

International Comparisons: Mathematics and Science Achievement at Grades 4 and 8

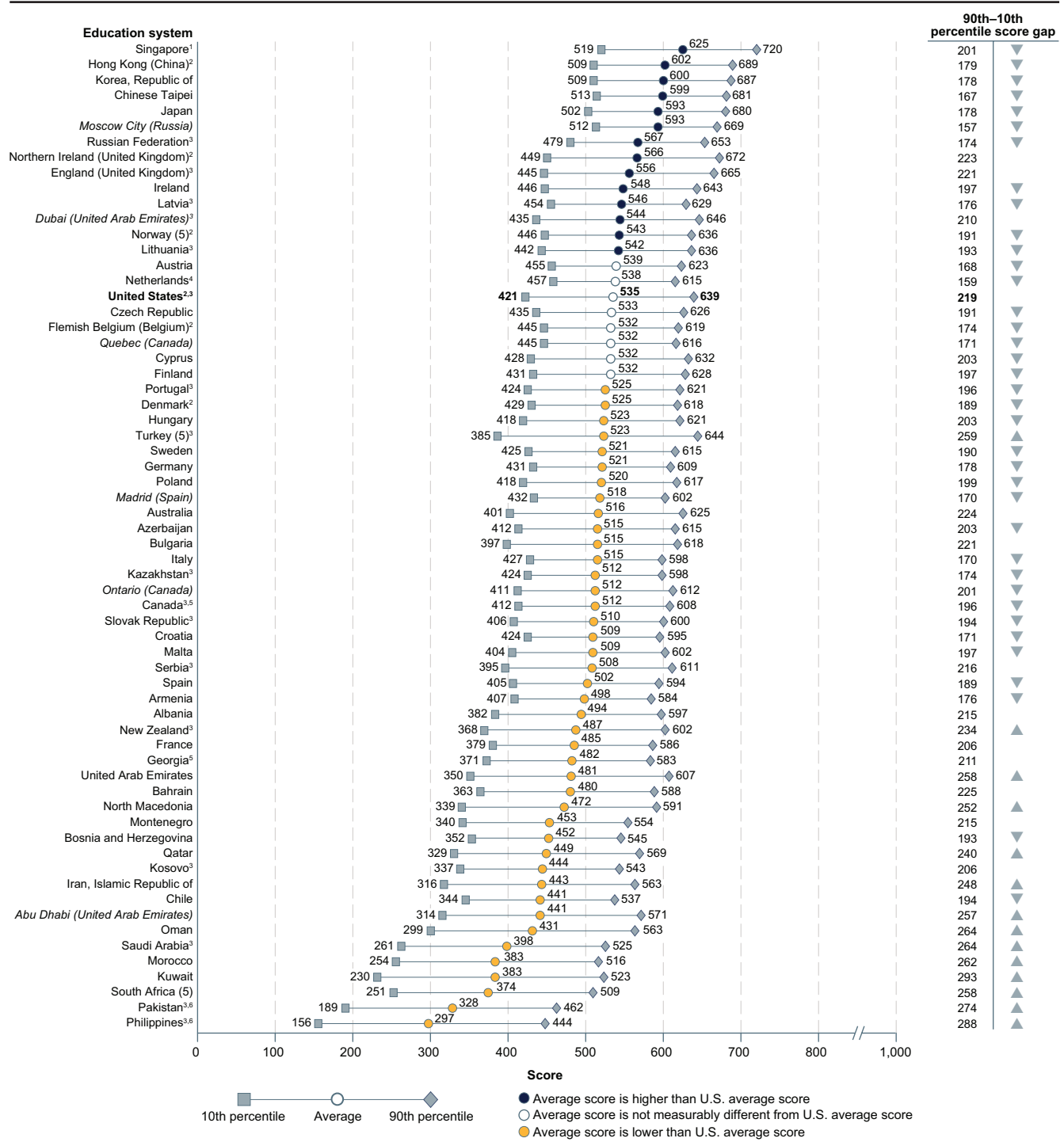
According to the 2019 Trends in International Mathematics and Science Study (TIMSS), the United States scored in the top quarter of participating education systems in both mathematics and science at both the 4th and 8th grades. While some participating education systems had a higher TIMSS 2019 score than the United States, none of these education systems had a wider score gap between their high and low performers than the United States.

