Changes Between 2011 and 2019 in Achievement Gaps Between High- and Low-Performing Students in Mathematics and Science: International Results From TIMSS

AUTHORS
Maria Stephens
Ebru Erberber
Yemurai Tsokodayi
Frank Fonseca
American Institutes for Research

Statistics in Brief publications present descriptive data in tabular formats to provide useful information to a broad audience, including members of the general public. They address simple and topical issues and questions. They do not investigate more complex hypotheses, account for interrelationships among variables, or support causal inferences. We encourage readers who are interested in more complex questions and in-depth analysis to explore other National Center for Education Statistics (NCES) resources, including publications, online data tools, and public- and restricted-use datasets. See nces.ed.gov and references noted in the body of the document for more information.

The findings of the 2019 Trends in International Mathematics and Science Study (TIMSS) provided insights regarding the equity of educational outcomes in the United States. The U.S. results showed that achievement gaps between high- and low-performing U.S. students increased from 2011 to 2019 in mathematics and science at both the 4th and 8th grades (NCES 2020). The results also showed that the increases were largely due to decreases in the scores of low performers. Such decreases were also observed in NAEP in mathematics (NCES 2019) over a similar time period (2009 to 2019).

This Statistics in Brief expands upon the national results and explores how achievement gaps between high and low performers, or differences in scores between students at the 90th and 10th percentiles, changed over this time period in all participating TIMSS education systems. The findings show that the widening achievement (or score) gaps observed in the United States in the past decade were mirrored in only a few other systems. In contrast, in some education systems, score gaps narrowed because the low-performing students’ scores improved, and average performance often improved as well.

Background
Prior cross-national research on the equity of educational outcomes includes a small number of studies focused specifically on changes in the score gaps between high- and low-performing students over time. For example, in Twenty Years of TIMSS, Mullis, Martin, and Loveless (2016) analyzed long-term changes in TIMSS scores for 22 countries in the 4th grade and 25 countries in the 8th grade—most of which had baseline data from 1995 and others from 1999 or 2003. Their analysis showed that the international average score gap between the 90th and 10th percentiles in the 4th grade closed by 15 points in mathematics and 26 points in science from the baseline to 2015. However, the gaps in the 8th grade remained nearly unchanged in both subjects. Another previous study that examined score gaps using TIMSS mathematics data exclusively from 1995 and 2015 (Miller and Fonseca 2021) found that most countries followed these same patterns, although less consistently at the 8th grade.

The TIMSS 2019 results, however, signal a change from these patterns

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of static or shrinking score gaps in the United States. In the 2019 TIMSS international report (Mullis et al. 2020), the ranges in performance in 2019 for the middle group of U.S. students (those at the 25th to 75th percentiles) appeared to be wider than in previous years, although they were not tested for statistical significance. This was observed in both mathematics and science and at both the 4th and 8th grades. Exploring these results further, the 2019 U.S. highlights report (NCES 2020) found the following for both subjects and grades:

- In 2019, the U.S. score gap between high- and low-performing students (those at the 90th and 10th percentiles) was larger than in most other education systems; and
- The U.S. score gap had increased from 2011 to 2019.

Notably, the 59-point increase in the score gap in eighth-grade mathematics—from 198 points in 2011 to 256 points in 2019—represented more than half a standard deviation on the TIMSS scale. This was due to a drop in the scores of low-performing students alongside a rise in the scores of high-performing students. Of concern, decreases in low performers’ scores were a consistent factor in the widening score gaps observed and a key driver for widening gaps in the other grades and subjects.

### Purpose

This brief examines how score gaps changed across education systems from 2011 to 2019, exploring the prevalence of widening score gaps—such as those observed in the United States in the past decade—as well as narrowing gaps. In doing so, this brief updates readers on the latest trends in score gaps in mathematics and science at grades 4 and 8 and also presents new analyses that focus on the patterns in score gap changes in the past decade.

Studying patterns in score gap changes sheds light on which part of the achievement distribution may be driving change. This context is important for evaluating equity in a nuanced way and for developing appropriate policy responses. For example, narrowing score gaps is an important goal, but some scenarios could be concerning, such as those due to decreases among high-performing students, either with relatively smaller decreases among low-performing students or without (see [NAEP’s visual depictions of the various ways score gaps can narrow](https://www.nap.edu/catalog/25983/Measuring-Equity-and-Excellence-in-Student-Performance)). Analyses such as these may also offer a model for future international and national reporting, in addition to providing data on educational equity.

### Data and Methods

This brief uses data from 47 education systems at grade 4 and 36 education systems at grade 8 that have data for both 2011 and 2019. In some cases, it focuses only on the subset of 29 education systems that participated in both years and at both grades. It is possible that results would differ depending on the years chosen for analyses across all comparison countries.

For this analysis, all estimates (i.e., average scores and 10th and 90th percentile scores) and their standard errors were calculated using the [EdSurvey R Package](https://cran.r-project.org/web/packages/EdSurvey/index.html) (NCES 2021), which was designed for the analysis of data from large-scale surveys, including international assessments such as TIMSS. EdSurvey takes into account the complex sample survey design of TIMSS, including the use of plausible values, replicate weights, and sampling weights. Covariance within a year is accounted for in the calculation of standard errors of the percentile gaps. Independent tests were conducted to determine the significance of changes in average scores, 10th and 90th percentile scores, and 90th–10th percentile gaps between 2011 and 2019. All stated changes are significant at the $p < .05$ level. Score-point differences presented in the text were computed from unrounded numbers, and they may differ from those computed using the rounded whole numbers that appear in the tables and figures. For more information about the data and methods used in this brief, please see the [TIMSS 2019 U.S. Technical Notes](https://nces.ed.gov/timss/technicalNotes.cfm) on the [TIMSS 2019 Results page](https://nces.ed.gov/timss/tables/report.cfm).

