CHAPTER 1

1

International Student Achievement in Mathematics

Chapter 1 summarizes eighth-grade achievement on the TIMSS 1999 mathematics assessment for each of the participating countries, and shows trends in student performance for those countries that also participated in TIMSS 1995 at the eighth grade. Comparisons of country performance against international benchmarks, as well as gender differences in performance, also are provided.

How Do Countries Differ in Mathematics Achievement?

1.1

Exhibit 1.1 presents the distribution of student achievement for the 38 countries that participated in TIMSS 1999.[1] Countries are shown in decreasing order of average (mean) scale score, together with an indication of whether the country average is significantly higher or lower than the international average. The international average of 487 was obtained by averaging across the mean scores for each of the 38 participating countries. The results reveal substantial differences in mathematics achievement between the high- and low-performing countries, from an average of 604 for Singapore to 275 for South Africa. Nineteen countries had average mathematics achievement that was significantly above the international average, including three countries that are participating in TIMSS for the first time – Chinese Taipei, Finland, and Malaysia.[2] Fourteen countries had average achievement below the international average, including seven countries new to TIMSS – Moldova, Tunisia, the Republic of Macedonia, Turkey, Jordan, Chile, and Morocco.

The broad range of achievement both within and across countries is illustrated in Exhibit 1.1 by a graphical representation of the distribution of student performance within each country. Achievement for each country is shown for the 25th and 75th percentiles as well as for the 5th and 95th percentiles.[3] Each percentile point indicates the percentages of students performing below and above that point on the scale. For example, 25 percent of the eighth-grade students in each country performed below the 25th percentile for that country, and 75 percent performed above the 25th percentile. The range between the 25th and 75th percentiles represents performance by the middle half of the students. In most countries, the range of performance for the middle group was between 100 and 130 scale-score points. In contrast, performance at the 5th and 95th percentiles represents the extremes in both lower and higher achievement. The range of performance between these two score points, which includes 90 percent of the population, is approximately 270 points in most countries. The dark boxes at the midpoints of the distributions show the 95 percent confidence intervals around the average achievement in each country.[4]

1 TIMSS used item response theory (IRT) methods to summarize the achievement results on a scale with a mean of 500 and a standard deviation of 100. Given the matrix-sampling approach, scaling averages students' responses in a way that accounts for differences in the difficulty of different subsets of items. It allows students' performance to be summarized on a common metric even though individual students responded to different items in the mathematics test. For more detailed information, see the "IRT Scaling and Data Analysis" section of Appendix A.

2 The significance tests in Exhibits 1.1 and 1.2 are based on a Bonferroni procedure for multiple comparisons that holds to 5 percent the probability of erroneously stating the mean of one country to be different from that of another country.

3 Tables of the percentile values and standard deviations for all countries are presented in Appendix D.

4 See the "IRT Scaling and Data Analysis" section of Appendix A for more details about calculating standard errors and confidence intervals for the TIMSS statistics.

As well as showing the wide spread of student achievement within each country, the percentiles also provide a perspective on the size of the differences among countries. Even though performance generally differed very little between one country and the next higher- or lower-performing country, the range in performance across the 38 countries was very large. For example, average performance in Singapore was comparable to or even exceeded performance at the 95th percentile in the lower-performing countries such as Chile, the Philippines, Morocco, and South Africa. This means that only the most proficient students in the lower-performing countries approached the level of achievement of Singaporean students of average proficiency.

To aid in interpretation, Exhibit 1.1 also includes the years of formal schooling and average age of the students in each country. Equivalence of chronological age does not necessarily mean that students have received the same number of years of formal schooling or studied the same curriculum. Most notably, students in Finland, Morocco, the Philippines, and parts of the Russian Federation had fewer years of formal schooling than their counterparts in other countries, while those in the Czech Republic, England, Moldova, and parts of Australia and New Zealand had more years of schooling. The average age of students ranged from 13.8 years in Cyprus and Finland to 15.5 years in South Africa.

1.2 Exhibit 1.2 compares overall mean achievement among individual countries. This figure shows whether or not the differences in average achievement between pairs of countries are statistically significant. Selecting a country of interest and reading across the table, a triangle pointing up indicates significantly higher performance than the comparison country listed across the top; a circle indicates no significant difference in performance; and a triangle pointing down indicates significantly lower performance.

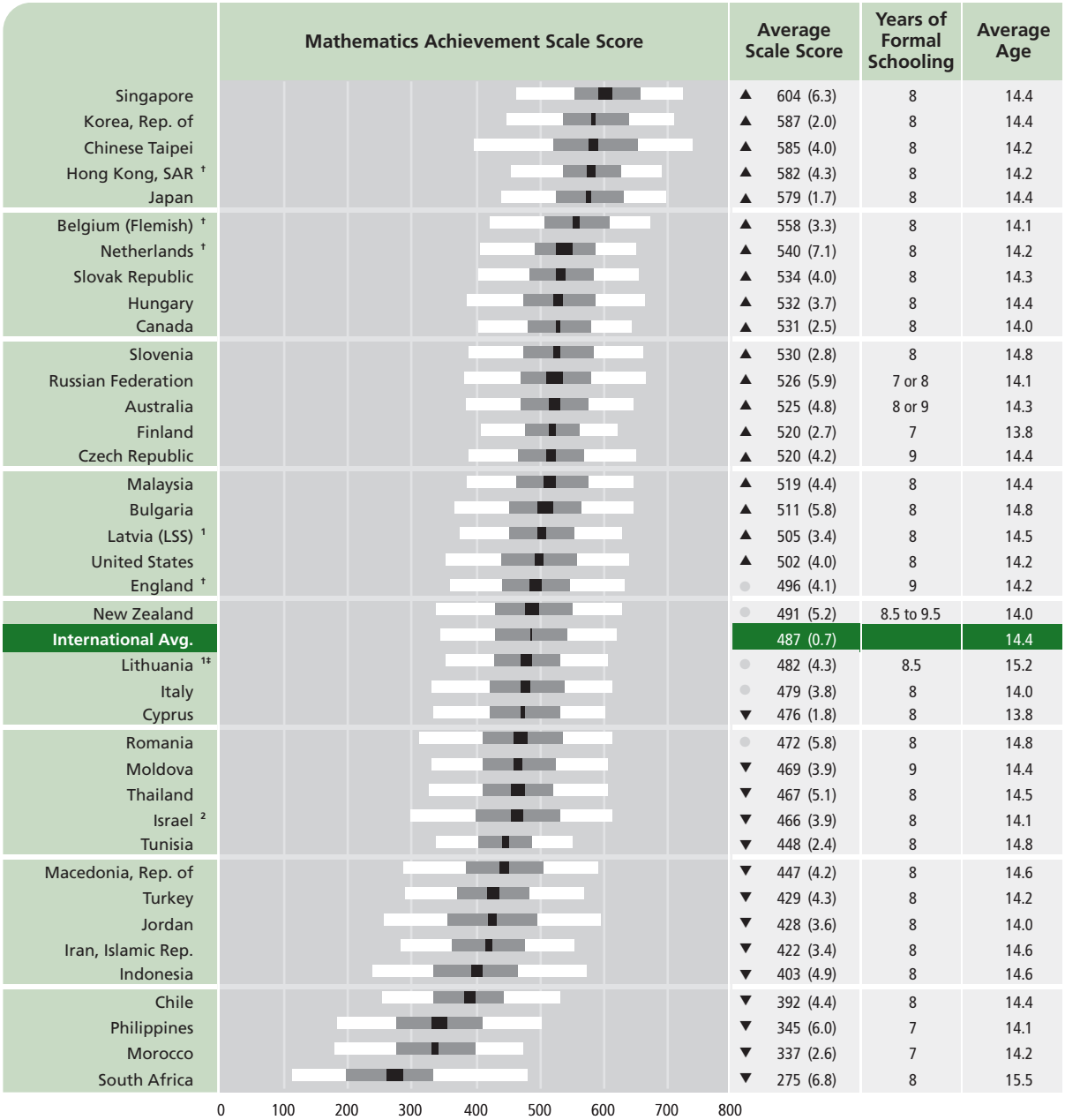
The data in Exhibit 1.2 reinforce the point that, when ordered by average achievement, adjacent countries usually did not significantly differ from each other, although the differences in achievement between the high-performing and low-performing countries were very large. Because of this wide range in performance, the pattern for a number of countries was one of having lower mean achievement than some countries, about the same mean achievement as other countries, and higher mean achievement than a third group of countries.

Singapore, the Republic of Korea, Chinese Taipei, and Hong Kong SAR had the highest average performance, with Singapore and Korea having significantly higher mean achievement than the rest of the other participating countries, and Chinese Taipei and Hong Kong significantly better than all the other countries except Japan. Japan also performed very well, with significantly higher achievement than most other participating countries, as did Belgium (Flemish).[5] Interestingly, the Netherlands, the Slovak Republic, Hungary, Canada, Slovenia, the Russian Federation, Australia, Finland, the Czech Republic, Malaysia, and Bulgaria all performed very similarly. In fact, the difference in performance from one country to the next was often negligible.

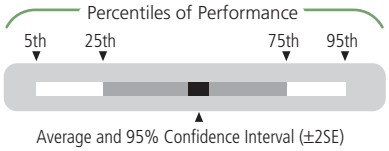
5 Average achievement in Belgium (Flemish) was 558 compared to 579 in Japan and 540 in the Netherlands. Even though the differences are comparable, the latter difference was not statistically significant because the Netherlands had a larger than usual standard error.