The Trends in International Mathematics and Science Study (TIMSS) is an international comparative study that has measured trends in mathematics and science achievement at the 4th and 8th grade every 4 years since 1995. These assessments are coordinated by the TIMSS & PIRLS¹ International Study Center at Boston College, under the auspices of the International Association for the Evaluation of Educational Achievement (IEA), an international organization of national research institutions and government agencies.

In 2019, TIMSS assessed the mathematics and science skills of 4th-graders in 64 education systems and of

8th-graders in 46 education systems. Education systems include member countries of the IEA (countries that are complete, independent, political entities, as well as subnational entities) and benchmarking participants (subnational entities that are not IEA member countries).² This indicator compares the U.S. average scores in both subjects with those of other education systems. It also looks at “score gaps” between the high- and low-performers in mathematics and science. Score gaps are the differences between the scores of students in the 90th and 10th percentiles of the distribution in a given subject. These gaps can be seen as an indicator of equity within an education system.

Figure 1. Average scores and 10th and 90th percentile scores of 4th-grade students on the TIMSS mathematics scale and percentile score gaps, by education system: 2019



▲ 90th to 10th percentile score gap is higher than the U.S. score gap.
▼ 90th to 10th percentile score gap is lower than the U.S. score gap.

¹ National Defined Population covers less than 90 percent of the National Target Population (but at least 77 percent), as defined by TIMSS.
² Met guidelines for sample participation rates only after replacement schools were included.
³ National Defined Population covers 90 to 95 percent of the National Target Population, as defined by TIMSS.
⁴ Did not satisfy guidelines for sample participation rates.
⁵ National Target Population does not include all of the International Target Population, as defined by TIMSS.
⁶ Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 15 percent but does not exceed 25 percent.