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1 At each grade, the TIMSS scale has a range of 0 to 1,000. A centerpoint of 500 was set to correspond to the mean of overall achievement in 1995, with 100 points set to correspond to the standard deviation. Score-point differences presented in the text were computed from unrounded numbers, and they may differ from those computed using the rounded whole numbers that appear in the tables and figures.
Study Questions and Key Findings

The key findings summarize the results, across grades 4 and 8, in both mathematics and science. See table A1 for the summary results at-a-glance.

1. In which education systems did score gaps between high- and low-performing students change (widen or narrow) between 2011 and 2019?

- Between 2011 and 2019, neither the widening nor narrowing of score gaps between high- and low-performing students was typical in any given TIMSS subject or grade. Across mathematics and science at the 4th and 8th grades, no more than a quarter of the participating education systems had a score gap that widened, and no more than one-third had a score gap that narrowed.

- Of the 29 education systems that participated in TIMSS 2011 and 2019 at both grades (see table A2), the United States was the only one where the score gap between high- and low-performing students widened in both mathematics and science at both grades. Qatar was the only education system where the score gap narrowed; and Australia, the Islamic Republic of Iran, Japan, and Lithuania were the only ones where the score gaps did not change.

2. Is the widening or narrowing of score gaps between 2011 and 2019 driven primarily by changes in the scores of high-performing students, low-performing students, or both?

Score gap changes and changes in the achievement distribution

- Between 2011 and 2019, score gaps generally widened because low-performing students’ scores decreased. In contrast, score gaps generally narrowed because low-performing students’ scores increased. In some education systems where score gaps narrowed, the scores of both low- and high-performing students increased, but the scores of the low-performing students increased more.

- In the United States, the score gap widened in both subjects and grades due to decreases in the scores of low-performing students—matching the prevailing international pattern. At the eighth grade, in addition to decreases in low-performing students’ scores, high-performing students’ scores increased, resulting in a pattern of divergence.

Score gap changes and changes in average scores

- Among education systems where score gaps narrowed from 2011 to 2019, the narrowing score gap was typically associated with increased average performance. In each grade and subject combination, about three-quarters or more of these education systems also had average score increases.

- Among education systems where score gaps widened from 2011 to 2019, there was no clear relationship between changes in score gaps and changes in average scores. In the United States, the score gap widened in both grades and subjects, although average scores did not change across this time period.
STUDY QUESTION 1: In which education systems did score gaps between high- and low-performing students change (widen or narrow) between 2011 and 2019?

Grade 4 Mathematics

Between 2011 and 2019, the score gap between high- and low-performing students in 4th-grade mathematics widened in 11 education systems and narrowed in 10 education systems (see figure 1). However, in most education systems (26 of 47), there was no change in the score gap over this time period.

The United States had one of the largest increases in score gaps across education systems at 24 points. Increases otherwise ranged from 16 points in Quebec-CAN to 29 points in Kuwait. Decreases in 4th-grade mathematics score gaps ranged from 14 points in Italy to 62 points in Azerbaijan.

There was no clear relationship between changes in score gap sizes and 2019 average scores in 4th-grade mathematics (see figure A1). Most education systems where score gaps widened were clustered in the middle range of performance. However, one education system (Hong Kong-CHN) had among the highest average scores in 2019 and one (Kuwait) had among the lowest. Education systems where score gaps narrowed were found across the distribution of performance, with Chinese Taipei and the Russian Federation having among the highest average scores and Qatar and Chile having among the lowest scores.

<table>
<thead>
<tr>
<th>Education system</th>
<th>2011-2019</th>
<th>Education system</th>
<th>2011-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widening score gap</td>
<td></td>
<td>Widening score gap</td>
<td></td>
</tr>
<tr>
<td>Kuwait</td>
<td>29 *</td>
<td>United Arab Emirates</td>
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<td>24 *</td>
<td>Croatia</td>
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<td>Netherlands</td>
<td>23 *</td>
<td>Ireland</td>
<td>#</td>
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<td>Portugal</td>
<td>22 *</td>
<td>Malta</td>
<td>-2</td>
</tr>
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<td>Belgium (Flemish)-BEL</td>
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<td>Quebec-CAN</td>
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<td>England-GBR</td>
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<td></td>
<td>No change in score gap</td>
<td></td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>14</td>
<td>Italy</td>
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<td>Ontario-CAN</td>
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<td>Russian Federation</td>
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</tr>
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<td>Denmark</td>
<td>11</td>
<td>Hungary</td>
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<tr>
<td>Austria</td>
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<td>Spain</td>
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<td>Abu Dhabi-UAE</td>
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<td>Korea, Republic of</td>
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</tr>
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<td>Lithuania</td>
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<tr>
<td>Australia</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 2019 score gap significantly wider than 2011 score gap
- 2019 score gap not significantly different from 2011 score gap
- 2019 score gap significantly narrower than 2011 score gap

# Rounds to zero.
* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 4th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 1 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

Between 2011 and 2019, the score gap between high- and low-performing students in 4th-grade science widened in only 6 of the 47 education systems, including in the United States (see figure 2). In 15 education systems, the score gap narrowed, and in 26 education systems there was no change in the size of the gap over this time period.

In the United States, the score gap in 4th-grade science widened by 14 points. Increases in gap size across other education systems ranged from 17 points in Quebec-CAN to 30 points in the Netherlands. Decreases in the score gap ranged from 14 points in Poland to 77 points in Dubai-UAE.

Compared to 4th-grade mathematics, in science the score gap widened in fewer education systems (6 compared to 11) and narrowed in more (15 compared to 10). About half (8 of 15) of the education systems where score gaps narrowed also had 2019 average scores above the TIMSS scale centerpoint of 500, including two education systems—Singapore and the Russian Federation—that were among the top three performers (see figure A2).