Exhibit 1.1 Distribution of Mathematics Achievement

TIMSS 1999 8th grade Mathematics



	Average Scale Score	Years of Formal Schooling	Average Age
Singapore	▲ 604 (6.3)	8	14.4
Korea, Rep. of	▲ 587 (2.0)	8	14.4
Chinese Taipei	▲ 585 (4.0)	8	14.2
Hong Kong, SAR †	▲ 582 (4.3)	8	14.2
Japan	▲ 579 (1.7)	8	14.4
Belgium (Flemish) †	▲ 558 (3.3)	8	14.1
Netherlands †	▲ 540 (7.1)	8	14.2
Slovak Republic	▲ 534 (4.0)	8	14.3
Hungary	▲ 532 (3.7)	8	14.4
Canada	▲ 531 (2.5)	8	14.0
Slovenia	▲ 530 (2.8)	8	14.8
Russian Federation	▲ 526 (5.9)	7 or 8	14.1
Australia	▲ 525 (4.8)	8 or 9	14.3
Finland	▲ 520 (2.7)	7	13.8
Czech Republic	▲ 520 (4.2)	9	14.4
Malaysia	▲ 519 (4.4)	8	14.4
Bulgaria	▲ 511 (5.8)	8	14.8
Latvia (LSS) 1	▲ 505 (3.4)	8	14.5
United States	▲ 502 (4.0)	8	14.2
England †	● 496 (4.1)	9	14.2
New Zealand	● 491 (5.2)	8.5 to 9.5	14.0
International Avg.	487 (0.7)		14.4
Lithuania 1‡	● 482 (4.3)	8.5	15.2
Italy	● 479 (3.8)	8	14.0
Cyprus	▼ 476 (1.8)	8	13.8
Romania	● 472 (5.8)	8	14.8
Moldova	▼ 469 (3.9)	9	14.4
Thailand	▼ 467 (5.1)	8	14.5
Israel 2	▼ 466 (3.9)	8	14.1
Tunisia	▼ 448 (2.4)	8	14.8
Macedonia, Rep. of	▼ 447 (4.2)	8	14.6
Turkey	▼ 429 (4.3)	8	14.2
Jordan	▼ 428 (3.6)	8	14.0
Iran, Islamic Rep.	▼ 422 (3.4)	8	14.6
Indonesia	▼ 403 (4.9)	8	14.6
Chile	▼ 392 (4.4)	8	14.4
Philippines	▼ 345 (6.0)	7	14.1
Morocco	▼ 337 (2.6)	7	14.2
South Africa	▼ 275 (6.8)	8	15.5



▲ Country average significantly higher than international average

● No statistically significant difference between country average and international average

▼ Country average significantly lower than international average

Significance tests adjusted for multiple comparisons

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 percent of National Desired Population (see Exhibit A.5).

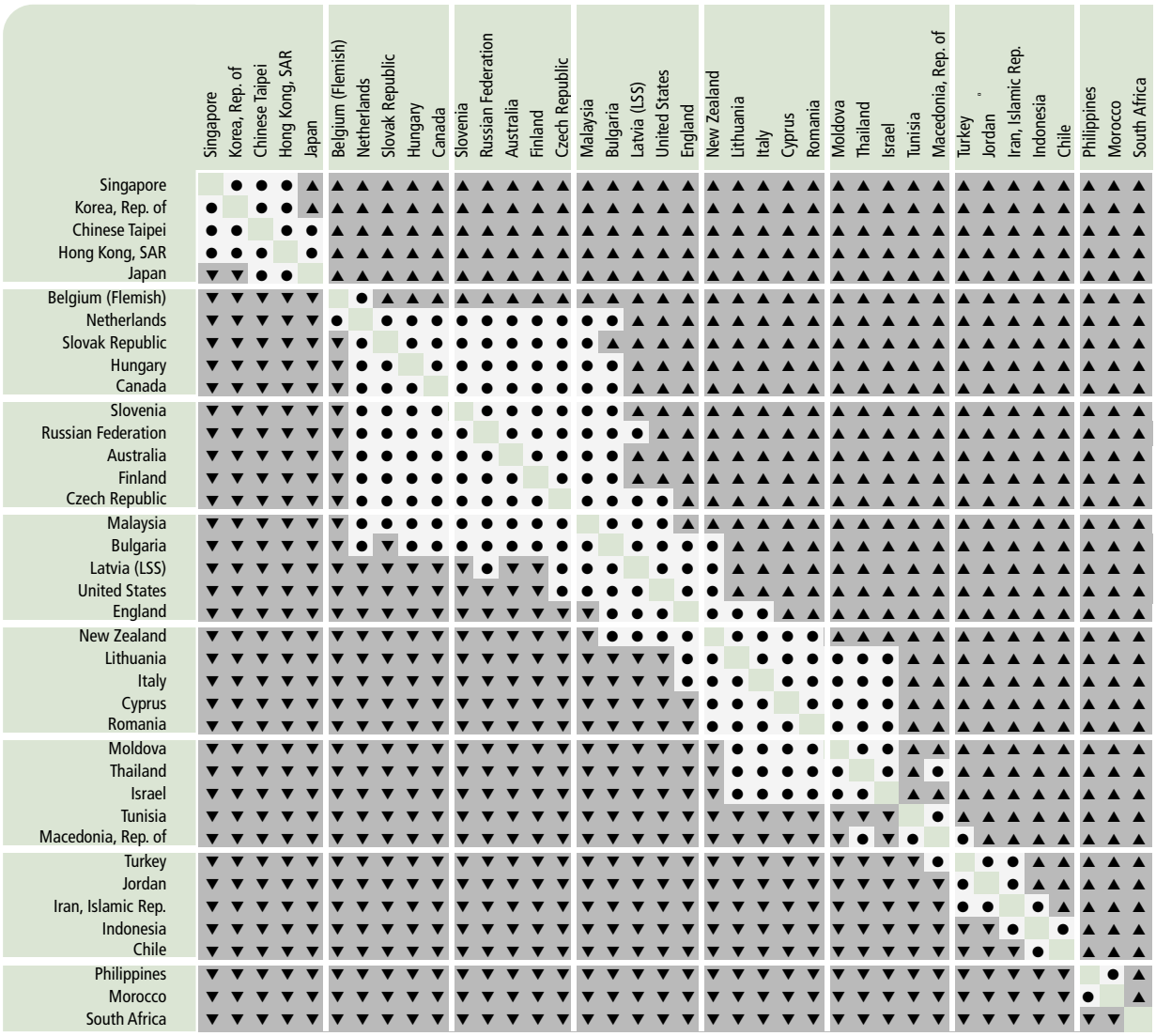
‡ Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year.

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

Exhibit 1.2 Multiple Comparisons of Average Mathematics Achievement

TIMSS 1999 8th grade Mathematics

Instructions: Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.



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

▲ Average achievement significantly higher than comparison country

● No statistically significant difference from comparison country

▼ Average achievement significantly lower than comparison country

Significance tests adjusted for multiple comparisons

How Has Mathematics Achievement Changed Since 1995?

1.3

Twenty-six countries took part in the TIMSS eighth-grade assessments in both 1995 and 1999. For these countries, Exhibit 1.3 shows the results and the differences in average achievement between the two years.[6] Average mathematics achievement across these 26 countries increased slightly, from a scale score of 519 in 1995 to 521 in 1999. However, this increase was not statistically significant.

In some countries, average mathematics achievement increased considerably between 1995 and 1999. The greatest increase was in Latvia (LSS)[7], with an increase of 17 scale-score points. Canada and Cyprus also had statistically significant gains in average mathematics achievement between 1995 and 1999. Hong Kong, the Netherlands, and Lithuania also had increases of 10 or more scale-score points, although the somewhat larger estimates of measurement error for these countries meant that the differences were not statistically significant. The Lithuanian results should be interpreted with additional caution, since Lithuania conducted the assessment six months later than other participants, when the students were beginning ninth grade rather than finishing eighth grade.

Several countries showed a small decrease in average achievement from 1995 to 1999, but only in the case of the Czech Republic was it statistically significant. Israel, South Africa, and Thailand are shown in a separate panel in Exhibit 1.3 because they used unapproved sampling procedures at the classroom level in 1995. Israel and Thailand showed large decreases since 1995, which could indicate an upward bias in the 1995 results due to their sampling problems in the original TIMSS rather than actual decreases.

TIMSS in 1995 assessed both fourth- and eighth-grade students. This allowed participants to compare their performance relative to each other at the fourth and eighth grades, and gave a cross-sectional perspective on how relative performance changed between grades.[8] For example, as

1.4

shown in Exhibit 1.4, Singapore, Korea, Japan, and Hong Kong performed significantly above the international average at the fourth grade in 1995 and again at the eighth grade in 1999. In contrast, the Netherlands and the Czech Republic were significantly above the international average at the fourth grade in 1995, but only similar to it four years later at the eighth grade. Canada had mathematics performance

6 TIMSS used IRT methods to place the eighth-grade results from 1995 and 1999 on the same scale. See Appendix A for more detailed information.

7 Because coverage of its eighth-grade population falls below 65%, Latvia is annotated LSS for Latvian-Speaking Schools only.