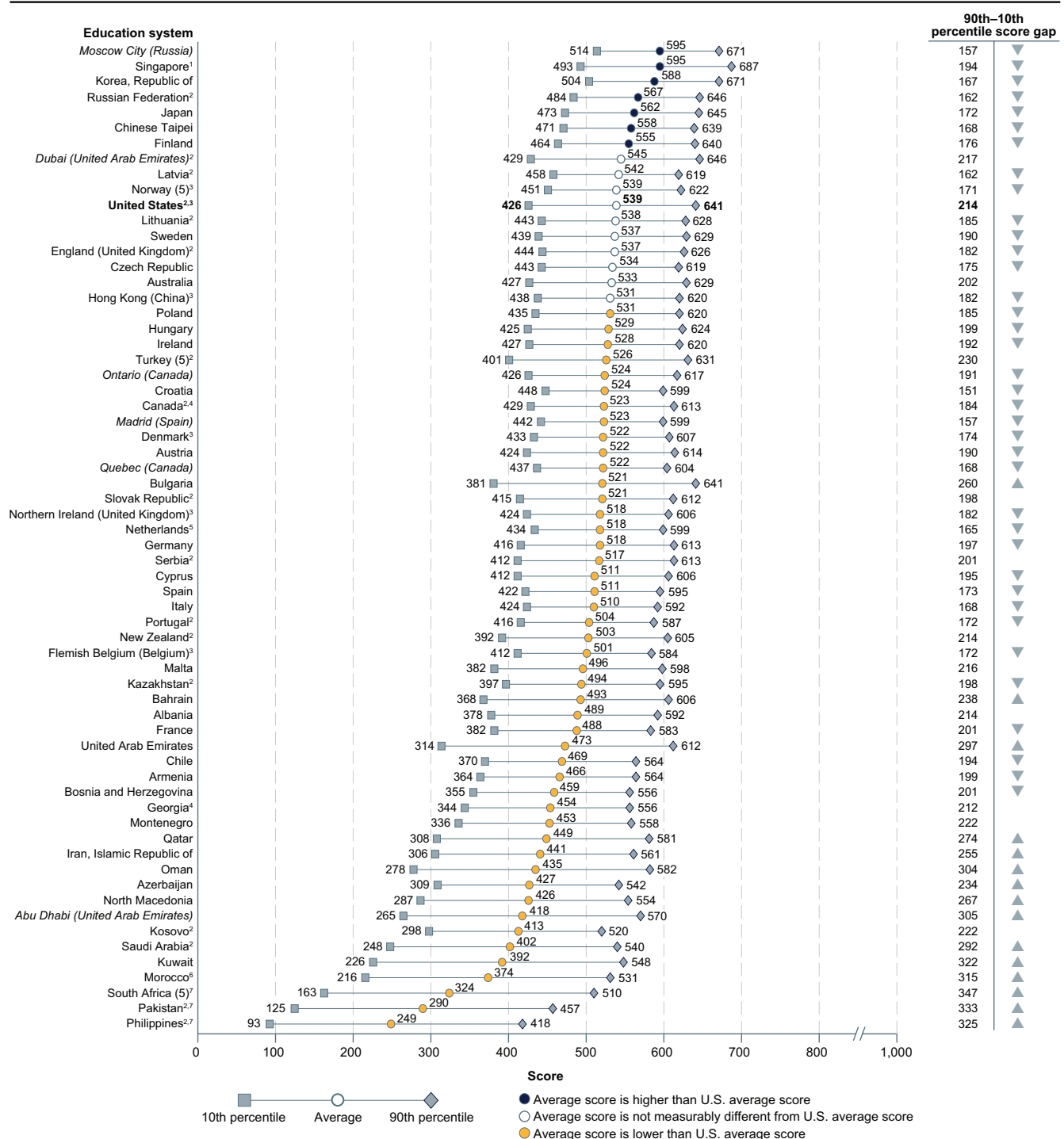
NOTE: In addition to average scores, this figure shows the scores for the (a) 10th percentile—the bottom 10 percent of students; and (b) 90th percentile—the top 10 percent of students. The percentile ranges are specific to each education system's distribution of scores, enabling users to compare scores across education systems. Education systems are ordered by average score. Education systems that are not countries are designated by their country in parentheses. Benchmarking participants are indicated with italics. For education systems with a "(5)" after their name, 5 indicates the years of formal schooling; these education systems chose to administer TIMSS at a different grade than other education systems (4 years of formal schooling). The TIMSS scale centerpoint is set at 500 and represents the mean of the overall achievement distribution in 1995. The standard deviation is set to 100. The TIMSS scale is the same in each administration (0 to 1,000 points); thus, a value of 500 in 2019 equals 500 in 1995. Although rounded numbers are displayed, data shown are based on unrounded estimates.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2019. See TIMSS 2019 U.S. Highlights Web Report, table M2a.

At grade 4, the U.S. average mathematics score (535) in 2019 was higher than the TIMSS scale “centerpoint” (500).³ Fourteen education systems had higher average mathematics scores than the United States, 7 had scores that were not measurably different, and 42 education systems had lower average scores. The 14 education systems with average mathematics scores above the U.S. score were Singapore, Hong Kong (China), the Republic of Korea, Chinese Taipei, Japan, Moscow City (Russia), Russian Federation, Northern Ireland (United Kingdom), England (United Kingdom), Ireland, Latvia, Dubai (United Arab Emirates), Norway, and Lithuania.

In the United States, the mathematics cut score for high-performing 4th-graders (i.e., those at the 90th percentile) was 639 points, and the cut score for low-performing 4th-graders (i.e., those at the 10th percentile) was 421 points. The difference between these two cut scores (219 points) is the mathematics score gap between the high- and low-performing U.S. 4th-graders. The U.S. score gap was larger than the corresponding score gaps in 37 education systems and smaller than the gaps in 14 education systems. Score gaps ranged from 157 points (the smallest) in Moscow City (Russia) to 293 points (the largest) in Kuwait.

Figure 2. Average scores and 10th and 90th percentile scores of 4th-grade students on the TIMSS science scale and percentile score gaps, by education system: 2019



▲ 90th to 10th percentile score gap is higher than the U.S. score gap.

▼ 90th to 10th percentile score gap is lower than the U.S. score gap.

¹ National Defined Population covers less than 90 percent of the National Target Population (but at least 77 percent), as defined by TIMSS.