### FIGURE 2. Changes in score gaps between high- and low-performing students on the TIMSS 4th-grade science scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>2011–2019 Change in score gap</th>
<th>Education system</th>
<th>2011–2019 Change in score gap</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Widening score gap</strong></td>
<td></td>
<td><strong>Narrowing score gap</strong></td>
<td></td>
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<tr>
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<td>30 *</td>
<td>Czech Republic</td>
<td>-7</td>
</tr>
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<td>Belgium (Flemish)-BEL</td>
<td>24 *</td>
<td>Denmark</td>
<td>-9</td>
</tr>
<tr>
<td>Abu Dhabi-UAE</td>
<td>19 *</td>
<td>Ireland</td>
<td>-9</td>
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<tr>
<td>Germany</td>
<td>18 *</td>
<td>Chile</td>
<td>-10</td>
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<td>Portugal</td>
<td>-13</td>
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<tr>
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<td>Georgia</td>
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<td>Spain</td>
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<td>Austria</td>
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<td>Italy</td>
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</tbody>
</table>

* Rounds to zero.
* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 4th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 2 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

Grade 8 Mathematics

In the United States, the score gap between high- and low-performing students in 8th-grade mathematics widened by 59 points from 2011 to 2019 (see figure 3). Six other education systems saw their score gaps widen, with their increases ranging from 20 points in the Republic of Korea to 48 points in Abu Dhabi-UAE.

In 8 education systems, the score gap in 8th-grade mathematics narrowed, with the decreases ranging from 18 points in South Africa to 46 points in Georgia. However, most education systems (21 out of 36) showed no change in their score gap from 2011 to 2019.

All but one of the education systems where score gaps in 8th-grade mathematics narrowed were also relatively poor performers, with 2019 average scores below the TIMSS scale centerpoint of 500 (see figure A3). The exception was Chinese Taipei, which was one of the top-performing education systems in 2019 while also having a score gap that narrowed by 19 points from 2011. The Republic of Korea, in contrast, was a top-performing education system where score gaps widened.

### FIGURE 3. Changes in score gaps between high- and low-performing students on the TIMSS 8th-grade mathematics scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Widening score gap</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
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<td>Iran, Islamic Rep. of</td>
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<td>Italy</td>
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<td>Dubai-UAE</td>
<td>-5</td>
</tr>
<tr>
<td>Finland</td>
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<td>Turkey</td>
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</tr>
<tr>
<td><strong>No change in score gap</strong></td>
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<td>Romania</td>
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<td>Hong Kong-CHN</td>
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<td>Quebec-CAN</td>
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<tr>
<td>Russian Federation</td>
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</table>

- 2019 score gap significantly wider than 2011 score gap
- 2019 score gap not significantly different from 2011 score gap
- 2019 score gap significantly narrower than 2011 score gap

# Rounds to zero.

* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 8th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. For “South Africa (9)”, the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 3 for standard errors [https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041](https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

**SOURCE:** International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011 and 2019.
Grade 8 Science
Between 2011 and 2019, the score gap between high- and low-performing students in 8th-grade science widened in 9 education systems and narrowed in 5 education systems (see figure 4). Eighth-grade science—in comparison to 4th- and 8th-grade mathematics and 4th-grade science—had the largest proportion of education systems in which score gaps widened (25 percent vs. 23, 19, and 13 percent, respectively) and the smallest proportion in which they narrowed (14 percent vs. 21, 22, and 32 percent, respectively).

The United States was one of the education systems where the score gap in 8th-grade science widened, with an increase of 45 points. It was in the middle of the 9 education systems, where increases ranged from 16 points in the Republic of Korea to 117 points in Abu Dhabi-UAE. Decreases in the score gap ranged from 17 points in Oman to 47 points in Qatar. In 22 of the 36 education systems, there were no changes in the score gap from 2011 to 2019.

All but one of the education systems where score gaps narrowed in 8th-grade science were also relatively poor performers, with 2019 average scores below the TIMSS scale centerpoint of 500 (see figure A4). The exception was Singapore, which was one of the top-performing education systems in 2019 while also having a score gap that narrowed by 28 points from 2011. The Republic of Korea, in contrast, was a top-performing education system where score gaps widened.

FIGURE 4. Changes in score gaps between high- and low-performing students on the TIMSS 8th-grade science scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widening score gap</td>
<td></td>
<td>Widening score gap</td>
<td></td>
</tr>
<tr>
<td>Abu Dhabi-UAE</td>
<td>117 *</td>
<td>Bahrain</td>
<td>3</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>80 *</td>
<td>Lithuania</td>
<td>3</td>
</tr>
<tr>
<td>Hong Kong-CHN</td>
<td>61 *</td>
<td>Hungary</td>
<td>2</td>
</tr>
<tr>
<td>Finland</td>
<td>55 *</td>
<td>Russian Federation</td>
<td>-2</td>
</tr>
<tr>
<td>United States</td>
<td>45 *</td>
<td>Morocco</td>
<td>-3</td>
</tr>
<tr>
<td>Sweden</td>
<td>42 *</td>
<td>Chinese Taipei</td>
<td>-4</td>
</tr>
<tr>
<td>Ontario-CAN</td>
<td>28 *</td>
<td>Iran, Islamic Rep. of</td>
<td>-5</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>16 *</td>
<td>Italy</td>
<td>-5</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>16 *</td>
<td>Japan</td>
<td>-7</td>
</tr>
<tr>
<td>No change in score gap</td>
<td></td>
<td>Dubai-UAE</td>
<td>-7</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>17</td>
<td>Jordan</td>
<td>-10</td>
</tr>
<tr>
<td>Lebanon</td>
<td>17</td>
<td>Turkey</td>
<td>-14</td>
</tr>
<tr>
<td>New Zealand</td>
<td>16</td>
<td>Malaysia</td>
<td>-15</td>
</tr>
<tr>
<td>England-GBR</td>
<td>16</td>
<td>Oman</td>
<td>-17 *</td>
</tr>
<tr>
<td>Romania</td>
<td>14</td>
<td>Georgia</td>
<td>-19 *</td>
</tr>
<tr>
<td>Chile</td>
<td>11</td>
<td>South Africa (9)</td>
<td>-26 *</td>
</tr>
<tr>
<td>Australia</td>
<td>9</td>
<td>Singapore</td>
<td>-28 *</td>
</tr>
<tr>
<td>Quebec-CAN</td>
<td>5</td>
<td>Qatar</td>
<td>-47 *</td>
</tr>
<tr>
<td>Israel</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2019 score gap significantly wider than 2011 score gap
2019 score gap not significantly different from 2011 score gap
2019 score gap significantly narrower than 2011 score gap

* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 8th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. For “South Africa (9)”, the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 4 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

**STUDY QUESTION 2: Is the widening or narrowing of score gaps between 2011 and 2019 driven primarily by changes in the scores of high-performing students, low-performing students, or both?**

**Grade 4 Mathematics**

Score gaps in 4th-grade mathematics generally **widened** from 2011 to 2019 because the scores of low-performing students decreased, as was the case in 7 of 11 education systems (see figure 5). These decreases ranged from 10 points in Quebec-CAN to 28 points in Belgium (Flemish)-BEL. In the United States, the scores of low-performing students decreased by 20 points, while there was no change in the score of high-performing students. The United States shared the same pattern of change—that is, a decrease for low-performing students, but no change for high-performing students—with Portugal, Belgium (Flemish)-BEL, Finland, Germany, and Quebec-CAN. A notable exception to the overall pattern was in Kuwait, where low-performing students’ scores **increased**, but the score gap still widened because of an even larger increase among high-performing students.

Score gaps in 4th-grade mathematics generally **narrowed** from 2011 to 2019 because low-performing students’ scores increased, as was the case in 9 of 10 education systems. These increases ranged from 13 points in Italy to 105 points in Dubai-UAE. In 5 of these education systems, the scores of high-performing students also increased, although not as much as they did for their low-performing students. Among education systems where score gaps narrowed, Chile was an exception. Although the scores of both low and high performers decreased, a larger decrease among high-performing students led to the narrowed score gap.

Among the 26 education systems that showed **no change** in their 4th-grade mathematics score gap, most (21) did still experience changes in the scores of their low- and/or high-performing students (see figure A5). However, these changes were either too small to change the score gap size or, if they occurred for both groups, similar in size at both ends of the distribution. In 15 of these education systems, the scores of both low and high performers increased.

Among education systems where score gaps narrowed in 4th-grade mathematics, nearly all (8 of 10) also increased their average score—demonstrating both improved equity and improved achievement. The relationship between change in score gap and average score varied for the other groups of education systems.

**FIGURE 5. Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 4th-grade mathematics scale, by education system: 2011 and 2019**

<table>
<thead>
<tr>
<th>Education system</th>
<th>Change in Scores of low-performing students</th>
<th>Change in Scores of high-performing students</th>
<th>Score gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuwait</td>
<td>-23</td>
<td>52</td>
<td>29 *</td>
</tr>
<tr>
<td>United States</td>
<td>-20</td>
<td>4</td>
<td>24 *</td>
</tr>
<tr>
<td>Netherlands</td>
<td>-13</td>
<td>10</td>
<td>23 *</td>
</tr>
<tr>
<td>Portugal</td>
<td>-20</td>
<td>2</td>
<td>22 *</td>
</tr>
<tr>
<td>Belgium (Flemish)-BEL</td>
<td>-28</td>
<td>-6</td>
<td>22 *</td>
</tr>
<tr>
<td>Finland</td>
<td>-25</td>
<td>-3</td>
<td>21 *</td>
</tr>
<tr>
<td>New Zealand</td>
<td>-6</td>
<td>13</td>
<td>19 *</td>
</tr>
<tr>
<td>Germany</td>
<td>-18</td>
<td>3</td>
<td>18 *</td>
</tr>
<tr>
<td>Sweden</td>
<td>9</td>
<td>27</td>
<td>18 *</td>
</tr>
<tr>
<td>Hong Kong-CN</td>
<td>-9</td>
<td>8</td>
<td>17 *</td>
</tr>
<tr>
<td>Quebec-CAN</td>
<td>-10</td>
<td>6</td>
<td>16 *</td>
</tr>
<tr>
<td>Italy</td>
<td>13</td>
<td>#</td>
<td>-14 *</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>32</td>
<td>17</td>
<td>-15 *</td>
</tr>
<tr>
<td>Chile</td>
<td>-12</td>
<td>-28</td>
<td>-16 *</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>14</td>
<td>#</td>
<td>-19 *</td>
</tr>
<tr>
<td>Hungary</td>
<td>21</td>
<td>1</td>
<td>-22 *</td>
</tr>
<tr>
<td>Qatar</td>
<td>55</td>
<td>21</td>
<td>-34 *</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>34</td>
<td>-3</td>
<td>-41 *</td>
</tr>
<tr>
<td>Dubai-UAE</td>
<td>105</td>
<td>54</td>
<td>-52 *</td>
</tr>
<tr>
<td>Armenia</td>
<td>71</td>
<td>17</td>
<td>-54 *</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>84</td>
<td>22</td>
<td>-62 *</td>
</tr>
</tbody>
</table>

* # Rounds to zero. * * p < .05. Change in score gap is significant at the .05 level of statistical significance. NOTE: This figure includes education systems that participated in TIMSS at 4th grade in both 2011 and 2019 and that had a change in the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) over that time period. Education systems are grouped by whether the score gap widened or narrowed. Within these groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 1 for standard errors (https://nces.ed.gov/pubssearch/pubsinfo.asp?pubid=2022041).