8 The mathematics achievement scale for fourth grade is not comparable to that for eighth grade, and so results for fourth grade and eighth grade may be compared only in relative terms, for example with reference to the international average for countries that participated in 1995 at both the fourth and eighth grades.

significantly below the international average at the fourth grade in 1995, but similar to it at the eighth grade in 1999. In contrast, the United States and Italy moved from being similar to the international average at the fourth grade in 1995 to significantly below it at the eighth grade in 1999.

It has been argued, at least in the United States, that recent reforms in education had their greatest impact in the earlier grades, and that a second TIMSS assessment could show better results for the eighth grade in 1999 than in 1995. Despite a modest, non-statistically significant gain at the eighth grade (see Exhibit 1.3), however, the data show that the relative position of the U.S. at grade 8 was below the international average in 1999 just as it was in 1995.

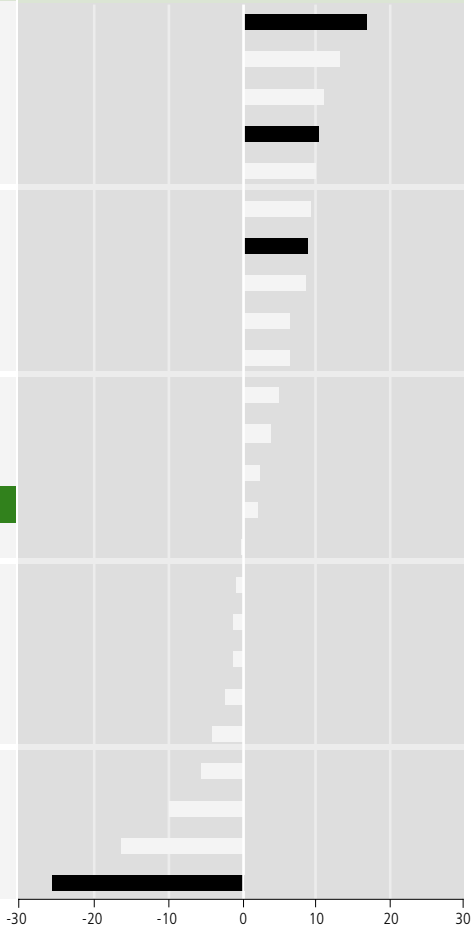
Exhibit 1.3 Trends in Mathematics Achievement

TIMSS 1999 8th grade Mathematics

	1995 Average Scale Score	1999 Average Scale Score	1995-1999 Difference
Latvia (LSS)	488 (3.6)	505 (3.4)	17 (5.0)
Hong Kong, SAR	569 (6.1)	582 (4.3)	13 (7.5)
Netherlands	529 (6.1)	540 (7.1)	11 (9.5)
Canada	521 (2.2)	531 (2.5)	10 (3.2)
Lithuania	472 (4.1)	482 (4.3)	10 (6.1)
United States	492 (4.7)	502 (4.0)	9 (6.2)
Cyprus	468 (2.2)	476 (1.8)	9 (2.9)
Belgium (Flemish)	550 (5.9)	558 (3.3)	8 (6.8)
Korea, Rep. of	581 (2.0)	587 (2.0)	6 (2.8)
Australia	519 (3.8)	525 (4.8)	6 (6.1)
Hungary	527 (3.2)	532 (3.7)	5 (4.9)
Iran, Islamic Rep.	418 (3.9)	422 (3.4)	4 (5.2)
Russian Federation	524 (5.3)	526 (5.9)	2 (8.0)
International Avg. §	519 (0.9)	521 (0.9)	2 (1.3)
Slovak Republic	534 (3.1)	534 (4.0)	0 (4.9)
Slovenia	531 (2.8)	530 (2.8)	-1 (3.9)
Romania	474 (4.6)	472 (5.8)	-1 (7.4)
England	498 (3.0)	496 (4.1)	-1 (5.2)
Japan	581 (1.6)	579 (1.7)	-2 (2.2)
Singapore	609 (4.0)	604 (6.3)	-4 (7.4)
Italy	491 (3.4)	485 (4.8)	-6 (6.0)
New Zealand	501 (4.7)	491 (5.2)	-10 (7.1)
Bulgaria	527 (5.8)	511 (5.8)	-16 (8.2)
Czech Republic	546 (4.5)	520 (4.2)	-26 (6.1)

Countries with Unapproved Sampling Procedures at the Classroom Level in 1995

Israel	513 (6.2)	482 (4.7)	-32 (7.8)
South Africa	278 (9.2)	275 (6.8)	-3 (11.5)
Thailand	516 (6.0)	467 (5.1)	-49 (7.9)



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

§ 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.

Exhibit 1.4 Mathematics Achievement for TIMSS 1999 Countries That Participated in 1995 at Both the Fourth and Eighth Grades in Relation to the Average Across These Countries

TIMSS 1999 8th grade Mathematics

1995

Eighth Grade
Difference From Average Across Countries§

Singapore	87 (3.8)
Japan	59 (1.8)
Korea, Rep. of	59 (2.1)
Hong Kong, SAR	47 (5.8)
Czech Republic	24 (4.3)
Slovenia	9 (2.8)
Netherlands	7 (5.8)
Hungary	5 (3.1)
Canada	-1 (2.2)
Australia	-3 (3.7)
New Zealand	-21 (4.5)
England	-24 (2.9)
United States	-29 (4.6)
Italy	-31 (3.3)
Latvia (LSS)	-33 (3.5)
Cyprus	-54 (2.3)
Iran, Islamic Rep.	-103 (3.8)
Avg. Across Countries §	**522 (0.9)**

Fourth Grade
Difference From Average Across Countries§

Singapore	73 (4.3)
Korea, Rep. of	63 (1.9)
Japan	50 (2.0)
Hong Kong, SAR	40 (3.8)
Netherlands	32 (2.9)
Czech Republic	23 (3.0)
Slovenia	8 (3.1)
Hungary	4 (3.5)
United States	0 (2.9)
Australia	0 (3.0)
Italy	-7 (4.5)
Canada	-12 (3.3)
Latvia (LSS)	-18 (4.4)
England	-33 (3.2)
Cyprus	-42 (3.1)
New Zealand	-48 (4.2)
Iran, Islamic Rep.	-130 (4.8)
Avg. Across Countries §	**517 (0.9)**

1999

Eighth Grade
Difference From Average Across Countries§

Singapore	80 (5.9)
Korea, Rep. of	63 (2.0)
Hong Kong, SAR	58 (4.2)
Japan	55 (1.8)
Netherlands	16 (6.8)
Hungary	8 (3.6)
Canada	7 (2.7)
Slovenia	6 (2.8)
Australia	1 (4.7)
Czech Republic	-4 (4.1)
Latvia (LSS)	-19 (3.3)
United States	-22 (3.8)
England	-28 (4.0)
New Zealand	-33 (4.9)
Italy	-39 (4.6)
Cyprus	-48 (1.9)
Iran, Islamic Rep.	-102 (3.3)
Avg. Across Countries §	**524 (1.0)**

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

Country average significantly higher than average across countries

Country average not significantly different from average across countries

Country average significantly lower than average across countries

Significance tests adjusted for multiple comparisons

§ Average across the subset of TIMSS 1999 countries that participated and met sampling guidelines in 1995 at both the fourth and eighth grades.

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

How Do Countries Compare with International Benchmarks of Mathematics Achievement?

The TIMSS mathematics achievement scale summarizes student performance on test items designed to measure a wide range of student knowledge and proficiency. In order to provide meaningful descriptions of what performance on the scale could mean in terms of the mathematics that students know and can do, TIMSS identified four points on the scale for use as international benchmarks, and conducted an ambitious scale-anchoring exercise to describe performance at these benchmarks. Exhibit 1.5 shows the four international benchmarks of mathematics achievement and briefly describes what students scoring at these benchmarks typically know and can do. More detailed descriptions appear in Chapter 2, together with example test items illustrating performance at each benchmark.

1.5

The Top 10% Benchmark is defined at the 90th percentile on the TIMSS mathematics scale, taking into account the performance of all students in all countries participating in 1999. This point on the scale, which corresponds to a scale score of 616, is the point above which the top 10 percent of the students in the TIMSS 1999 assessment scored. Students performing at this level demonstrated that they could organize information, make generalizations, and explain solution strategies in non-routine problem solving situations.

The Upper Quarter Benchmark is the 75th percentile on the mathematics scale. This point, corresponding to a scale score of 555, is the point above which the top 25 percent of students scored. Students scoring at this benchmark demonstrated that they could apply their mathematical understanding and knowledge in a wide variety of relatively complex situations involving fractions, decimals, geometric properties, and algebraic expressions.

The Median Benchmark, with a score of 479, corresponds to the 50th percentile, or median. This is the point above which the top half of the students scored on the TIMSS 1999 assessment. Students performing at this level showed they could apply basic mathematical knowledge in straightforward situations, such as one-step word problems involving addition and subtraction or computational problems based on basic properties of geometric figures and simple algebraic relationships.

The Lower Quarter Benchmark is the 25th percentile and corresponds to a scale score of 396. This score point was reached by the top 75 percent of students, and may be used as a benchmark of performance for lower-achieving students. Students scoring at this level typically demonstrated computational facility with whole numbers.