² National Defined Population covers 90 to 95 percent of the National Target Population, as defined by TIMSS.

³ Met guidelines for sample participation rates only after replacement schools were included.

⁴ National Target Population does not include all of the International Target Population, as defined by TIMSS.

⁵ Did not satisfy guidelines for sample participation rates.

⁶ Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 15 percent but does not exceed 25 percent.

⁷ Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 25 percent.

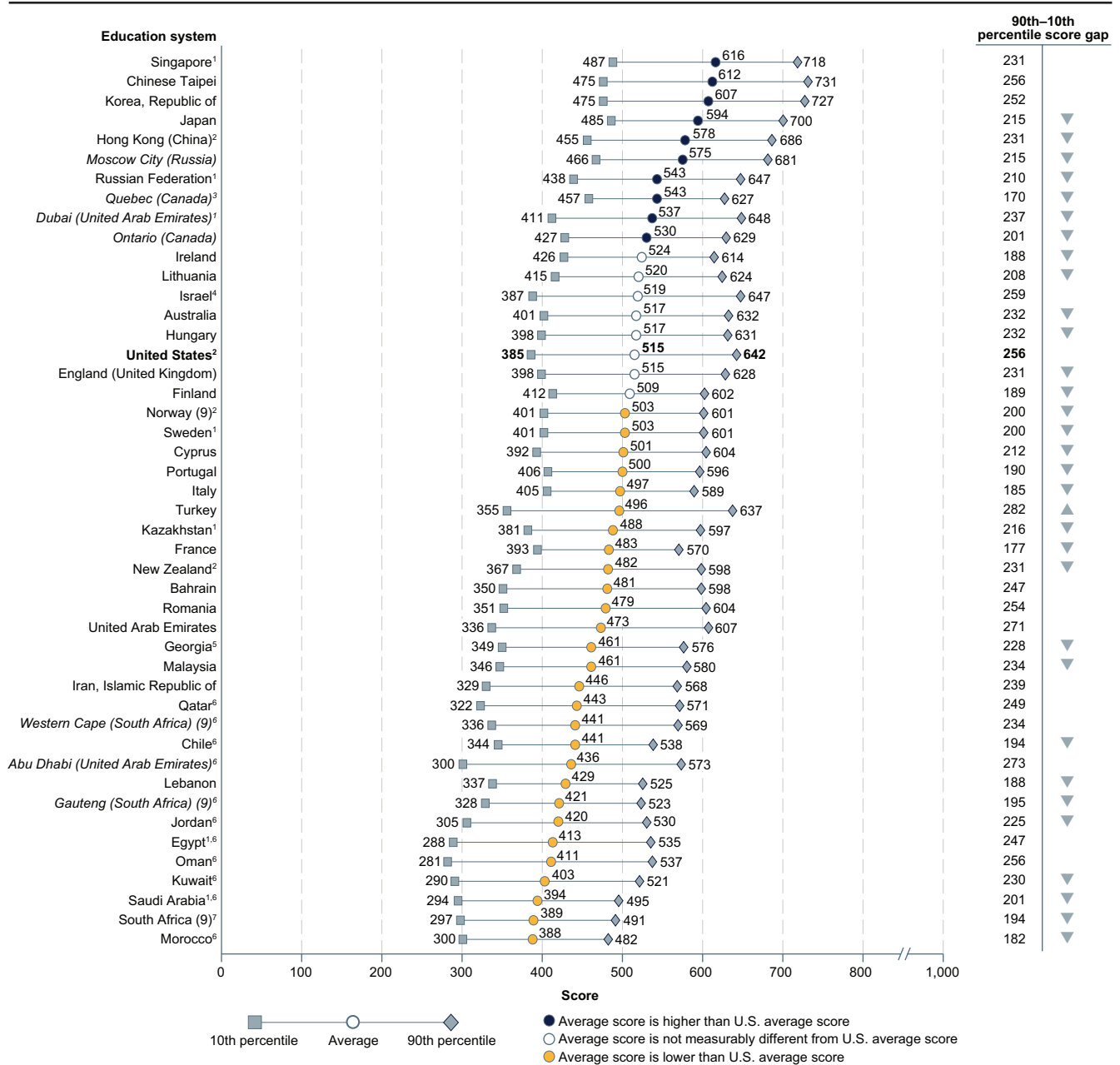
NOTE: In addition to average scores, this figure shows the scores for the (a) 10th percentile—the bottom 10 percent of students; and (b) 90th percentile—the top 10 percent of students. The percentile ranges are specific to each education system's distribution of scores, enabling users to compare scores across education systems. Education systems are ordered by average score. Education systems that are not countries are designated by their country in parentheses. Benchmarking participants are indicated with italics. For education systems with a "(5)" after their name, 5 indicates the years of formal schooling; these education systems chose to administer TIMSS at a different grade than other education systems (4 years of formal schooling). The TIMSS scale centerpoint is set at 500 and represents the mean of the overall achievement distribution in 1995. The standard deviation is set to 100. The TIMSS scale is the same in each administration (0 to 1,000 points); thus, a value of 500 in 2019 equals 500 in 1995. Although rounded numbers are displayed, data shown are based on unrounded estimates.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2019. See TIMSS 2019 U.S. Highlights Web Report, table S2a.

