510 (3.9) ▲	509 (3.6)	516 (3.8)
Moldova, Rep. of	474 (4.6)	475 (4.0)	461 (4.4) ▲	446 (4.5)
1 ‡ Morocco	389 (4.6)	406 (3.6) ▲	394 (4.5)	401 (4.0)
† Netherlands	523 (3.3)	545 (4.1) ▲	529 (3.8)	548 (3.5) ▲
New Zealand	514 (5.1)	537 (6.3) ▲	519 (3.7)	532 (5.5) ▲
Norway	506 (2.4)	527 (3.9) ▲	494 (2.6)	498 (2.9)
Palestinian Nat'l Auth.	441 (3.4)	436 (4.5)	454 (3.9) ▲	432 (6.0)
Philippines	376 (6.0)	377 (7.4)	410 (5.4) ▲	394 (6.0)
Romania	461 (5.6)	477 (5.7) ▲	469 (5.0)	475 (5.1)
Russian Federation	508 (3.6)	527 (3.7) ▲	486 (3.6)	496 (3.9) ▲
Saudi Arabia	400 (6.5)	389 (5.6)	417 (5.7)	405 (5.2)
† Scotland	503 (4.9)	527 (3.6) ▲	505 (4.1)	517 (3.6) ▲
1 Serbia	463 (3.5)	480 (3.2) ▲	453 (3.2)	461 (2.6) ▲
Singapore	542 (4.1)	556 (4.4) ▲	566 (3.7)	569 (4.5)
Slovak Republic	508 (4.9)	537 (3.7) ▲	498 (3.6)	518 (2.8) ▲
Slovenia	515 (3.3)	532 (3.4) ▲	512 (3.1)	519 (2.4) ▲
South Africa	245 (6.9)	248 (7.5)	260 (8.4)	260 (7.7)
Sweden	525 (3.5)	539 (4.3) ▲	494 (3.0)	505 (2.8) ▲
Tunisia	391 (2.3)	426 (2.3) ▲	427 (2.5)	445 (2.9) ▲
‡ United States	519 (3.2)	546 (3.1) ▲	527 (3.4)	539 (3.1) ▲
‡ England	535 (5.2)	553 (5.3) ▲	532 (4.5)	547 (5.1) ▲
International Avg.	466 (0.6)	482 (0.6) ▲	472 (0.6)	476 (0.6) ▲
Benchmarking Participants				
Basque Country, Spain	497 (3.0)	516 (3.4) ▲	490 (3.5)	497 (3.6)
Indiana State, US	523 (5.5)	549 (5.4) ▲	530 (4.5)	545 (4.7) ▲
Ontario Province, Can.	522 (3.3)	544 (3.7) ▲	538 (3.2)	545 (3.1)
Quebec Province, Can.	539 (3.6)	562 (3.1) ▲	523 (3.9)	540 (2.9) ▲

▲ Significantly higher than other gender

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Nearly satisfied guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

2 National Defined Population covers less than 90% of National Desired Population (see Exhibit A.6).

◆◆ Korea tested the same cohort of students as other countries, but later in 2003, 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's Trends in International Mathematics and Science Study (TIMSS) 2003