Exhibit 1.6 displays the percentage of students in each participating country that reached each international benchmark, in decreasing order by percentage reaching the Top 10% Benchmark. If student achievement in mathematics were distributed in the same way in every country, then each country would be expected to have approximately 10 percent of its students reaching the Top 10% Benchmark, 25 percent the Upper Quarter Benchmark, 50 percent the Median Benchmark, and 75 percent the Lower Quarter Benchmark. Although New Zealand came fairly close, no country followed this pattern exactly. Instead, the high-performing countries generally had greater percentages of students reaching each benchmark, and the low-performing countries had lesser percentages. Among the high performers, for example, Singapore, Chinese Taipei, Korea, Hong Kong, and Japan had one-third or more of their students reaching the Top 10% Benchmark, about two-thirds or more reaching the Upper Quarter Benchmark, around 90 percent reaching the Median Benchmark, and almost all (95 to 99 percent) reaching the Lower Quarter Benchmark. In contrast, low-performing countries such as South Africa, the Philippines, and Morocco had almost no students reaching the Top 10% Benchmark, no more than one percent reaching the Upper Quarter Benchmark, less than 10 percent reaching the Median Benchmark, and no more than 31 percent reaching the Lower Quarter Benchmark.

1.6

Although Exhibit 1.6 is organized to draw particular attention to the percentage of high-achieving students in each country, it conveys information about the distribution of middle and low performers also. For example, Canada, Australia, and Malaysia had 12 percent of their students reaching the Top 10% Benchmark, as might be expected, but 94 to 96 percent (rather than 75 percent) reaching the Lower Quarter Benchmark.

Exhibits 1.7 through 1.10 provide more information on the change in student performance from 1995 to 1999 by showing the percentages reaching each international benchmark (Top 10%, Upper Quarter, Median, and Lower Quarter) in each of the years for the 26 countries that participated in both assessments.[9] In general, there were very few changes at any of the benchmarks, but these exhibits do provide fur-

1.7–1.10

9 For Exhibits 1.7 through 1.10 the benchmarks were those computed from the 1999 data.

ther detail about the countries that showed increases or decreases in Exhibit 1.3 in average mathematics achievement from 1995 to 1999. For example, the decrease in performance in the Czech Republic is also apparent at the Upper Quarter, Median, and Lower Quarter benchmarks, implying a decrease at most levels of the proficiency distribution. In contrast, the increase for Latvia (LSS) appears mainly at the Median benchmark, and for Cyprus at the Lower Quarter benchmark.

Exhibits 1.5 – 1.10 Overleaf

Exhibit 1.5 TIMSS 1999 International Benchmarks of Mathematics Achievement

TIMSS 1999 8th grade Mathematics

• Top 10% Benchmark

Students can organize information, make generalizations, and explain solution strategies in non-routine problem solving situations. They can organize information and make generalizations to solve problems; apply knowledge of numeric, geometric, and algebraic relationships to solve problems (e.g., among fractions, decimals, and percents; geometric properties; and algebraic rules); and find the equivalent forms of algebraic expressions.

90th Percentile: 616

• Upper Quarter Benchmark

Students can apply their understanding and knowledge in a wide variety of relatively complex situations. They can order, relate and compute with fractions and decimals to solve word problems; solve multi-step word problems involving proportions with whole numbers; solve probability problems; use knowledge of geometric properties to solve problems; identify and evaluate algebraic expressions and solve equations with one variable.

75th Percentile: 555

• Median Benchmark

Students can apply basic mathematical knowledge in straightforward situations. They can add or subtract to solve one-step word problems involving whole numbers and decimals; identify representations of common fractions and relative sizes of fractions; solve for missing terms in proportions; recognize basic notions of percents and probability; use basic properties of geometric figures; read and interpret graphs, tables, and scales; and understand simple algebraic relationships.

50th Percentile: 479

• Lower Quarter Benchmark

Students can do basic computations with whole numbers. The few items that anchor at this level provide some evidence that students can add, subtract, and round with whole numbers. When there are the same number of decimal places, they can subtract with multiple regrouping. Students can round whole numbers to the nearest hundred. They recognize some basic notation and terminology.

25th Percentile: 396

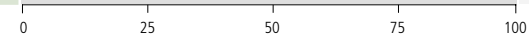
The international benchmarks are based on the combined data from the countries participating in 1999.

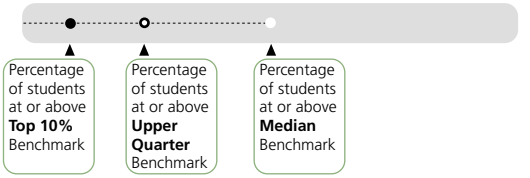
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

Exhibit 1.6 Percentages of Students Reaching TIMSS 1999 International Benchmarks of Mathematics Achievement

TIMSS 1999 8th grade Mathematics

	Percentages of Students Reaching International Benchmarks	Top 10%	Upper Quarter	Median	Lower Quarter
Singapore		46 (3.5)	75 (2.7)	93 (1.3)	99 (0.3)
Chinese Taipei		41 (1.7)	66 (1.5)	85 (1.0)	95 (0.6)
Korea, Rep. of		37 (1.0)	68 (0.9)	91 (0.5)	99 (0.2)
Hong Kong, SAR †		33 (2.3)	68 (2.4)	92 (1.5)	99 (0.6)
Japan		33 (1.1)	64 (0.9)	89 (0.5)	98 (0.3)
Belgium (Flemish) †		23 (1.4)	54 (1.7)	85 (1.4)	98 (0.7)
Hungary		16 (1.2)	41 (1.9)	74 (1.6)	94 (1.0)
Slovenia		15 (1.2)	39 (1.4)	74 (1.4)	95 (0.7)
Russian Federation		15 (1.8)	37 (2.8)	72 (2.7)	94 (1.2)
Netherlands †		14 (2.3)	45 (4.1)	81 (3.5)	96 (1.3)
Slovak Republic		14 (1.4)	40 (2.3)	78 (1.8)	96 (0.6)
Canada		12 (1.1)	38 (1.5)	77 (1.3)	96 (0.6)
Australia		12 (1.8)	37 (2.7)	73 (2.4)	94 (0.8)
Malaysia		12 (1.4)	34 (2.4)	69 (2.2)	94 (0.8)
Czech Republic		11 (1.4)	33 (2.1)	69 (2.3)	94 (1.1)
Bulgaria		11 (2.3)	30 (3.0)	66 (2.6)	91 (1.3)
United States		9 (1.0)	28 (1.6)	61 (1.9)	88 (1.0)
New Zealand		8 (1.2)	25 (2.4)	56 (2.5)	85 (1.5)
Latvia (LSS) 1		7 (0.9)	26 (1.8)	63 (2.0)	92 (1.0)
England †		7 (0.9)	24 (1.9)	58 (2.1)	89 (1.3)
Finland		6 (0.9)	31 (1.7)	75 (1.5)	96 (0.5)
Italy		5 (0.7)	20 (1.4)	52 (2.1)	83 (1.4)
Romania		5 (1.1)	19 (1.9)	49 (2.6)	80 (2.1)
Israel 2		5 (0.6)	18 (1.3)	47 (1.8)	77 (1.9)
Lithuania 1‡		4 (0.7)	17 (2.0)	52 (2.4)	86 (1.8)
Moldova		4 (0.7)	16 (1.5)	45 (2.2)	81 (1.7)
Thailand		4 (0.8)	16 (1.8)	44 (2.6)	81 (1.6)
Cyprus		3 (0.4)	17 (0.8)	51 (1.1)	84 (0.8)
Macedonia, Rep. of		3 (0.4)	12 (1.0)	38 (1.9)	72 (1.8)
Jordan		3 (0.5)	11 (0.9)	32 (1.5)	62 (1.4)
Indonesia		2 (0.4)	7 (0.9)	22 (1.4)	52 (2.2)
Turkey		1 (0.3)	7 (1.0)	27 (1.9)	65 (2.0)
Iran, Islamic Rep.		1 (0.2)	5 (0.8)	25 (1.7)	63 (1.5)
Chile		1 (0.5)	3 (1.1)	15 (1.8)	48 (2.0)
Tunisia		0 (0.1)	4 (0.5)	32 (1.6)	80 (1.3)
Philippines		0 (0.1)	1 (0.5)	8 (1.4)	31 (2.5)
South Africa		0 (0.2)	1 (0.4)	5 (1.0)	14 (2.0)
Morocco		0 (0.0)	0 (0.2)	5 (0.4)	27 (1.1)





Top 10% Benchmark (90th Percentile) = 616

Upper Quarter Benchmark (75th Percentile) = 555

Median Benchmark (50th Percentile) = 479

Lower Quarter Benchmark (25th Percentile) = 391

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 percent of National Desired Population (see Exhibit A.5).

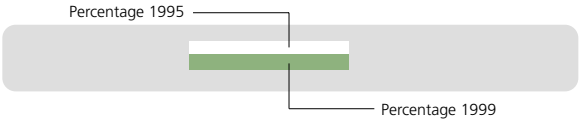
‡ Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year.