At grade 4, the U.S. average science score (539) in 2019 was also higher than the TIMSS scale “centerpoint” of 500. Seven education systems had higher average science scores than the United States, 9 had scores that were not measurably different, and 47 education systems had lower average scores. The 7 education systems with average science scores above the U.S. score were Moscow City (Russia), Singapore, the Republic of Korea, the Russian Federation, Japan, Chinese Taipei, and Finland.

In the United States, the science cut score for high-performing 4th-graders was 641 points, and the cut score for low-performing 4th-graders was 426 points. The difference between these two cut scores (214 points) is the science score gap between the high- and low-performing U.S. 4th-graders. The U.S. score gap was larger than the corresponding score gaps in 37 education systems and smaller than the gaps in 15 education systems. Score gaps ranged from 151 points (the smallest) in Croatia to 347 points (the largest) in South Africa.

Figure 3. Average scores and 10th and 90th percentile scores of 8th-grade students on the TIMSS mathematics scale and percentile score gaps, by education system: 2019



▲ 90th to 10th percentile score gap is higher than the U.S. score gap.
▼ 90th to 10th percentile score gap is lower than the U.S. score gap.

¹ National Defined Population covers 90 to 95 percent of the National Target Population, as defined by TIMSS.

² Met guidelines for sample participation rates only after replacement schools were included.

³ Nearly satisfied guidelines for sample participation rates after replacement schools were included.

⁴ National Defined Population covers less than 90 percent of the National Target Population (but at least 77 percent), as defined by TIMSS.

⁵ National Target Population does not include all of the International Target Population, as defined by TIMSS.

⁶ Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 15 percent but does not exceed 25 percent.

⁷ Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 25 percent.