Grade 4 Science

In 4 of 6 education systems, score gaps in 4th-grade science widened from 2011 to 2019 because the scores of low-performing students decreased (see figure 6). These decreases ranged from 14 points in the United States to 27 points in the Netherlands. In the other two of these education systems, the widening gaps were due to increases in high performers’ scores.

Among the 6 education systems where score gaps widened, the United States shared the same pattern of change with Germany, Belgium (Flemish)-BEL, and the Netherlands: a decrease for low-performing students, but no change for high-performing students. This was also the pattern of change found for the United States in 4th-grade mathematics.

Score gaps in 4th-grade science generally narrowed from 2011 to 2019 because of improvements among low-performing students, as was the case in 12 of 15 education systems. These students’ score increases ranged from 17 points in Chinese Taipei to 124 points in Dubai-UAE. In 7 of these education systems, the scores of high-performing students also increased, although not as much as they did among low performers. Among education systems where score gaps narrowed, a less common pattern was a drop in high performers’ scores with no change among low performers, which occurred in Hungary, Italy, and Azerbaijan.

Among the 26 education systems that showed no change in their 4th-grade science score gap, some (14) did still experience changes in the scores of their low- and/or high-performing students (see figure A6). In 5 education systems—Lithuania, United Arab Emirates, Australia, Kuwait, and Morocco—scores increased at both ends of the distribution.

Most education systems that narrowed their score gap in 4th-grade science also increased their average score (11 of 15)—demonstrating improved equity and achievement. The relationship between change in score gap and average score varied for the other groups of education systems. Among education systems where the score gap widened, average scores either dropped or remained unchanged (such as in the United States).

**FIGURE 6. Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 4th-grade science scale, by education system: 2011 and 2019**

<table>
<thead>
<tr>
<th>Education system</th>
<th>Scores of low-performing students</th>
<th>Scores of high-performing students</th>
<th>Score gap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Change in 2011</td>
<td>Change in 2019</td>
<td>Change in 2011</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td><strong>Widening score gap</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>-27</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Belgium (Flemish)-BEL</td>
<td>-21</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Abu Dhabi-UAE</td>
<td>-19</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Germany</td>
<td>-19</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Quebec-CAN</td>
<td>-4</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td><strong>United States</strong></td>
<td>-14</td>
<td>1</td>
<td>14*</td>
</tr>
<tr>
<td><strong>Narrowing score gap</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>33</td>
<td>-19</td>
<td>14*</td>
</tr>
<tr>
<td>Hungary</td>
<td>5</td>
<td>-13</td>
<td>17*</td>
</tr>
<tr>
<td>Italy</td>
<td>-5</td>
<td>-23</td>
<td>18*</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>17</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>26</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>2</td>
<td>-23</td>
<td>24*</td>
</tr>
<tr>
<td>England-GBR</td>
<td>23</td>
<td>-3</td>
<td>26*</td>
</tr>
<tr>
<td>Singapore</td>
<td>25</td>
<td>-2</td>
<td>27*</td>
</tr>
<tr>
<td>Armenia</td>
<td>64</td>
<td>35</td>
<td>30*</td>
</tr>
<tr>
<td>Malta</td>
<td>68</td>
<td>32</td>
<td>35*</td>
</tr>
<tr>
<td>Bahrain</td>
<td>63</td>
<td>28</td>
<td>35*</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>22</td>
<td>-15</td>
<td>37*</td>
</tr>
<tr>
<td>Qatar</td>
<td>85</td>
<td>28</td>
<td>58*</td>
</tr>
<tr>
<td>Dubai-UAE</td>
<td>124</td>
<td>46</td>
<td>77*</td>
</tr>
</tbody>
</table>

# Rounds to zero.
* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes education systems that participated in TIMSS at 4th grade in both 2011 and 2019 and that had a change in the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) over that time period. Education systems are grouped by whether the score gap widened or narrowed. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 2 for standard errors (https://nces.ed.gov/pubssearch/pubsinfo.asp?pubid=2022041).

Grade 8 Mathematics

In 3 of 7 education systems, score gaps in 8th-grade mathematics widened from 2011 to 2019 because the scores of high-performing students increased without any changes among low-performing students (see figure 7). These systems are the United Arab Emirates, Sweden, and Ontario-CAN. In the United States and Abu Dhabi-UAE, however, improvements among high-performing students were accompanied by declines among low-performing students, leading to among the largest score gaps across education systems in 2019. The scores of low performers in these two education systems decreased by 24 and 36 points, respectively.

Score gaps in 8th-grade mathematics narrowed from 2011 to 2019 because of improvements among low-performing students, as was the case in all 8 education systems where gaps narrowed. These students’ score increases ranged from 16 points in Chinese Taipei to 59 points in Georgia. In 2 of these education systems (South Africa and Oman), the scores of high-performing students also increased, although not as much as they did among low performers. Only one education system (Saudi Arabia) saw a score increase for low-performing students, without any changes among high-performing students accompanied by a decline among high-performing students.

Among the 21 education systems that showed no change in their 8th-grade mathematics score gap, over half of these systems (12) still experienced changes in the scores of their low- and/or high-performing students (see figure A7). In 8 education systems, score increases among both high and low performers were similar enough that the overall gaps did not change. Only in Lebanon did the scores of both groups of students decline.

Most education systems (20 of 36) experienced an increase in their 8th-grade mathematics average score from 2011 to 2019—regardless of score gap change. Where score gaps widened, average score increases were due to increases in the scores of high-performing students. Where score gaps narrowed, this was typically due to increases in the scores of low-performing students. Among education systems with no score gap change, average score increases were typically due to score increases at both ends of the distribution.