Exhibit 3.3: Average Achievement in Science Content Areas by Gender

Countries	Average Scale Scores for Science Content Areas					
	Life Science		Physical Science		Earth Science	
	Girls	Boys	Girls	Boys	Girls	Boys
Armenia	443 (4.5) ▲	428 (5.0)	430 (4.5)	428 (4.9)	455 (3.9) ▲	445 (4.1)
† Australia	527 (3.5) ▲	520 (4.9)	518 (3.8)	518 (5.1)	519 (4.0)	518 (5.7)
Belgium (Flemish)	523 (1.9)	524 (2.3)	507 (2.6)	507 (2.5)	521 (2.2)	524 (2.4)
Chinese Taipei	539 (1.6)	542 (2.0)	551 (2.2)	557 (2.6) ▲	553 (2.9)	565 (2.8) ▲
Cyprus	479 (2.7)	485 (2.7)	475 (2.5)	483 (3.0) ▲	485 (2.6)	489 (3.0)
† England	532 (3.0)	531 (3.8)	549 (3.3)	544 (4.1)	535 (3.8)	536 (4.2)
† Hong Kong, SAR	536 (2.8)	533 (2.7)	551 (3.2) ▲	544 (2.8)	537 (3.4)	536 (3.0)
Hungary	537 (3.2)	536 (2.8)	522 (3.5)	530 (3.2)	520 (5.0)	531 (4.1) ▲
Iran, Islamic Rep. of	437 (6.6) ▲	415 (5.3)	432 (7.4) ▲	410 (5.2)	437 (5.2) ▲	423 (3.7)
Italy	521 (3.9)	521 (3.7)	510 (4.1)	513 (3.6)	514 (4.5)	523 (3.6) ▲
Japan	529 (2.0)	530 (2.0)	557 (2.2)	557 (2.4)	530 (2.5)	539 (2.3) ▲
Latvia	535 (2.4) ▲	527 (2.9)	536 (3.1) ▲	528 (3.1)	534 (3.4)	534 (3.3)
1 Lithuania	518 (2.4)	517 (2.5)	514 (2.8)	513 (3.2)	503 (4.2)	507 (3.8)
Moldova, Rep. of	511 (4.2) ▲	497 (4.5)	495 (4.1) ▲	483 (4.4)	511 (5.2) ▲	499 (5.6)
Morocco	303 (7.6)	297 (6.0)	311 (7.9)	305 (7.4)	313 (7.5)	308 (6.1)
† Netherlands	545 (2.2)	549 (2.2)	501 (2.2)	509 (2.2) ▲	496 (2.9)	509 (2.9) ▲
New Zealand	524 (2.9) ▲	516 (2.7)	519 (2.9) ▲	513 (2.6)	523 (3.1)	522 (2.3)
Norway	483 (2.6)	477 (2.8)	457 (3.0)	454 (2.6)	473 (3.4)	472 (3.5)
Philippines	339 (10.4) ▲	322 (8.1)	349 (10.6) ▲	337 (9.3)	331 (10.7) ▲	317 (8.6)
Russian Federation	528 (5.5)	525 (4.5)	527 (5.8)	526 (5.2)	528 (6.9)	527 (5.7)
† Scotland	500 (3.5)	511 (3.9) ▲	499 (3.0)	507 (3.7)	492 (2.9)	505 (3.6) ▲
Singapore	559 (4.9)	557 (5.7)	580 (5.8)	574 (6.6)	534 (5.0)	541 (6.1)
Slovenia	490 (3.6)	488 (3.8)	499 (2.8)	496 (3.2)	489 (3.0)	492 (4.1)
Tunisia	294 (6.5)	285 (6.3)	326 (5.9)	322 (5.5)	337 (5.5)	336 (5.8)
† United States	536 (2.1)	538 (2.6)	529 (2.1)	533 (2.7) ▲	531 (2.6)	539 (2.9) ▲
International Avg.	491 (0.8) ▲	487 (0.8)	490 (0.9) ▲	488 (0.8)	488 (0.9)	490 (0.8) ▲
Benchmarking Participants						
Indiana State, US	551 (2.6)	558 (4.3)	544 (3.3)	548 (4.5)	547 (3.5)	557 (4.6) ▲
Ontario Province, Can.	540 (3.7)	542 (4.7)	534 (3.6)	539 (4.6)	531 (4.0)	547 (5.1) ▲
Quebec Province, Can.	506 (2.3)	500 (3.1)	496 (2.5)	497 (3.0)	505 (2.7)	510 (3.8)

▲ Significantly higher than other gender

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

† Met guidelines for sample participation rates only after replacement schools were included (see Exhibit A.9).

1 National Desired Population does not cover all of International Desired Population (see Exhibit A.6).

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

What Changes Have Occurred in Content-Area Achievement?

To examine changes in achievement in the science content areas, Exhibit 3.4 shows the average percent correct for eighth-grade students in 2003 and 1999 for items given in both the 2003 and 1999 TIMSS assessments. If achievement improved significantly between assessments, the 1999 result is annotated with an up arrow or down arrow. 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 in all of the five different content areas. The first column in the table shows overall trends in the average percentage correct metric. For the most part, significant differences agree with those in the overall scale score (and the direction is always consistent).