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

Exhibit 1.7 Trends in Percentages of Students Reaching the TIMSS 1999 Top 10% International Benchmark of Mathematics Achievement

TIMSS 1999 8th grade Mathematics

	Percentages of Students At or Above the Top 10% International Benchmark in 1995 and 1999	1995 Percentage of Students	1999 Percentage of Students	1995-1999 Difference
Singapore		46 (3.0)	46 (3.5)	0 (4.7)
Korea, Rep. of		36 (1.2)	37 (1.0)	2 (1.4)
Hong Kong, SAR		28 (2.6)	33 (2.3)	5 (3.4)
Japan		34 (1.0)	33 (1.1)	0 (1.5)
Belgium (Flemish)		19 (1.6)	23 (1.4)	4 (2.2)
Hungary		13 (1.1)	16 (1.2)	3 (1.6)
Slovenia		13 (1.1)	15 (1.2)	2 (1.5)
International Avg. §		14 (0.4)	15 (0.3)	1 (0.4)
Russian Federation		12 (1.4)	15 (1.8)	2 (2.2)
Netherlands		12 (2.1)	14 (2.3)	3 (3.1)
Slovak Republic		14 (1.2)	14 (1.4)	-1 (1.8)
Australia		11 (1.2)	12 (1.8)	1 (2.2)
Canada		9 (0.9)	12 (1.1)	3 (1.4)
Czech Republic		19 (2.1)	11 (1.4)	-8 (2.5)
Bulgaria		19 (2.0)	11 (2.3)	-8 (3.0)
United States		6 (0.9)	9 (1.0)	3 (1.4)
New Zealand		8 (1.2)	8 (1.2)	0 (1.7)
Latvia (LSS)		5 (0.8)	7 (0.9)	3 (1.2)
England		8 (1.2)	7 (0.9)	0 (1.6)
Italy		7 (0.8)	6 (1.0)	-1 (1.2)
Romania		5 (0.8)	5 (1.1)	0 (1.3)
Lithuania		3 (0.5)	4 (0.7)	1 (0.9)
Cyprus		4 (0.4)	3 (0.4)	-1 (0.6)
Iran, Islamic Rep.		0 (0.3)	1 (0.2)	0 (0.4)
	0 25 50 75 100			
Countries with Unapproved Sampling Procedures at the Classroom Level in 1995				
Israel		8 (1.5)	6 (0.7)	-3 (1.6)
South Africa		0 (0.2)	0 (0.2)	0 (0.3)
Thailand		10 (2.1)	4 (0.8)	-5 (2.3)



1999 significantly higher than 1995 ▲

No significant difference between 1995 and 1999 ●

1999 significantly lower than 1995 ▼

Significance tests adjusted for multiple comparisons

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

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

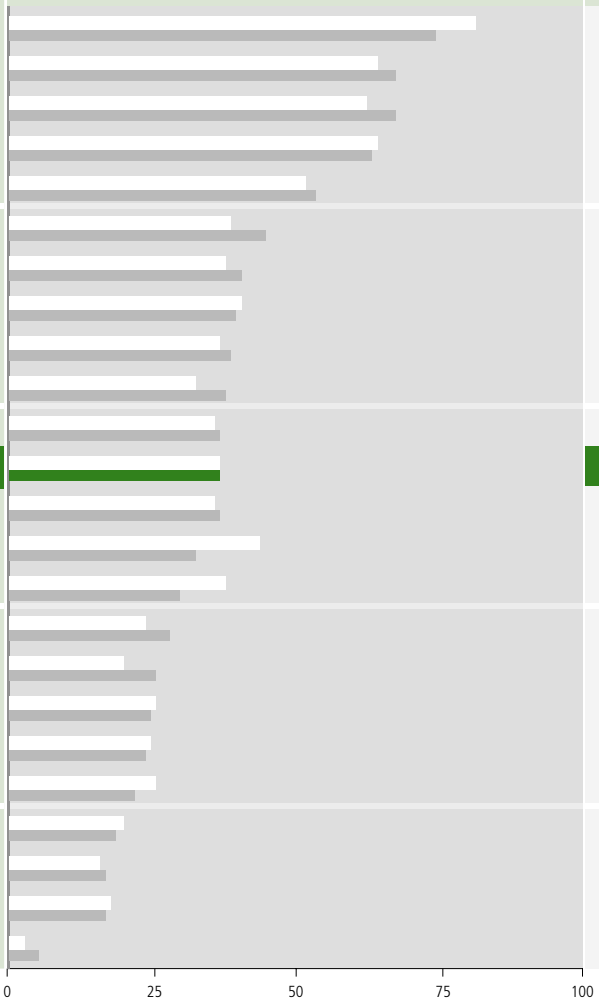
Trend notes: Because coverage fell below 65% in 1995 and 1999, Latvia is annotated LSS for Latvian-Speaking Schools only. Lithuania tested later in 1999 than in 1995, at the beginning of the next school year. In 1995, Italy and Israel were unable to cover their International Desired Population; 1999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

Exhibit 1.8 Trends in Percentages of Students Reaching the TIMSS 1999 Upper Quarter International Benchmark of Mathematics Achievement

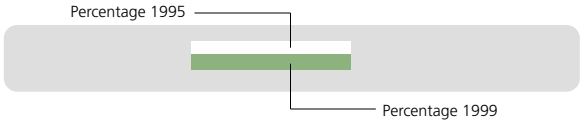
TIMSS 1999 8th grade Mathematics

	Percentages of Students At or Above the Upper Quarter International Benchmark in 1995 and 1999	1995 Percentage of Students	1999 Percentage of Students	1995-1999 Difference
Singapore		82 (1.9)	75 (2.7)	-7 (3.4)
Korea, Rep. of		65 (1.0)	68 (0.9)	3 (1.4)
Hong Kong, SAR		63 (3.2)	68 (2.4)	5 (4.0)
Japan		65 (0.9)	64 (0.9)	-1 (1.4)
Belgium (Flemish)		52 (2.8)	54 (1.7)	3 (3.2)
Netherlands		39 (3.0)	45 (4.1)	6 (5.2)
Hungary		38 (1.6)	41 (1.9)	3 (2.6)
Slovak Republic		41 (1.6)	40 (2.3)	-1 (2.7)
Slovenia		37 (1.6)	39 (1.4)	2 (2.1)
Canada		33 (1.3)	38 (1.5)	5 (1.9)
Australia		36 (1.9)	37 (2.7)	1 (3.3)
International Avg. §		37 (0.5)	37 (0.5)	0 (0.6)
Russian Federation		36 (3.1)	37 (2.8)	0 (4.1)
Czech Republic		44 (2.5)	33 (2.1)	-12 (3.3) ▼
Bulgaria		38 (2.7)	30 (3.0)	-8 (4.1)
United States		24 (1.9)	28 (1.6)	4 (2.5)
Latvia (LSS)		20 (1.5)	26 (1.8)	6 (2.2)
New Zealand		26 (2.1)	25 (2.4)	-1 (3.2)
England		25 (1.5)	24 (1.9)	-2 (2.4)
Italy		26 (1.6)	22 (1.8)	-4 (2.4)
Romania		20 (1.6)	19 (1.9)	-1 (2.4)
Lithuania		16 (1.4)	17 (2.0)	1 (2.6)
Cyprus		18 (0.9)	17 (0.8)	-1 (1.3)
Iran, Islamic Rep.		3 (0.6)	5 (0.8)	2 (1.0)



Countries with Unapproved Sampling Procedures at the Classroom Level in 1995

Israel	31 (2.9)	21 (1.6)	-10 (3.3)
South Africa	2 (0.8)	1 (0.4)	-1 (0.9)
Thailand	31 (3.3)	16 (1.8)	-16 (3.7) ▼



1999 significantly higher than 1995 ▲

No significant difference between 1995 and 1999

1999 significantly lower than 1995 ▼

Significance tests adjusted for multiple comparisons

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

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

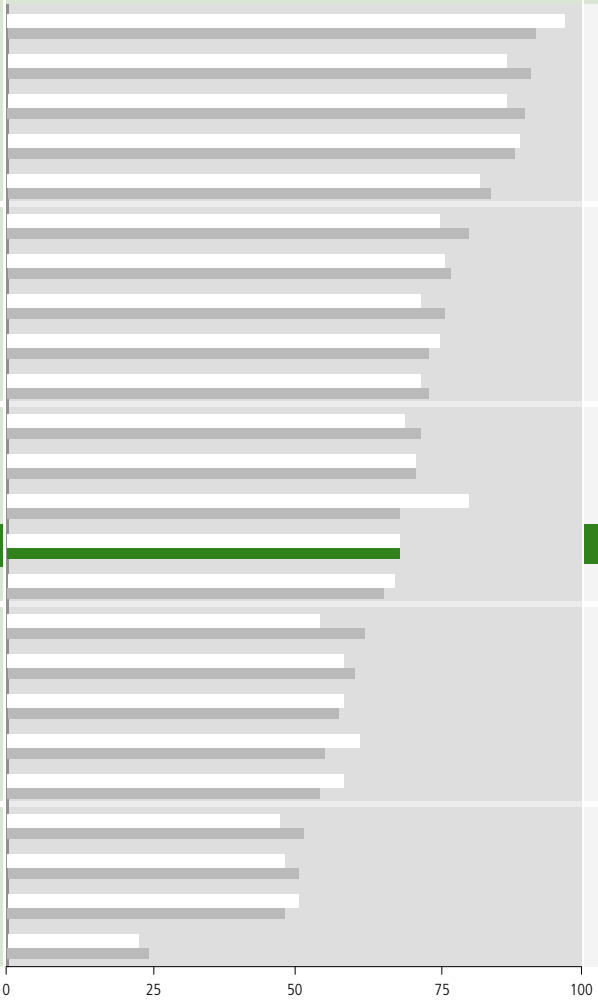
Trend notes: Because coverage fell below 65% in 1995 and 1999, Latvia is annotated LSS for Latvian-Speaking Schools only. Lithuania tested later in 1999 than in 1995, at the beginning of the next school year. In 1995, Italy and Israel were unable to cover their International Desired Population; 1999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