Notably, in the six education systems where scores declined among low performers, high performers, or both groups, none saw improvements in their average scores (including the United States), and two education systems (Abu Dhabi-UAE and Lebanon) saw declines.


did the scores of both groups not change. Only in Lebanon enough that the overall gaps did

FIGURE 7. Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 8th-grade mathematics scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>Change in scores of low-performing students</th>
<th>Change in scores of high-performing students</th>
<th>Score gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>-24</td>
<td>35</td>
<td>59 *</td>
</tr>
<tr>
<td>Abu Dhabi-UAE</td>
<td>-36</td>
<td>13</td>
<td>48 *</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>-4</td>
<td>38</td>
<td>43 *</td>
</tr>
<tr>
<td>Sweden</td>
<td>7</td>
<td>33</td>
<td>26 *</td>
</tr>
<tr>
<td>Finland</td>
<td>-17</td>
<td>6</td>
<td>23 *</td>
</tr>
<tr>
<td>Ontario</td>
<td>8</td>
<td>29</td>
<td>21 *</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>-17</td>
<td>3</td>
<td>20 *</td>
</tr>
<tr>
<td>South Africa (9)</td>
<td>45</td>
<td>27</td>
<td>-18 *</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>16</td>
<td>-4</td>
<td>-19 *</td>
</tr>
<tr>
<td>Oman</td>
<td>57</td>
<td>32</td>
<td>-26 *</td>
</tr>
<tr>
<td>Jordan</td>
<td>35</td>
<td>3</td>
<td>-32 *</td>
</tr>
<tr>
<td>Morocco</td>
<td>36</td>
<td>-2</td>
<td>-38 *</td>
</tr>
<tr>
<td>Qatar</td>
<td>57</td>
<td>19</td>
<td>-38 *</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>20</td>
<td>-21</td>
<td>-41 *</td>
</tr>
<tr>
<td>Georgia</td>
<td>59</td>
<td>13</td>
<td>-46 *</td>
</tr>
</tbody>
</table>

* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes education systems that participated in TIMSS at 8th grade in both 2011 and 2019 and that had a change in the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) over that time period. Education systems are grouped by whether the score gap widened or narrowed. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. For “South Africa (9),” the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 3 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

Grade 8 Science

In 5 of 9 education systems, score gaps in 8th-grade science widened from 2011 to 2019 because the scores of low-performing students decreased while the scores of high-performing students increased, which is a pattern that was not frequently seen in other grades and subjects (see figure 8). The United States was one of these 5 education systems, with a 27-point decrease among low performers and a 17-point increase among high performers. In Hong Kong-CHN, the widening of the score gap was due to a decrease in the scores of low-performing students, with no change in the scores of high-performing students. In contrast, the widening of the score gap in Sweden and the Republic of Korea was due to an increase in high-performing students’ scores.

Score gaps in 8th-grade science narrowed from 2011 to 2019 because of increases in low performers’ scores, as was the case in all 5 education systems where score gaps narrowed. These increases ranged from 31 points in Singapore to 82 points in Qatar. In 4 of these education systems, the scores of high-performing students also increased, although not as much as they did among low performers.

Among the 22 education systems that showed no change in their 8th-grade science score gap, most of these systems (15) still did experience changes in the scores of their low- and/ or high-performing students (see figure A8). These changes were either too small to change the achievement gap size or, if they occurred for both groups, similar in size at both ends of the distribution. In 7 of the 15 education systems, the scores of both low and high performers increased.

All 5 education systems where score gaps narrowed in 8th-grade science also increased their average score, demonstrating both improved equity and improved achievement. In fact, all education systems (I3) that saw an increase in the scores of low-performing students also saw an increase in average score, regardless of whether high performers’ scores improved or gap sizes changed.

Most education systems that saw a drop in the scores of low-performing students (8 out of 11) also saw a drop in average scores, even when high performers’ scores increased. The United States and Ontario-CAN were two of the exceptions, where diverging scores between low- and high-performing students resulted in a widening score gap but no change in average score.

### FIGURE 8. Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 8th-grade science scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>Scores of low-performing students</th>
<th>Change in</th>
<th>Scores of high-performing students</th>
<th>Score gap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>2019</td>
<td>Widening score gap</td>
<td>2011</td>
</tr>
<tr>
<td>Abu Dhabi-UAE</td>
<td>29</td>
<td>46</td>
<td>17 *</td>
<td>14</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>-29</td>
<td>-42</td>
<td>23 *</td>
<td>40</td>
</tr>
<tr>
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* # Rounds to zero.
*  p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes education systems that participated in TIMSS at 8th grade in both 2011 and 2019, and that had a change in the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) over that time period. Education systems are grouped by whether the score gap widened or narrowed. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. For “South Africa (9)”, the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 4 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

FIND OUT MORE

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To access and explore TIMSS data, visit the TIMSS International Data Explorer at https://nces.ed.gov/surveys/international/ide/.

Read the NCES TIMSS 2019 U.S. Results.

Visit the IEA TIMSS website.

Read the International TIMSS 2019 Report.

References


# Appendix


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▲ 2019 score significantly higher than 2011 score
▼ 2019 score significantly lower than 2011 score
# Rounds to zero.

NOTE: This table includes education systems that participated in TIMSS in both 2011 and 2019 at either grade and had a significant change (p < .05) in the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) over that time period. Education systems are grouped by whether the score gap widened or narrowed. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. Italics indicate the education systems that participated in TIMSS 2011 and 2019 at both grades. For “South Africa (9),” the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates.

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* Indicates participation in particular assessment

NOTE: Education systems are ordered alphabetically. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. Italics indicate the education systems that participated in TIMSS 2011 and 2019 at both grades. For “South Africa (9)”, the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling).