During the four years between 1999 and 2003, participants were generally consistent in either showing improvements or declines. Lithuania had statistically significant improvements in all five content areas. Chile and Israel improved in four areas, and Ontario in three. Participants improving in two areas included Hong Kong SAR, Moldova, the Philippines, and the United States. On the other hand, Belgium (Flemish), Bulgaria, and Tunisia had statistically significant decreases in all five content areas. In Cyprus, average achievement showed statistically significant decreases in four content areas. Japan and the Slovak Republic showed significant decreases in three content areas and an increase in one.

Exhibit 3.4: Trends in Average Percent Correct in Science Content Areas*

Countries	Average Percent Correct for Science Content Areas					
	Total Science Trend Items (74 items)		Life Science Trend Items (17 items)		Chemistry Trend Items (14 items)	
	2003	1999	2003	1999	2003	1999
Australia	57 (0.7)	– –	61 (0.8)	– –	53 (0.9)	– –
Belgium (Flemish)	56 (0.5)	60 (0.5) ▼	61 (0.6)	64 (0.5) ▼	49 (0.5)	51 (1.0) ▼
Bulgaria	50 (1.1)	57 (1.1) ▼	50 (1.2)	58 (1.3) ▼	53 (1.2)	62 (1.1) ▼
Chile	40 (0.5)	38 (0.7) ▲	43 (0.6)	41 (0.8) ▲	41 (0.7)	38 (0.7) ▲
Chinese Taipei	66 (0.7)	67 (0.6)	62 (0.6)	64 (0.6)	71 (0.9)	72 (0.8)
Cyprus	42 (0.4)	46 (0.3) ▼	41 (0.5)	49 (0.6) ▼	42 (0.5)	47 (0.7) ▼
Hong Kong, SAR	61 (0.7)	59 (0.7)	61 (0.6)	59 (0.8) ▲	57 (0.7)	56 (0.7)
Hungary	62 (0.5)	63 (0.7)	61 (0.7)	61 (0.8)	66 (0.7)	67 (0.8)
Indonesia	39 (0.6)	40 (0.6)	38 (0.6)	38 (0.7)	31 (0.4)	32 (0.6)
Iran, Islamic Rep. of	44 (0.5)	44 (0.7)	39 (0.6)	40 (0.7)	46 (0.6)	48 (0.7) ▼
Israel	53 (0.6)	49 (0.8) ▲	56 (0.7)	50 (0.9) ▲	56 (0.8)	51 (0.9) ▲
Italy	53 (0.6)	53 (0.7)	55 (0.8)	54 (0.8)	52 (0.8)	53 (1.0)
Japan	61 (0.5)	63 (0.4) ▼	61 (0.5)	63 (0.5) ▼	59 (0.6)	61 (0.6)
Jordan	48 (0.7)	47 (0.6)	50 (0.9)	46 (0.7) ▲	51 (0.8)	52 (0.8)
Korea, Rep. of	63 (0.4)	64 (0.4)	64 (0.5)	62 (0.5)	54 (0.5)	61 (0.5) ▼
Latvia (LSS)	54 (0.7)	53 (0.6)	53 (0.8)	50 (0.8)	54 (1.0)	53 (0.8)
Lithuania	58 (0.6)	50 (0.8) ▲	57 (0.7)	48 (0.9) ▲	60 (0.7)	53 (0.9) ▲
Macedonia, Rep. of	45 (0.7)	46 (0.7)	45 (0.8)	47 (0.8)	52 (0.9)	52 (1.1)
Malaysia	53 (0.8)	52 (0.8)	49 (1.0)	51 (1.0)	52 (0.9)	49 (0.7) ▲
Moldova, Rep. of	48 (0.7)	47 (0.8)	46 (1.0)	48 (0.9)	50 (0.8)	46 (1.0) ▲
Netherlands	61 (0.7)	61 (1.4)	66 (0.8)	63 (1.5)	53 (0.8)	53 (1.2)
New Zealand	56 (1.0)	54 (1.0)	59 (1.0)	56 (1.1)	50 (1.2)	50 (1.1)
Philippines	35 (0.8)	33 (0.9)	38 (1.0)	34 (1.0) ▲	31 (0.7)	34 (0.8) ▼
Romania	48 (1.0)	48 (0.9)	50 (1.1)	48 (1.1)	49 (1.1)	52 (1.2)
Russian Federation	56 (0.6)	57 (1.3)	55 (0.5)	54 (1.5)	61 (1.0)	64 (1.5)
Singapore	67 (0.9)	67 (1.4)	65 (0.9)	66 (1.5)	70 (1.1)	65 (1.6) ▲
Slovak Republic	56 (0.7)	58 (0.7) ▼	57 (0.8)	59 (0.8)	57 (0.9)	61 (0.8) ▼
Slovenia	57 (0.5)	– –	54 (0.8)	– –	61 (0.7)	– –
South Africa	23 (0.7)	24 (0.7)	23 (0.7)	24 (0.9)	27 (0.6)	29 (0.6) ▼
Tunisia	35 (0.5)	41 (0.4) ▼	34 (0.6)	39 (0.5) ▼	40 (0.4)	45 (0.5) ▼
United States	58 (0.6)	57 (0.7)	63 (0.7)	61 (0.9)	55 (0.7)	55 (0.9)
‡ England	61 (0.9)	61 (1.0)	63 (1.0)	64 (0.9)	57 (1.1)	56 (1.2)
International Avg.	52 (0.1)	52 (0.1) ▲	52 (0.1)	52 (0.2) ▲	52 (0.1)	52 (0.2)
Benchmarking Participants						
Indiana State, US	59 (1.0)	60 (1.4)	64 (1.0)	66 (1.4)	56 (1.3)	57 (1.5)
Ontario Province, Can.	59 (0.6)	56 (0.6) ▲	65 (0.7)	61 (0.8) ▲	51 (0.8)	51 (0.9)
Quebec Province, Can.	60 (0.7)	61 (1.9)	60 (0.8)	61 (1.9)	55 (0.8)	57 (1.1)