Exhibit 1.9 Trends in Percentages of Students Reaching the TIMSS 1999 Median International Benchmark of Mathematics Achievement

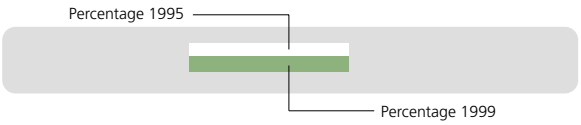
TIMSS 1999 8th grade Mathematics

	Percentages of Students At or Above the Median International Benchmark in 1995 and 1999	1995 Percentage of Students	1999 Percentage of Students	1995-1999 Difference	
Singapore		98 (0.4)	93 (1.3)	-5 (1.3)	▼
Hong Kong, SAR		88 (2.2)	92 (1.5)	4 (2.6)	●
Korea, Rep. of		88 (0.7)	91 (0.5)	3 (0.9)	●
Japan		90 (0.5)	89 (0.5)	-1 (0.7)	●
Belgium (Flemish)		83 (2.6)	85 (1.4)	2 (3.0)	●
Netherlands		76 (2.9)	81 (3.5)	4 (4.6)	●
Slovak Republic		77 (1.4)	78 (1.8)	1 (2.2)	●
Canada		73 (1.2)	77 (1.3)	4 (1.5)	●
Slovenia		76 (1.4)	74 (1.4)	-2 (2.0)	●
Hungary		73 (1.6)	74 (1.6)	1 (2.2)	●
Australia		70 (1.7)	73 (2.4)	3 (2.9)	●
Russian Federation		72 (2.5)	72 (2.7)	0 (3.8)	●
Czech Republic		81 (1.5)	69 (2.3)	-11 (2.7)	▼
International Avg. §		69 (0.4)	69 (0.5)	0 (0.6)	●
Bulgaria		68 (2.5)	66 (2.6)	-2 (3.6)	●
Latvia (LSS)		55 (1.8)	63 (2.0)	8 (2.6)	▲
United States		59 (2.4)	61 (1.9)	2 (3.0)	●
England		59 (1.4)	58 (2.1)	-1 (2.6)	●
New Zealand		62 (2.3)	56 (2.5)	-6 (3.4)	●
Italy		59 (1.8)	55 (2.5)	-4 (3.0)	●
Lithuania		48 (2.3)	52 (2.4)	4 (3.2)	●
Cyprus		49 (1.3)	51 (1.1)	2 (1.7)	●
Romania		51 (2.2)	49 (2.6)	-2 (3.4)	●
Iran, Islamic Rep.		23 (1.7)	25 (1.7)	2 (2.2)	●



Countries with Unapproved Sampling Procedures at the Classroom Level in 1995

Israel	71 (2.8)	54 (2.2)	-17 (3.6)	▼
South Africa	7 (2.1)	5 (1.0)	-2 (2.4)	●
Thailand	69 (2.5)	44 (2.6)	-25 (3.6)	▼



▲ 1999 significantly higher than 1995

● No significant difference between 1995 and 1999

▼ 1999 significantly lower than 1995

Significance tests adjusted for multiple comparisons

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

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

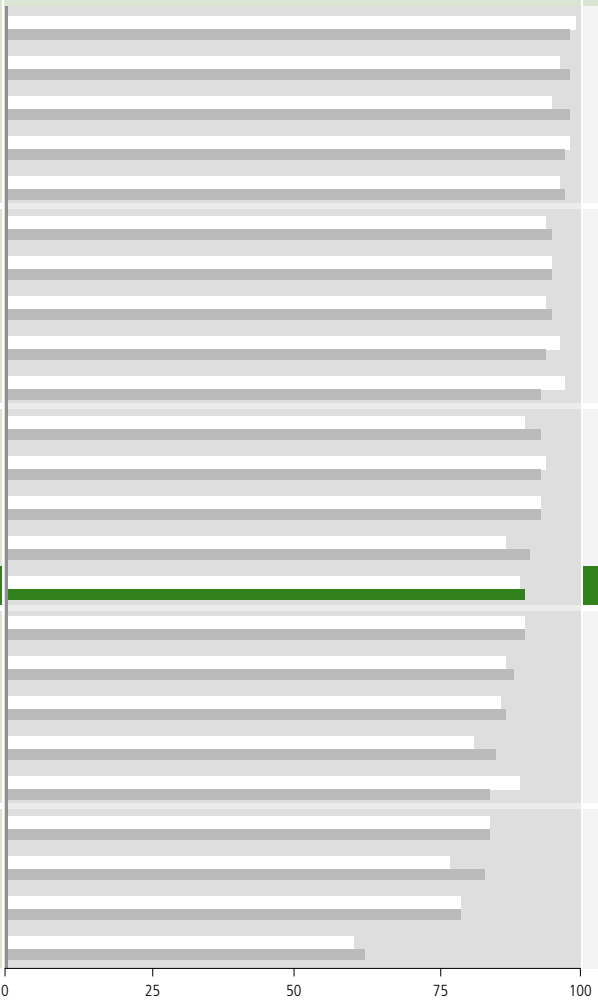
Trend notes: Because coverage fell below 65% in 1995 and 1999, Latvia is annotated LSS for Latvian-Speaking Schools only. Lithuania tested later in 1999 than in 1995, at the beginning of the next school year. In 1995, Italy and Israel were unable to cover their International Desired Population; 1999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

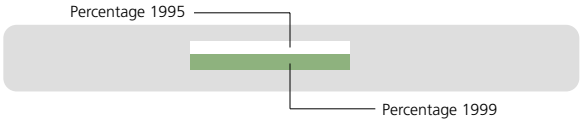
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Exhibit 1.10 Trends in Percentages of Students Reaching the TIMSS 1999 Lower Quarter International Benchmark of Mathematics Achievement

TIMSS 1999 8th grade Mathematics

	Percentages of Students At or Above the Lower Quarter International Benchmark in 1995 and 1999	1995 Percentage of Students	1999 Percentage of Students	1995-1999 Difference	
Singapore		100 (0.0)	99 (0.3)	-1 (0.3)	●
Korea, Rep. of		97 (0.4)	99 (0.2)	1 (0.5)	●
Hong Kong, SAR		96 (1.1)	99 (0.6)	2 (1.2)	●
Japan		99 (0.2)	98 (0.3)	0 (0.3)	●
Belgium (Flemish)		97 (1.1)	98 (0.7)	1 (1.3)	●
Netherlands		95 (1.6)	96 (1.3)	1 (2.0)	●
Slovak Republic		96 (0.5)	96 (0.6)	0 (0.7)	●
Canada		95 (0.5)	96 (0.6)	1 (0.8)	●
Slovenia		97 (0.6)	95 (0.7)	-3 (0.9)	●
Czech Republic		98 (0.4)	94 (1.1)	-4 (1.1)	▼
Australia		91 (0.9)	94 (0.8)	3 (1.2)	●
Hungary		95 (0.8)	94 (1.0)	-1 (1.2)	●
Russian Federation		94 (1.1)	94 (1.2)	0 (1.7)	●
Latvia (LSS)		88 (1.4)	92 (1.0)	4 (1.6)	●
International Avg. §		90 (0.3)	91 (0.3)	1 (0.4)	●
Bulgaria		91 (1.0)	91 (1.3)	0 (1.6)	●
England		88 (1.1)	89 (1.3)	1 (1.6)	●
United States		87 (1.5)	88 (1.0)	1 (1.8)	●
Lithuania		82 (1.7)	86 (1.8)	4 (2.5)	●
New Zealand		90 (1.3)	85 (1.5)	-4 (2.0)	●
Italy		85 (1.2)	85 (1.9)	0 (2.4)	●
Cyprus		78 (1.1)	84 (0.8)	6 (1.4)	▲
Romania		80 (1.6)	80 (2.1)	0 (2.7)	●
Iran, Islamic Rep.		61 (2.0)	63 (1.5)	1 (2.5)	●
Countries with Unapproved Sampling Procedures at the Classroom Level in 1995					
Israel		92 (1.4)	82 (2.1)	-10 (2.6)	▼
South Africa		15 (3.0)	14 (2.0)	-1 (3.6)	●
Thailand		93 (0.9)	81 (1.6)	-13 (1.9)	▼





1999 significantly higher than 1995 ▲

No significant difference between 1995 and 1999 ●

1999 significantly lower than 1995 ▼

Significance tests adjusted for multiple comparisons

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

§ 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.

What Are the Gender Differences in Mathematics Achievement?

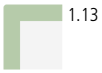
1.11 Exhibits 1.11 through 1.14 show gender differences in eighth-grade mathematics achievement in 1999, and also changes since 1995. Exhibit 1.11 presents average achievement separately for girls and boys for each of the TIMSS 1999 countries, as well as the difference between the means. Countries are shown in increasing order of this gender difference. The gender difference for each country is shown by a bar, indicating the amount of the difference, whether the direction of the difference favored girls or boys, and whether the difference is statistically significant (indicated by a darkened bar). On average across all countries there was a modest but significant difference favoring boys, although the situation varied considerably from country to country. In most countries the gender difference was negligible. The only countries with differences large enough to be statistically significant were Israel, the Czech Republic, the Islamic Republic of Iran, and Tunisia. The countries with the greatest differences were Iran and Tunisia, where the mean for boys exceeded the mean for girls by 24 to 25 scale-score points.