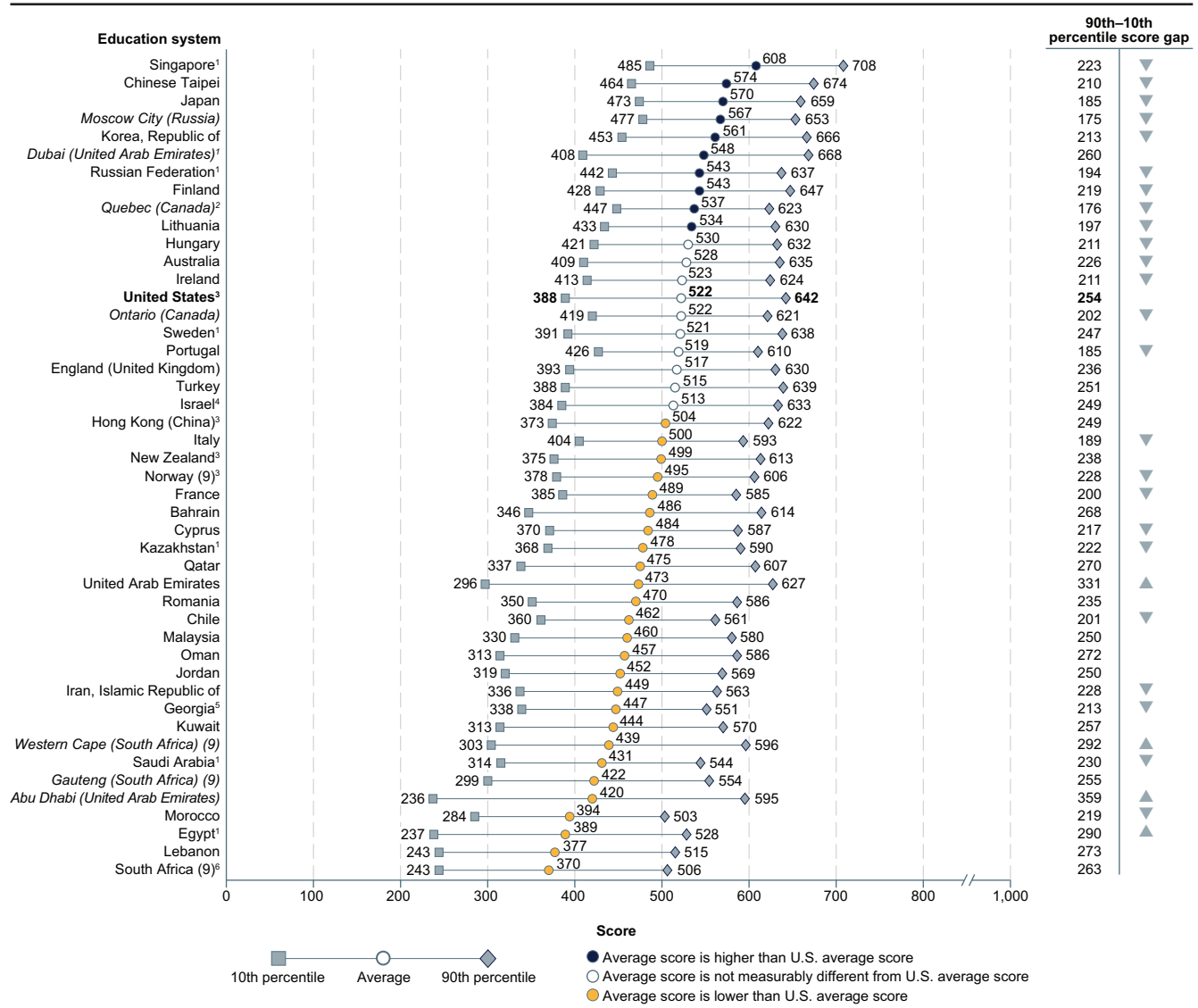
NOTE: In addition to average scores, this figure shows the scores for the (a) 10th percentile—the bottom 10 percent of students; and (b) 90th percentile—the top 10 percent of students. The percentile ranges are specific to each education system’s distribution of scores, enabling users to compare scores across education systems. Education systems are ordered by average score. Education systems that are not countries are designated by their country in parentheses. Benchmarking participants are indicated with italics. For education systems with a “(9)” after their name, 9 indicates the years of formal schooling; these education systems chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). The TIMSS scale centerpoint is set at 500 and represents the mean of the overall achievement distribution in 1995. The standard deviation is set to 100. The TIMSS scale is the same in each administration (0 to 1,000 points); thus, a value of 500 in 2019 equals 500 in 1995. Although rounded numbers are displayed, data shown are based on unrounded estimates.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2019. See TIMSS 2019 U.S. Highlights Web Report, table M2b.

At grade 8, the U.S. average mathematics score (515) in 2019 was higher than the TIMSS scale “centerpoint” of 500. Ten education systems had higher average mathematics scores than the United States, 7 had scores that were not measurably different, and 28 education systems had lower average scores. The 10 education systems with average mathematics scores above the U.S. score were Singapore, Chinese Taipei, the Republic of Korea, Japan, Hong Kong (China), Moscow City (Russia), the Russian Federation, Quebec (Canada), Dubai (United Arab Emirates), and Ontario (Canada).