▲ 2003 significantly higher than 1999

▼ 2003 significantly lower than 1999

* Applies only to items that appeared on both the 1999 and 2003 assessments. Fourth grade data are not available.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

Trend notes: Because of differences in population coverage, 1999 data are not shown for Australia and Slovenia. Korea tested later in 2003 than in 1999 at the beginning of the next school year. Similarly, Lithuania tested later in 1999 than in 2003. Data for Latvia in this exhibit include Latvian-speaking schools only.

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

A dash (–) indicates comparable data are not available.

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Exhibit 3.4: Trends in Average Percent Correct in Science Content Areas*

Countries	Average Percent Correct for Science Content Areas											
	Physics Trend Items (22 items)			Earth Science Trend Items (12 items)			Environmental Science Trend Items (9 items)		
	2003	1999		2003	1999		2003	1999	
Australia	59 (0.9)	– –		57 (1.0)	– –		56 (1.0)	– –	
Belgium (Flemish)	61 (0.6)	64 (0.8)	▼	56 (0.7)	59 (1.0)	▼	49 (0.8)	54 (0.7)	▼
Bulgaria	48 (1.1)	52 (1.4)	▼	57 (1.3)	63 (1.2)	▼	43 (1.3)	50 (1.3)	▼
Chile	40 (0.5)	37 (0.7)	▲	41 (0.6)	38 (0.7)	▲	33 (0.6)	37 (0.8)	▼
Chinese Taipei	62 (0.8)	64 (0.7)		69 (0.8)	71 (0.7)		70 (0.9)	69 (0.8)	
Cyprus	46 (0.6)	47 (0.5)		43 (0.6)	46 (0.6)	▼	35 (0.6)	42 (0.7)	▼
Hong Kong, SAR	61 (0.7)	62 (0.8)		64 (0.8)	65 (0.9)		62 (1.0)	55 (1.0)	▲
Hungary	62 (0.7)	63 (0.8)		66 (0.7)	70 (0.9)	▼	52 (1.0)	53 (1.0)	
Indonesia	42 (0.7)	43 (0.7)		43 (0.8)	45 (0.9)		40 (0.8)	46 (0.9)	▼
Iran, Islamic Rep. of	41 (0.6)	42 (0.7)		54 (0.8)	53 (0.9)		42 (0.7)	40 (0.8)	
Israel	53 (0.8)	48 (0.9)	▲	54 (0.7)	50 (1.1)	▲	42 (0.9)	42 (1.0)	
Italy	49 (0.7)	50 (0.8)		61 (0.9)	58 (1.0)		47 (0.9)	49 (0.9)	
Japan	65 (0.5)	68 (0.4)	▼	62 (0.6)	66 (0.6)	▼	54 (0.9)	50 (0.7)	▲
Jordan	42 (0.8)	42 (0.6)		53 (0.8)	52 (0.7)		44 (1.0)	44 (0.8)	
Korea, Rep. of	68 (0.5)	67 (0.4)		67 (0.6)	67 (0.7)		58 (0.8)	58 (0.7)	
Latvia (LSS)	57 (0.9)	57 (0.8)		54 (1.0)	51 (1.0)	▲	49 (1.2)	48 (1.0)	
Lithuania	61 (0.6)	55 (0.9)	▲	59 (0.8)	49 (1.0)	▲	46 (0.8)	38 (1.0)	▲