1.12 Exhibit 1.12 provides information on gender differences in mathematics achievement among students with high performance compared to those in the middle of the achievement distribution. For each country, score levels were computed for the highest-scoring 25 percent of students, called the upper quarter level, and for the top-scoring 50 percent of students, called the median level. The percentages of girls and boys in each country reaching each of the two levels were computed. For equitable performance, 25 percent each of girls and boys should have reached the upper quarter level, and 50 percent each the median level.

On average across countries, 23 percent of girls compared with 27 percent of boys reached the upper quarter level, and 49 percent of girls compared with 51 percent of boys reached the median level. These gender differences favoring boys, although small, were statistically significant. Despite this, in nearly all participating countries the percentages of girls and boys reaching the upper quarter and median levels were equivalent. In all but four countries, the percentages reaching the upper quarter and median levels were not significantly different, indicating that gender equity exists in most countries at these levels. However, in Israel, Tunisia, and the United States, the percentages of boys reaching the upper quarter level were significantly greater than the percentages of girls reaching

this level. In Tunisia, the percentage of boys reaching the median level was also significantly greater than the percentage of girls, whereas in the Philippines, the percentage of girls reaching level was greater (53 percent for girls vs. 46 percent for boys).

Achievement differences from 1995 to 1999 are presented separately for girls and for boys in Exhibit 1.13. Average mathematics achievement across countries for girls increased significantly in Korea only. Achievement for both girls and boys decreased significantly in the Czech Republic, Israel, and Thailand.



Taking the study of trends in gender differences one step further, Exhibit 1.14 presents the difference in average mathematics achievement between boys and girls in 1995 and in 1999, and shows whether the difference has changed. Korea is the one country showing a significant decrease in the gender difference, from 17 to 5 scale-score points favoring boys. Fortunately, no country showed a significant increase in gender differences in mathematics performance.

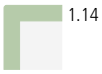
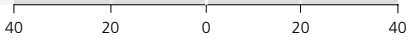


Exhibit 1.11 Average Mathematics Achievement by Gender

TIMSS 1999 8th grade Mathematics

	Girls Average Scale Score	Boys Average Scale Score	Difference (Absolute Value)	Gender Difference: Girls Scored Higher	Gender Difference: Boys Scored Higher
Bulgaria	510 (5.9)	511 (6.9)	0 (5.5)		
Macedonia, Rep. of	446 (5.3)	447 (4.3)	0 (4.5)		
Russian Federation	526 (6.0)	526 (6.4)	1 (3.3)		
Slovenia	529 (3.0)	531 (3.6)	1 (3.6)		
Turkey	428 (4.7)	429 (4.4)	2 (2.8)		
Australia	524 (5.7)	526 (5.7)	2 (6.0)		
Hong Kong, SAR †	583 (4.7)	581 (5.9)	2 (6.5)		
Singapore	603 (6.1)	606 (7.5)	2 (5.7)		
Lithuania 1‡	480 (4.7)	483 (4.8)	3 (4.0)		
Moldova	468 (4.1)	471 (4.7)	3 (4.1)		
Canada	529 (2.5)	533 (3.2)	3 (2.9)		
Finland	519 (3.0)	522 (3.5)	3 (3.6)		
Chinese Taipei	583 (3.9)	587 (5.3)	4 (4.6)		
Thailand	469 (5.7)	465 (5.5)	4 (4.9)		
Belgium (Flemish) †	560 (7.2)	556 (8.3)	4 (14.2)		
Cyprus	479 (2.1)	474 (2.7)	4 (3.3)		
International Avg.	485 (0.8)	489 (0.9)	4 (1.1)		
Malaysia	521 (4.7)	517 (6.0)	5 (6.1)		
Indonesia	401 (5.4)	405 (5.0)	5 (3.3)		
Slovak Republic	532 (4.2)	536 (4.5)	5 (3.6)		
Netherlands †	538 (7.6)	542 (7.0)	5 (3.0)		
Romania	475 (6.3)	470 (6.2)	5 (4.7)		
Korea, Rep. of	585 (3.1)	590 (2.2)	5 (3.7)		
Latvia (LSS) 1	502 (3.8)	508 (4.4)	5 (4.5)		
Hungary	529 (4.0)	535 (4.3)	6 (3.7)		
Jordan	431 (4.7)	425 (5.9)	7 (8.1)		
United States	498 (3.9)	505 (4.8)	7 (3.4)		
New Zealand	495 (5.5)	487 (7.6)	7 (8.3)		
Japan	575 (2.4)	582 (2.3)	8 (3.3)		
Chile	388 (4.3)	397 (5.8)	9 (5.5)		
Italy	475 (4.5)	484 (4.3)	9 (4.2)		
Philippines	352 (6.9)	337 (6.5)	15 (6.1)		
South Africa	267 (7.5)	283 (7.3)	16 (5.9)		
Israel 2	459 (4.2)	474 (4.8)	16 (4.6)		
Czech Republic	512 (4.0)	528 (5.8)	17 (5.0)		
Morocco	326 (5.3)	344 (4.1)	17 (7.7)		
England †	487 (5.4)	505 (5.0)	19 (6.5)		
Iran, Islamic Rep.	408 (4.2)	432 (4.8)	24 (6.5)		
Tunisia	436 (2.4)	460 (2.9)	25 (2.2)		



Gender difference statistically significant

Gender difference not statistically significant

Significance tests adjusted for multiple comparisons

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 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 the next school year.

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

Exhibit 1.12 Percentages of Girls and Boys Reaching Each Country's Own Upper Quarter and Median Levels of Mathematics Achievement

TIMSS 1999 8th grade Mathematics

	Upper Quarter		Median	
	Percent of Girls	Percent of Boys	Percent of Girls	Percent of Boys
Australia	24 (2.8)	26 (2.6)	49 (3.2)	51 (3.0)
Belgium (Flemish) †	25 (2.5)	25 (2.5)	50 (3.1)	50 (3.5)
Bulgaria	24 (3.1)	26 (3.5)	51 (3.0)	49 (3.2)
Canada	24 (1.2)	26 (1.4)	49 (1.3)	51 (1.9)
Chile	23 (1.9)	27 (2.6)	48 (2.2)	52 (2.4)
Chinese Taipei	22 (1.5)	28 (1.9)	49 (1.9)	51 (2.1)
Cyprus	24 (1.4)	26 (1.4)	50 (1.4)	50 (1.5)
Czech Republic	22 (1.6)	28 (2.5)	46 (2.4)	54 (2.9)
England †	20 (2.7)	30 (2.4)	46 (3.0)	54 (2.7)
Finland	23 (1.8)	27 (2.2)	49 (1.9)	51 (2.2)
Hong Kong, SAR †	24 (2.5)	26 (2.4)	50 (2.9)	50 (3.1)
Hungary	24 (1.9)	26 (1.8)	48 (2.2)	52 (2.1)
Indonesia	25 (1.6)	25 (1.7)	49 (2.1)	52 (2.1)
Iran, Islamic Rep.	19 (2.0)	29 (2.2)	43 (2.5)	55 (2.5)
Israel [2]	21 (1.5)	29 (1.7) ▲	47 (2.0)	53 (2.2)
Italy	23 (1.8)	28 (1.7)	47 (2.2)	53 (2.2)
Japan	23 (1.3)	27 (1.1)	47 (1.5)	53 (1.3)
Jordan	24 (1.7)	26 (2.1)	51 (2.0)	49 (2.2)
Korea, Rep. of	24 (1.1)	26 (1.0)	48 (1.5)	52 (1.3)
Latvia (LSS) [1]	24 (1.9)	27 (2.1)	49 (2.2)	52 (2.2)
Lithuania [1‡]	24 (2.5)	26 (2.3)	50 (2.5)	50 (2.5)
Macedonia, Rep. of	26 (1.8)	24 (1.6)	51 (2.4)	49 (2.0)
Malaysia	26 (2.3)	24 (2.9)	52 (2.6)	48 (3.4)
Moldova	24 (1.6)	27 (2.1)	50 (2.1)	51 (2.2)
Morocco	21 (1.7)	28 (1.5)	45 (2.2)	54 (1.7)
Netherlands †	24 (3.6)	26 (3.2)	48 (4.2)	52 (4.4)
New Zealand	26 (2.6)	24 (3.5)	52 (3.0)	48 (3.5)
Philippines	27 (2.7)	23 (2.5)	53 (2.7) ▲	46 (2.5)
Romania	25 (2.3)	25 (2.4)	51 (2.8)	49 (2.8)
Russian Federation	24 (2.4)	26 (2.5)	49 (2.9)	51 (3.2)
Singapore	23 (3.1)	26 (3.4)	49 (3.6)	51 (4.2)
Slovak Republic	23 (2.0)	27 (2.2)	48 (2.6)	52 (2.7)
Slovenia	24 (1.6)	26 (1.5)	49 (1.7)	51 (2.0)
South Africa	23 (2.7)	27 (2.3)	47 (2.5)	53 (2.1)
Thailand	25 (2.6)	24 (2.4)	50 (2.9)	50 (2.7)
Tunisia	19 (1.4)	31 (1.6) ▲	42 (1.7)	59 (1.6) ▲
Turkey	25 (1.8)	25 (1.9)	50 (2.2)	50 (1.8)
United States	23 (1.3)	27 (1.9) ▲	49 (2.0)	51 (2.3)
International Avg.	23 (0.4)	27 (0.4) ▲	49 (0.4)	51 (0.4) ▲

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

▲ Significantly greater percentage 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 the next school year.