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- 2019 score gap significantly wider than 2011 score gap
- 2019 score gap not significantly different from 2011 score gap
- 2019 score gap significantly narrower than 2011 score gap

▲ 2019 average score significantly higher than the TIMSS centerpoint
▼ 2019 average score significantly lower than the TIMSS centerpoint

# ROUNDS TO ZERO.

* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 4th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are ordered by 2019 average score. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 1 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

FIGURE A2. Changes in score gaps between high- and low-performing students on the TIMSS 4th-grade science scale, by education system: 2011 and 2019

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- 2019 score gap significantly wider than 2011 score gap
- 2019 score gap not significantly different from 2011 score gap
- 2019 score gap significantly narrower than 2011 score gap

▲ 2019 average score significantly higher than the TIMSS centerpoint
▼ 2019 average score significantly lower than the TIMSS centerpoint

# Rounds to zero.

* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 4th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are ordered by 2019 average score. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country.

TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 2 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

FIGURE A3. Changes in score gaps between high- and low-performing students on the TIMSS 8th-grade mathematics scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
<th>2019 Average score</th>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
<th>2019 Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>12</td>
<td>616 ▲</td>
<td>Turkey</td>
<td>-10</td>
<td>496</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>-19 *</td>
<td>612 ▲</td>
<td>Kazakhstan</td>
<td>10</td>
<td>488 ▼</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>20 *</td>
<td>607 ▲</td>
<td>New Zealand</td>
<td>9</td>
<td>482 ▼</td>
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<td>Japan</td>
<td>-1</td>
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<td>481 ▼</td>
</tr>
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<td>Hong Kong-CHN</td>
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<td>578 ▲</td>
<td>Romania</td>
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<td>479 ▼</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>#</td>
<td>543 ▲</td>
<td>United Arab Emirates</td>
<td>43 *</td>
<td>473 ▼</td>
</tr>
<tr>
<td>Quebec-CAN</td>
<td>11</td>
<td>543 ▲</td>
<td>Georgia</td>
<td>-46 *</td>
<td>461 ▼</td>
</tr>
<tr>
<td>Dubai-UAE</td>
<td>-5</td>
<td>537 ▲</td>
<td>Malaysia</td>
<td>-7</td>
<td>461 ▼</td>
</tr>
<tr>
<td>Ontario-CAN</td>
<td>21 *</td>
<td>530 ▲</td>
<td>Iran, Islamic Rep. of</td>
<td>-2</td>
<td>446 ▼</td>
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<td>Lithuania</td>
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<td>Qatar</td>
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<td>Abu Dhabi-UAE</td>
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<td>436 ▼</td>
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<tr>
<td>Hungary</td>
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<td>-6</td>
<td>429 ▼</td>
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<tr>
<td>United States</td>
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<td>Jordan</td>
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<td>420 ▼</td>
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<tr>
<td>England-GBR</td>
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<td>Oman</td>
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<td>411 ▼</td>
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<tr>
<td>Finland</td>
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<td>509 ▲</td>
<td>Saudi Arabia</td>
<td>-41 *</td>
<td>394 ▼</td>
</tr>
<tr>
<td>Sweden</td>
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<td>503</td>
<td>South Africa (9)</td>
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<td>389 ▼</td>
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<td>-5</td>
<td>497</td>
<td>Morocco</td>
<td>-38 *</td>
<td>388 ▼</td>
</tr>
</tbody>
</table>

- 2019 score gap significantly wider than 2011 score gap
- 2019 score gap not significantly different from 2011 score gap
- 2019 score gap significantly narrower than 2011 score gap
- ▲ 2019 average score significantly higher than the TIMSS centerpoint
- ▼ 2019 average score significantly lower than the TIMSS centerpoint

# Rounds to zero.
* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 8th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are ordered by 2019 average score. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. For “South Africa (9)”, the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 3 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

FIGURE A4. Changes in score gaps between high- and low-performing students on the TIMSS 8th-grade science scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
<th>2019 Average score</th>
<th>Education system</th>
<th>2011-2019 Change in score gap</th>
<th>2019 Average score</th>
</tr>
</thead>
<tbody>
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<td>608 ▲</td>
<td>Italy</td>
<td>-5</td>
<td>500</td>
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<td>Chinese Taipei</td>
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<td>574 ▲</td>
<td>New Zealand</td>
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<tr>
<td>Japan</td>
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<td>570 ▲</td>
<td>Bahrain</td>
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<td>486 ▼</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>16 *</td>
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<td>Kazakhstan</td>
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<td>478 ▼</td>
</tr>
<tr>
<td>Dubai-UAE</td>
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<td>548 ▲</td>
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<td>543 ▲</td>
<td>United Arab Emirates</td>
<td>80 *</td>
<td>473 ▼</td>
</tr>
<tr>
<td>Finland</td>
<td>55 *</td>
<td>543 ▲</td>
<td>Romania</td>
<td>14</td>
<td>470 ▼</td>
</tr>
<tr>
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<td>537 ▲</td>
<td>Chile</td>
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<td>462 ▼</td>
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<td>Malaysia</td>
<td>-15</td>
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</tr>
<tr>
<td>Hungary</td>
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<td>530 ▲</td>
<td>Oman</td>
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<td>457 ▼</td>
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<td>Australia</td>
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<td>United States</td>
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<td>522 ▲</td>
<td>Iran, Islamic Rep. of</td>
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<td>449 ▼</td>
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<td>522 ▲</td>
<td>Georgia</td>
<td>-19 *</td>
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<td>Sweden</td>
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<td>521 ▲</td>
<td>Saudia Arabia</td>
<td>16 *</td>
<td>431 ▼</td>
</tr>
<tr>
<td>England-GBR</td>
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<td>517 ▲</td>
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<td>117</td>
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<td>Turkey</td>
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<td>South Africa (9)</td>
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</tr>
</tbody>
</table>