In the United States, the mathematics cut score for high-performing 8th-graders was 642 points, and the cut score for low-performing 8th-graders was 385 points. The difference between these two cut scores (256 points) is the mathematics score gap between the high- and low-performing U.S. 8th-graders. The U.S. score gap was larger than the corresponding score gaps in 31 education systems and smaller than the gap in 1 education system. Score gaps ranged from 170 points (the smallest) in Quebec (Canada) to 282 points (the largest) in Turkey.

Figure 4. Average scores and 10th and 90th percentile scores of 8th-grade students on the TIMSS science scale and percentile score gaps, by education system: 2019



▲ 90th to 10th percentile score gap is higher than the U.S. score gap.
▼ 90th to 10th percentile score gap is lower than the U.S. score gap.

¹ National Defined Population covers 90 to 95 percent of the National Target Population, as defined by TIMSS.

² Nearly satisfied guidelines for sample participation rates after replacement schools were included.

³ Met guidelines for sample participation rates only after replacement schools were included.

⁴ National Defined Population covers less than 90 percent of the National Target Population (but at least 77 percent), as defined by TIMSS.

⁵ National Target Population does not include all of the International Target Population, as defined by TIMSS.

⁶ Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 15 percent but does not exceed 25 percent.

NOTE: In addition to average scores, this figure shows the scores for the (a) 10th percentile—the bottom 10 percent of students; and (b) 90th percentile—the top 10 percent of students. The percentile ranges are specific to each education system's distribution of scores, enabling users to compare scores across education systems. Education systems are ordered by average score. Education systems that are not countries are designated by their country in parentheses. Benchmarking participants are indicated with italics. For education systems with a "(9)" after their name, 9 indicates the years of formal schooling; these education systems chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). The TIMSS scale centerpoint is set at 500 and represents the mean of the overall achievement distribution in 1995. The standard deviation is set to 100. The TIMSS scale is the same in each administration (0 to 1,000 points); thus, a value of 500 in 2019 equals 500 in 1995. Although rounded numbers are displayed, data shown are based on unrounded estimates.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2019. See TIMSS 2019 U.S. Highlights Web Report, table S2b.

At grade 8, the U.S. average science score (522) in 2019 was higher than the TIMSS scale “centerpoint” of 500. Ten education systems had higher average science scores than the United States, 9 had scores that were not measurably different, and 26 education systems had lower average scores. The 10 education systems with average science scores above the U.S. score were Singapore, Chinese Taipei, Japan, Moscow City (Russia), the Republic of Korea, Dubai (United Arab Emirates), the Russian Federation, Finland, Quebec (Canada), and Lithuania.

In the United States, the science cut score for high-performing 8th-graders on the 2019 TIMSS science scale was 642 points, and the cut score for low-performing 8th-graders was 388 points. The difference between these two cut scores (254 points) is the science score gap between the high- and low-performing U.S. 8th-graders. The U.S. score gap was larger than the corresponding score gaps in 24 education systems and smaller than the gaps in 4 education systems. Score gaps ranged from 175 points (the lowest) in Moscow City (Russia) to 359 points (the largest) in Abu Dhabi (United Arab Emirates).

Endnotes:

¹ The Progress in International Reading Literacy Study (PIRLS) evaluates reading literacy at grade 4. For more information on PIRLS, see indicator [International Comparisons: Reading Literacy at Grade 4](#).

² Benchmarking systems are able to participate in TIMSS even though they may not be members of the IEA. Participating allows them the opportunity to assess their students’ achievement and to evaluate their curricula in an international context.

³ TIMSS scores are reported on a scale from 0 to 1,000, with a scale centerpoint set at 500 and the standard deviation set at 100. The TIMSS scale centerpoint represents the mean of the overall achievement distribution in 1995. The TIMSS scale is the same in each administration; thus, a value of 500 in 2019 equals 500 in 1995 when that was the international average.

Reference tables: *TIMSS 2019 U.S. Highlights Web Report* tables [M2a](#), [M2b](#), [S2a](#), and [S2b](#), [M1a](#), [M1b](#), [S1a](#), [S1b](#)

Glossary: N/A

Related indicators and resources: [International Comparisons: Reading Literacy at Grade 4](#); [International Comparisons: Reading, Mathematics, and Science Literacy of 15-Year-Old Students](#); [Mathematics Performance](#); [Science Performance](#)