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

Exhibit 1.13 Trends in Average Mathematics Achievement by Gender

TIMSS 1999 8th grade Mathematics

Girls

	1995 Average Scale Score	1999 Average Scale Score	1995-1999 Difference	
Hong Kong, SAR	559 (7.0)	583 (4.7)	24 (8.4)	●
Latvia (LSS)	486 (4.0)	502 (3.8)	16 (5.4)	●
Netherlands	522 (6.6)	538 (7.6)	15 (10.2)	●
Korea, Rep. of	571 (3.0)	585 (3.1)	13 (4.3)	▲
United States	490 (4.7)	498 (3.9)	8 (6.1)	●
Lithuania	472 (4.6)	480 (4.7)	8 (6.7)	●
Cyprus	471 (2.6)	479 (2.1)	7 (3.3)	●
Belgium (Flemish)	553 (8.1)	560 (7.2)	7 (10.9)	●
Canada	522 (2.4)	529 (2.5)	7 (3.3)	●
Australia	520 (4.3)	524 (5.7)	4 (7.0)	●
International Avg. §	516 (1.0)	520 (1.0)	3 (1.5)	●
Iran, Islamic Rep.	405 (6.1)	408 (4.2)	3 (7.3)	●
Romania	473 (4.4)	475 (6.3)	2 (7.7)	●
Slovenia	527 (3.2)	529 (3.0)	2 (4.4)	●
Hungary	527 (3.6)	529 (4.0)	2 (5.4)	●
Russian Federation	524 (5.0)	526 (6.0)	2 (7.8)	●
Slovak Republic	532 (3.1)	532 (4.2)	-1 (5.3)	●
New Zealand	497 (5.3)	495 (5.5)	-2 (7.6)	●
Japan	577 (1.9)	575 (2.4)	-2 (3.0)	●
Italy	488 (4.5)	483 (5.5)	-5 (7.1)	●
Singapore	610 (4.9)	603 (6.1)	-7 (7.8)	●
England	495 (4.0)	487 (5.4)	-8 (6.8)	●
Czech Republic	539 (5.4)	512 (4.0)	-27 (6.6)	▼
Countries with Unapproved Sampling Procedures at the Classroom Level in 1995				
Israel	500 (7.0)	473 (5.1)	-27 (8.7)	▼
South Africa	264 (8.4)	267 (7.5)	4 (11.3)	●
Thailand	520 (7.4)	469 (5.7)	-51 (9.4)	▼

Boys

	1995 Average Scale Score	1999 Average Scale Score	1995-1999 Difference	
Latvia (LSS)	490 (4.2)	508 (4.4)	17 (6.2)	●
Canada	520 (3.0)	533 (3.2)	12 (4.5)	●
Lithuania	472 (4.6)	483 (4.8)	11 (6.7)	●
United States	495 (5.2)	505 (4.8)	10 (7.0)	●
Cyprus	465 (3.3)	474 (2.7)	10 (4.2)	●
Belgium (Flemish)	547 (8.7)	556 (8.3)	9 (12.0)	●
Australia	517 (5.0)	526 (5.7)	9 (7.5)	●
Hungary	527 (3.6)	535 (4.3)	8 (5.5)	●
Netherlands	534 (6.6)	542 (7.0)	8 (9.6)	●
England	500 (5.5)	505 (5.0)	5 (7.5)	●
Hong Kong, SAR	577 (7.2)	581 (5.9)	4 (9.4)	●
Russian Federation	523 (6.2)	526 (6.4)	3 (8.9)	●
Iran, Islamic Rep.	429 (4.7)	432 (4.8)	3 (6.6)	●
International Avg. §	522 (1.1)	524 (1.2)	2 (1.6)	●
Korea, Rep. of	588 (2.7)	590 (2.2)	1 (3.5)	●
Slovak Republic	536 (3.7)	536 (4.5)	1 (5.7)	●
Singapore	608 (4.7)	606 (7.5)	-2 (8.9)	●
Japan	585 (2.2)	582 (2.3)	-3 (3.0)	●
Slovenia	535 (3.1)	531 (3.6)	-4 (4.7)	●
Romania	475 (5.3)	470 (6.2)	-5 (8.2)	●
Italy	494 (3.7)	488 (5.4)	-6 (6.5)	●
New Zealand	505 (6.1)	487 (7.6)	-18 (9.9)	●
Czech Republic	552 (4.6)	528 (5.8)	-24 (7.4)	▼
Israel	530 (6.9)	490 (5.3)	-40 (8.7)	▼
South Africa	293 (12.7)	283 (7.3)	-10 (14.6)	●
Thailand	511 (6.1)	465 (5.5)	-46 (8.3)	▼

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

§ 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. Trends in gender data for Bulgaria are unavailable.

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

Exhibit 1.14 Trends in Gender Differences in Average Mathematics Achievement

TIMSS 1999 8th grade Mathematics

	1995			1999			Change in Gender Difference*
	Girls Average Scale Score	Boys Average Scale Score	Difference (Absolute Value)	Girls Average Scale Score	Boys Average Scale Score	Difference (Absolute Value)	
Australia	520 (4.3)	517 (5.0)	3 (5.3)	524 (5.7)	526 (5.7)	2 (6.0)	⬌
Belgium (Flemish)	553 (8.1)	547 (8.7)	6 (12.2)	560 (7.2)	556 (8.3)	4 (14.2)	⬌
Canada	522 (2.4)	520 (3.0)	2 (3.2)	529 (2.5)	533 (3.2)	3 (2.9)	⬌
Cyprus	471 (2.6)	465 (3.3)	7 (3.9)	479 (2.1)	474 (2.7)	4 (3.3)	⬌
Czech Republic	539 (5.4)	552 (4.6) ▲	14 (3.9)	512 (4.0)	528 (5.8) ▲	17 (5.0)	⬌
England	495 (4.0)	500 (5.5)	6 (7.7)	487 (5.4)	505 (5.0)	19 (6.5)	⬌
Hong Kong, SAR	559 (7.0)	577 (7.2)	17 (7.7)	583 (4.7)	581 (5.9)	2 (6.5)	⬌
Hungary	527 (3.6)	527 (3.6)	0 (3.5)	529 (4.0)	535 (4.3)	6 (3.7)	⬌
Iran, Islamic Rep.	405 (6.1)	429 (4.7) ▲	24 (7.8)	408 (4.2)	432 (4.8) ▲	24 (6.5)	⬌
Italy	488 (4.5)	494 (3.7)	5 (4.8)	483 (5.5)	488 (5.4)	5 (4.8)	⬌
Japan	577 (1.9)	585 (2.2) ▲	8 (2.7)	575 (2.4)	582 (2.3)	8 (3.3)	⬌
Korea, Rep. of	571 (3.0)	588 (2.7) ▲	17 (4.2)	585 (3.1)	590 (2.2)	5 (3.7)	⬊
Latvia (LSS)	486 (4.0)	490 (4.2)	4 (4.0)	502 (3.8)	508 (4.4)	5 (4.5)	⬌
Lithuania	472 (4.6)	472 (4.6)	0 (4.1)	480 (4.7)	483 (4.8)	3 (4.0)	⬌
Netherlands	522 (6.6)	534 (6.6) ▲	12 (3.9)	538 (7.6)	542 (7.0)	5 (3.0)	⬌
New Zealand	497 (5.3)	505 (6.1)	8 (6.6)	495 (5.5)	487 (7.6)	7 (8.3)	⬌
Romania	473 (4.4)	475 (5.3)	2 (3.4)	475 (6.3)	470 (6.2)	5 (4.7)	⬌
Russian Federation	524 (5.0)	523 (6.2)	1 (3.5)	526 (6.0)	526 (6.4)	1 (3.3)	⬌
Singapore	610 (4.9)	608 (4.7)	2 (5.3)	603 (6.1)	606 (7.5)	2 (5.7)	⬌
Slovak Republic	532 (3.1)	536 (3.7)	3 (3.1)	532 (4.2)	536 (4.5)	5 (3.6)	⬌
Slovenia	527 (3.2)	535 (3.1)	8 (3.0)	529 (3.0)	531 (3.6)	1 (3.6)	⬌
United States	490 (4.7)	495 (5.2)	5 (3.1)	498 (3.9)	505 (4.8)	7 (3.4)	⬌
International Avg. §	516 (1.0)	522 (1.1) ▲	6 (1.1)	520 (1.0)	524 (1.1) ▲	5 (1.2)	⬌
Countries with Unapproved Sampling Procedures at the Classroom Level in 1995							
Israel	500 (7.0)	530 (6.9) ▲	29 (5.8)	473 (5.1)	490 (5.3) ▲	17 (4.7)	⬌
South Africa	264 (8.4)	293 (12.7)	29 (10.9)	267 (7.5)	283 (7.3)	16 (5.9)	⬌
Thailand	520 (7.4)	511 (6.1)	9 (7.0)	469 (5.7)	465 (5.5)	4 (4.9)	⬌

▲ Significantly higher than other gender

Significance tests adjusted for multiple comparisons

Increased ⬈

Decreased ⬊

No change ⬌

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

* Indicates whether 1999 gender difference is significantly different than 1995 gender difference.

§ 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. Trends in gender data for Bulgaria are unavailable.

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