- ▲ 2019 average score significantly higher than the TIMSS centerpoint
- ▼ 2019 average score significantly lower than the TIMSS centerpoint
- 2019 score gap significantly wider than 2011 score gap
- 2019 score gap not significantly different from 2011 score gap
- 2019 score gap significantly narrower than 2011 score gap

*p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 8th grade in both 2011 and 2019. Score gap refers to the gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile). Education systems are ordered by 2019 average score. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. For “South Africa (9)”, the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 4 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

FIGURE A5. Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 4th-grade mathematics scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>Change in Scores of low-performing students</th>
<th>Change in Scores of high-performing students</th>
<th>Score gap</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>-120  -60  0  60  120</td>
<td>-120  -60  0  60  120</td>
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<td>29*</td>
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<td>10</td>
<td>24*</td>
<td>-6</td>
</tr>
<tr>
<td>Netherlands</td>
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<td>22*</td>
<td>-7</td>
</tr>
<tr>
<td>Portugal</td>
<td>-28</td>
<td>-6</td>
<td>22*</td>
<td>-17 ▼</td>
</tr>
<tr>
<td>Finland</td>
<td>-25</td>
<td>-3</td>
<td>21*</td>
<td>-13 ▼</td>
</tr>
<tr>
<td>New Zealand</td>
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<td>Germany</td>
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<td>18</td>
<td>18*</td>
<td>-7 ▼</td>
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<td>27</td>
<td>18*</td>
<td>17 ▲</td>
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<td>Hong Kong-CIH</td>
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<td>8</td>
<td>17*</td>
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<td>16*</td>
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<td>-12</td>
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<td>Ontario-CAN</td>
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<td>-6</td>
</tr>
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<td>Poland</td>
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<td>46</td>
<td>13</td>
<td>39 ▲</td>
</tr>
<tr>
<td>Czech Republic</td>
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<td>12</td>
<td>22 ▲</td>
</tr>
<tr>
<td>Denmark</td>
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<td>-12 ▼</td>
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<td>31 ▲</td>
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<td>5</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Iran, Islamic Rep. of</td>
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<td>6</td>
<td>12 ▲</td>
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<td>20 ▲</td>
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<td>5</td>
<td>23 ▲</td>
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<td>Korea, Republic of</td>
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<td>-5</td>
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<td>21</td>
<td>#</td>
<td>19 ▲</td>
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<td>21 ▲</td>
</tr>
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<td>-8</td>
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<tr>
<td>Bahrain</td>
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<td>44 ▲</td>
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<td>8 ▲</td>
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<td>46 ▲</td>
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<td>13 ▲</td>
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<td>Georgia</td>
<td>41</td>
<td>24</td>
<td>-17</td>
<td>32 ▲</td>
</tr>
</tbody>
</table>

- 2019 score significantly higher than 2011 score
- 2019 score not significantly different from 2011 score
- 2019 score significantly lower than 2011 score
- 2019 average score significantly higher than 2011 average score
- 2019 average score significantly lower than 2011 average score

* p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 4th grade in both 2011 and 2019. Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 1 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

FIGURE A6. Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 4th-grade science scale, by education system: 2011 and 2019

<table>
<thead>
<tr>
<th>Education system</th>
<th>Change in Scores of low-performing students</th>
<th>Change in Scores of high-performing students</th>
<th>Score gap</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-120 -60 0 60 120</td>
<td>-120 -60 0 60 120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widening score gap</td>
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<td>-11 ▼</td>
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<td>-4</td>
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</table>

- 2019 score significantly higher than 2018 score
- 2019 score not significantly different from 2018 score
- 2019 score significantly lower than 2018 score
- 2019 average score significantly higher than 2018 average score
- 2019 average score significantly lower than 2018 average score
- Rounds to zero.

*p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 4th grade in both 2011 and 2019. Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 2 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

**FIGURE A7.** Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 8th-grade mathematics scale, by education system: 2011 and 2019

<table>
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<tr>
<th>Education system</th>
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<th>Narrowing score gap</th>
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<td>Ontario</td>
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### Table Notes
- **Change in**
  - Scores of low-performing students
  - Scores of high-performing students
  - Score gap
  - Average score

### Table Legend
- 2019 score significantly higher than 2011 score
- 2019 score not significantly different from 2011 score
- 2019 score significantly lower than 2011 score
- 2019 average score significantly higher than 2011 average score
- 2019 average score significantly lower than 2011 average score

**NOTE:** This figure includes all education systems that participated in TIMSS at 8th grade in both 2011 and 2019. Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap. Education systems that are not countries are designated by the appended three-letter international abbreviation for their country. For “South Africa (9),” the 9 indicates the years of formal schooling. They chose to administer TIMSS at a different grade than other education systems (8 years of formal schooling). TIMSS scores are reported on a scale of 0 to 1,000 with a TIMSS centerpoint of 500 and standard deviation of 100. Although rounded numbers are displayed, the data shown are based on unrounded estimates. Please see the corresponding data table 3 for standard errors (https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2022041).

**SOURCE:** International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2011 and 2019.
FIGURE A8. Changes in scores of low- and high-performing students, score gaps, and average scores on the TIMSS 8th-grade science scale, by education system: 2011 and 2019

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<th>Average score</th>
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- 2019 score significantly higher than 2011 score
- 2019 score not significantly different from 2011 score
- 2019 score significantly lower than 2011 score
- ▲ 2019 average score significantly higher than 2011 average score
- ▼ 2019 average score significantly lower than 2011 average score
- Rounds to zero.
- * p < .05. Change in score gap is significant at the .05 level of statistical significance.

NOTE: This figure includes all education systems that participated in TIMSS at 8th grade in both 2011 and 2019. Education systems are grouped by whether the score gap between high-performing students (those at the 90th percentile) and low-performing students (those at the 10th percentile) widened, did not change significantly, or narrowed from 2011 to 2019. Within those groups, education systems are in descending order of the size of the change in the score gap.

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