Macedonia, Rep. of	45 (0.7)	45 (0.9)		47 (0.9)	45 (1.1)		34 (1.0)	35 (0.9)	
Malaysia	55 (0.8)	53 (0.8)		56 (1.0)	56 (1.0)		51 (1.1)	50 (1.0)	
Moldova, Rep. of	49 (0.9)	47 (0.9)	▲	53 (0.9)	52 (1.0)		38 (1.1)	38 (1.2)	
Netherlands	65 (0.7)	64 (1.5)		62 (0.9)	61 (1.5)		58 (1.3)	59 (2.0)	
New Zealand	60 (1.0)	57 (1.0)	▲	53 (1.1)	53 (1.0)		52 (1.4)	54 (1.1)	
Philippines	35 (0.8)	33 (0.8)		36 (1.0)	35 (1.0)		33 (1.3)	26 (1.1)	▲
Romania	47 (0.9)	47 (1.0)		51 (1.2)	52 (1.1)		44 (1.2)	42 (1.2)	
Russian Federation	56 (0.7)	58 (1.1)		61 (0.7)	60 (1.4)		45 (1.0)	46 (1.5)	
Singapore	68 (0.7)	69 (1.3)		65 (0.8)	63 (1.5)		68 (1.1)	73 (1.8)	▼
Slovak Republic	56 (0.7)	59 (0.9)	▼	60 (0.9)	57 (1.0)	▲	50 (1.0)	53 (0.9)	▼
Slovenia	56 (0.6)	– –		63 (0.7)	– –		51 (1.0)	– –	
South Africa	23 (0.8)	24 (0.7)		24 (0.7)	23 (0.6)		19 (1.0)	20 (0.9)	
Tunisia	33 (0.6)	39 (0.5)	▼	38 (0.7)	44 (0.7)	▼	30 (0.7)	38 (0.5)	▼
United States	57 (0.6)	54 (0.7)	▲	60 (0.7)	58 (0.8)	▲	55 (0.9)	54 (0.7)	
‡ England	63 (0.9)	61 (1.2)		64 (1.0)	63 (0.9)		54 (1.3)	56 (1.4)	
International Avg.	53 (0.1)	52 (0.2)		55 (0.2)	54 (0.2)	▲	47 (0.2)	47 (0.2)	
Benchmarking Participants									
Indiana State, US	56 (1.2)	55 (1.4)		60 (1.1)	63 (1.6)		57 (1.2)	60 (2.3)	
Ontario Province, Can.	61 (0.6)	58 (0.8)	▲	60 (0.8)	54 (0.7)	▲	58 (1.0)	57 (1.0)	
Quebec Province, Can.	63 (0.7)	63 (2.6)		65 (1.1)	65 (1.8)		54 (1.0)	60 (2.8)	▼

▲ 2003 significantly higher than 1999

▼ 2003 significantly lower than 1999

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

* Applies only to items that appeared on both the 1999 and 2003 assessments. Fourth grade data are not available.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

Trend notes: Because of differences in population coverage, 1999 data are not shown for Australia and Slovenia. Korea tested later in 2003 than in 1999 at the beginning of the next school year. Similarly, Lithuania tested later in 1999 than in 2003. Data for Latvia in this exhibit include Latvian-speaking schools only.

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

A dash (–) indicates comparable data are not available.